Journal of Telecommunications and the Digital Economy

Special Issue:

Women's Participation in the Digital Economy and Digital Society

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Editorial

A Special Issue

Leith H. Campbell
Managing Editor

Abstract: This editorial introduces the June issue, which includes a main Special Issue section on Women's Participation in the Digital Economy and Digital Society, as well as papers from the general submissions.

Keywords: Editorial

Special Issue: Women's Participation in the Digital Economy and Digital Society

This number of the *Journal* features a Special Issue on Women's Participation in the Digital Economy and Digital Society. The topic, while it is of broad interest in its own right, also helps to shine a light on barriers that may exist to the continued expansion of the digital economy and the formation of a fully digital society.

The four Guest Editors, Barbara Pisker, Hareesh N. Ramanathan, Željko Pavić and Johanna Plante, have been diligent in encouraging submissions, organizing peer reviews, and identifying 12 papers suitable for publication out of about 34 submissions. I would like to thank them for their sustained efforts over many months and recognize especially the leadership of Dr Pisker in bringing the Special Issue together. The Guest Editorial (Pisker *et al.*, 2023) provides some context for the Special Issue and an overview of the content.

We are also pleased to publish a Foreword to the Special Issue by Vicki Brady, the CEO of Telstra, Australia's largest telecommunications company. Ms Brady's support for the topic and this publication is very welcome.

Elsewhere in This Issue

We also include two papers from our general submissions.

In the Telecommunications section, we have one paper: *Media Activities and Telecommunications Consumers' Awareness of Their Rights: A Study of Mobile Phone Users in Calabar, Nigeria.*

In the Biography section, we publish an obituary of George Hams, a respected Australian telecommunications engineer and manager, and an international telecommunications adviser.

As always, we encourage you to consider submitting articles to the *Journal* and we welcome comments and suggestions on which topics or special issues would be of interest. Feedback on the current Special Issue and future issues would be welcome.

Reference

Pisker, B., Ramanathan, H. N., Pavić, Ž., & Plante, J. (2023). Guest Editorial: Women's Participation in the Digital Economy and Digital Society. *Journal of Telecommunications and the Digital Economy*, *11*(2), 1–5. https://doi.org/10.18080/jtde.v11n2.756

Guest Editorial

Women's Participation in the Digital Economy and Digital Society

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Hareesh N. Ramanathan
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Abstract: This guest editorial provides some background to the Special Issue on "Women's Participation in the Digital Economy and Digital Society". It describes the major themes emerging from the twelve papers selected for publication.

Keywords: Digital gender gap, women, digital economy and society

On Women as a Cornerstone Topic in a Journal Special Issue

Although each of us is an individual, community is the pure essence of our human being. All our goals and activities are forming numerous and different groups, building up our societies. The core idea of group involvement has always been formed around needs and interests that evolved and changed over time. Starting from Maslow's hierarchy (1943) of ground, physiological needs, progressing towards the complexity of reaching higher self-esteem levels of the needs pyramid, and, especially, keeping up with the level's priority, our individual and collective goals cannot be obtained without those intangible bonds and threads, forming our hubs and the social tissue of our networks, groups and communities.

Therefore, from the collective, group standpoint, we must deploy all our top resources to achieve individual but simultaneously common societal goals, regardless of all the differences

we find among ourselves. These may be based on characteristics that differentiate us in colour, gender, and age. Additionally, variety makes us potent in resolving contemporary global challenges. Our resilience and strength lie in the diversity among us.

Historically and cross-culturally, we are aware of the supremacy status certain social groups have claimed and forced upon others, often aiming towards isolated, selfish, unilateral and narrow goals. Those examples, presented or experienced at a micro or macro level, have given us a mandatory basic lecture on the certainty of inclusiveness, openness and diversity as a universal benefit for all, as the UN Declaration of Human Rights (1948) has endorsed.

Bearing this thought in mind, we aim to set this Special Issue on Women's Participation in the Digital Economy and Digital Society as a non-binary (as opposed to Hofstede's (2001) masculine vs feminine concept) but inclusive topic. Focusing on women, we see it as a piece of a globally differentiated social group's kaleidoscope. Other social group varieties (minorities, disabled, elderly, Indigenous, marginalized) are scrutinized as humanity's eternal quest for global socio-economic equilibrium continues.

Therefore, focusing on Women in the Digital Economy and Society in this Special Issue has been chosen purely in the form of interest from different socio-economic aspects of our digital society. The variety of interests in higher rates of women's participation in the digital economy and society is rational and reasonable, firstly, due to the general population composition, as women comprise half of the overall population. Looking narrowly through a profit lens, human potential and capital in half of the population should not be wasted. It is also grown in our values through a principle of equality and equity, the rule of law and justice, and it sets the way we aspire. Further, our societies and economies have been proven to benefit from gender-balanced and inclusive practices. However, our current data still show plodding resistance in different aspects of gender equilibrium: from parliamentary seat occupancy, ICT business participation, to AI development. A digital gender gap stands stubborn and persistent, obvious and measurable in the gender pay gap, glass ceiling patterns, and the overall cultural and ideological matrix (Pisker *et al.*, 2019; 2020; 2021; 2022).

Finally, this Special Issue hopefully makes a step forward in our effort for a more inclusive and balanced society of tomorrow.

On this Special Issue

The idea of joint work on this Special Issue came alive after a debate on Women in ICT, a paper presented at the ICDEc 2021 conference, where Dr Leith Campbell, as a session moderator, suggested broadening the topic and bringing it closer to *Journal* readers. In fulfilling this goal,

the guest editorial team has been gathered with a notion of cross-cultural diversity, expertise in scientific and professional backgrounds, and a sense of gender balance.

The topic itself is currently the focus of the socio-economic community, and the twelve contributions published here cover the topic from a global perspective: from Brazil, the EU and Russia, to India, Sri Lanka, Indonesia, Malaysia and Australia.

The issue is organized into five thematic parts, ordered according to the common characteristics of the papers, the topics prioritized from the general to the specific.

The first block of papers on general gender cases and perspectives in the digital economy and society confirms and debates key topic issues through three contributions. *Gender Bias in Artificial Intelligence*, through a systematic literature review, confirms gender bias exists in AI development, highlighting types, causes and mitigating strategies to overcome future development trends. *"Is It Okay That She is a Woman?"* describes gender prejudice in ICT, from within a scientific, higher education institution, and reveals a shift beginning towards non-binary gender neutrality in Russian academia. *Not a Toy for Boys Only* takes a business perspective in qualitative research to identify reasons for the underrepresentation of women in ICT in Croatia.

Section two brings an insight into access and ability of broadband use in Australian women (*Being Digitally Savvy*), confirming current women's digital capital and pointing a path towards inclusive practices. On work-family balance in the Philippine business process outsourcing industry (*Telecommuting on Women's Work-Family Balance through Work-Family Conflicts*), quantitative research results refer to persistent inequality in household work distribution, while qualitative research on mindfulness suggests it can be a balancing factor in work-family conflicts.

The following three papers present work on digital literacy. The first, *Conditions Affecting the Perspective Towards the "Work-From-Home" Setup*, explains the interconnections between digital financial literacy and women's economic empowerment in Indonesia. The second, *Financial Literacy, Digital Financial Literacy and Women's Economic Empowerment*, examines the need for digital financial literacy among women. The third, *Non-Obvious Connections Between Information Literacy and Online Payments*, reveals some connections between information literacy and online payments.

The fourth section encompasses two research papers on women and entrepreneurship, confirming that empowered ICT skills and cultural capital reinforce entrepreneurial intention among women and prove women are vital in SME sustainability.

Finally, the issue concludes with research on women's technology usage. *E-wallet and Women in India* shows that women are trendy and up-to-date, at whatever age. Lastly, research on the

impact of technology-evoked mental imagery on brand personality and brand association for beauty brands shows women are technologically smart, using Augmented Reality as a critical societal frame of the future.

Through different approaches and aspects of a modern digital economy and society, the research has identified various social roles that women obtain: as producers and users, in academia, business and industry. Through theoretical and practical, qualitative and quantitative approaches, the papers in this issue have confirmed the perpetual existence of old, traditional divides and barriers that woman face; and have opened new horizons in challenges they are facing nowadays with AI and VR (Virtual Reality) as current socio-economic drivers.

The articles have proved that gender bias and prejudice is present in AI and ICT, and that the digital gender gap and work-family balance are continuing burdens. The papers have stressed the importance of digital literacy, ICT skills and cultural capital in women's economic, entrepreneurial and sustainability empowerment, showing women being technologically and digitally aware, witty and ingenious.

Due to the findings noted above, we acknowledge various cross-cultural differences in phases and stages women face in their response to the omnipresence of digital transformation. It is also worth underlining here how technology has no inherent potential to favour any social group before others. It is always upon the creators and users in their intention to make the best version of it, fitting responsibly to a broader societal frame.

We welcome all the reactions and comments related to this Special Issue, hoping for a prosperous and inclusive future collaboration in new challenges to come.

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Foreword

Special Issue: Women's Participation in the Digital Economy and Digital Society

Vicki Brady
Telstra Chief Executive Officer

A Foreword to the Special Issue

From an early age, we tell our children that anything is possible. We instil in them the notion that, if you set your mind to something and work hard, you can do just about anything.

Yet, despite all our progress, particularly over the last few years with the acceleration of digitisation and the growth of the digital economy, women around the world continue to face barriers each and every day: Barriers in accessing reliable and affordable Internet; Barriers to developing digital literacy skills; Barriers in leadership, education and entrepreneurship. Gender bias and stereotypes still stand in the way for many.

As CEO of Australia's largest telco, I understand the value of diversity in the workplace and the significant benefits it brings to the digital economy.

This Special Issue on Women's Participation in the Digital Economy and Digital Society delves into some of the critical work being done globally to understand issues facing women as we continue to digitise, including cultural barriers, digital skills gaps, ways of working, AI and gender bias. It also looks at the important role women play in business and how a deeper understanding of technology can give them a competitive advantage.

This edition includes a broad range of interesting studies and analysis on women across the world, with one important message: more needs to be done to help support and drive women to actively participate and effectively contribute to the digital economy.

Telecommunications companies like Telstra can make a difference. Understanding where the barriers are is the first step and this issue will touch on some of these.

Addressing these barriers is next, but in isolation, our progress will be slow – let's face it, we can't solve these issues on our own.

Collaboration within markets and across the industry is critical to drive the change we need for women no matter where they are or what they do. Addressing the digital divide is not just the right thing to do, but it is also vital for continued economic growth.

We're at an incredibly unique moment in time and I'm looking ahead at the next decade as one of profound opportunity for the telco industry.

While connectivity is the bedrock of the digital economy, it is not the end point – it is just the beginning. Its true impact will be in the things it enables and that includes great industrial and social change and innovation.

Women play such a critical role in the future of the information, communications and technology industries, and this edition of the *Journal of Telecommunications and the Digital Economy* shines a light on how enhanced digital inclusiveness not only strengthens innovation and the economy but, most importantly, improves wellbeing and prosperity for the greater good of society.

Gender Bias in Artificial Intelligence

A Systematic Review of the Literature

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Abstract: This study presents a Systematic Literature Review (SLR) of Gender Bias in Artificial Intelligence (AI). The research was conducted using two techniques: a domain-based approach to SLR process providing a bibliometric sample description and in-depth examination of the thematic categories arising from inductive categorization, extracted from reading and interpretation of the final 35 sample articles analyzed. In answering three key research questions on the types, causes, and overcoming (mitigating) strategies of gender bias in artificial intelligence, three thematic treemaps were constructed, enabling systematic overview as an essential contribution to the literature. The main types of gender bias found in AI are categorized as societal, technical, and individual. Societal and socio-technical aspects stand out as the leading causes of bias, while debiasing, dataset design and gender sensitivity were the most frequent among the main strategies for overcoming bias. The study also proposes theoretical, practical and managerial capacity building and policy implications that aim to influence broad socio-technical challenges and refer to changes necessary, aiming to create bias-free artificial intelligence.

Keywords: Bias, Gender, Artificial Intelligence, Systematic Literature Review

Introduction

If we think in terms of creation, drawing a parallel with the thesis in the first book of Moses called Genesis, just as God created man in his image, nowadays we live in a tech society witnessing profound developments in AI, in the role of a creator as humankind. Besides acknowledging the undeniable fact that we live in thrilling times of acceleration, as we

approach the point of singularity, we are obliged to reassure ourselves that great power also comes with great responsibility.

Being aware of the social responsibility we bear in creating and using AI, we need to question, test, and debate its potentially embedded biases starting from within our human imperfection, especially being aware of the biases coded in a creator's mindset. For this systematic literature review (SLR) research, we focused on gender bias in AI, aiming to answer three main research questions (RQ):

RQ1) What are the main types of gender bias in AI?

RQ2) What are the leading causes of these AI gender biases?

RQ3) What are the main strategies for overcoming (mitigating) gender biases in AI?

Early work on the topic of the intersection between gender and AI followed an overall, broader socio-generic pattern predominantly in tech sciences literature, starting with Licklider and Taylor (1968) discussing the potential impact of computer technology on society, and raised concerns regarding the reinforcement of existing social biases and discrimination. Further, Deacon and Brooks (1988) argued that the biases and limitations of human designers and programmers could be reflected in artificial intelligence systems and have negative consequences for their users. Finally, Breazeal and Brooks (1997) examined the impact of gender biases in artificial intelligence and robotics research and development and called for more diverse and inclusive approaches to these fields.

In feminist theory, we find early works by Haraway (1987, 1991), Turkle (2005), and Oldenziel (1992) focused closely and specifically on gendered aspects of technology, gender-biased technology embedment, and their societal implications. Haraway's work laid the foundation for feminist discussions on technology, including the gendered implications of biased AI. Gender-focused AI literature development continues in social sciences in the works of Wajcman (2004), Crawford (2013, 2021), and Noble (2018), gaining full empirical materialization and entering the vivid scientific debate in the last quinquennial.

As AI is becoming an omnichanger in contemporary societies, with the interdisciplinary scientific research literature on gender-biased AI continuing to grow exponentially, it is scientifically justified to systematize the literature contributing towards a comprehensive review in terms of critical causes, types, and mitigating strategies on gender biases in AI presented in this research paper. Previous systematic literature reviews on gender-biased AI have just begun to develop in the field, adding significant contributions. Kordzadeh and Ghasemaghaei (2022) deliver a review, synthesis and future research directions, Reyero Lobo *et al*. (2022) show the applicability of semantics to address bias in AI, while Fyrvald (2019) suggests solutions for mitigating algorithmic bias in AI systems based on qualitative research.

Nadeem *et al.* (2022) conceptualized gender bias in AI-based decision-making systems, proposing mitigating strategies for biased effects. There are also relevant contributions from Wellner and Rothman (2020) regarding the idea of feminist AI and a relevant overview of the state of gender equality in and by AI from Patón-Romero *et al.* (2022).

Although recent years have shown a growing trend in the body of literature and research on gender bias in artificial intelligence, especially in the last decade, the field lacks systematization, broader research network interest and rootedness in the social sciences field. The paper aims to contribute towards a deeper understanding of the current state of knowledge on this topic, categorizing types, causes and overcoming strategies for gender bias in AI. While providing insights into the most effective strategies for addressing gender bias in AI, the paper highlights the need for further research in this area. Additionally, it provides a valuable resource for policymakers, practitioners, and other stakeholders, recommending best practices for overcoming (mitigating) gender bias in AI. The research also has the potential to significantly advance understanding of this critical issue in the field of social sciences and set a path for future research.

Method

The authors used a systematic literature review (SLR) as a research method that relies primarily on content analysis for inductive data extraction (Kraus *et al.*, 2020). As proposed here, SLR can be employed for various purposes, including collating, synthesizing, and mapping literature in the field. Indeed, the SLR proved to be adequate for answering these three research questions. In addition to the content analysis in response to the questions, this study also performed a bibliometric analysis, describing the articles according to their publication incidence by year, author, and country (Paul & Criado, 2020). In addition to content analysis in response to the questions, this study also performed a bibliometric description of the final sample, describing the articles according to their publication incidence by year, author, and country (Corrêa *et al.*, 2022b; Paul & Criado, 2020).

Search strategy

The authors heeded the three stages proposed by Tranfield *et al.* (2003): planning, conducting, and disseminating. In the planning stage, the authors created a research protocol after identifying theoretical and empirical gaps that suggested the proposal's relevance (Table 1) (Machado *et al.*, 2020; Tranfield *et al.*, 2003). Next, the authors defined the criteria that would include and exclude articles and the quality aspects of the papers that should be considered when selecting the final sample. Based on these criteria, the authors filtered and set the final research sample. In the third stage, disclosure, the authors conducted an

explanatory and in-depth examination of the thematic categories arising from inductive categorization, that is, extracted from the reading and interpretation of the articles in light of the proposed questions (Machado *et al.*, 2020; Tranfield *et al.*, 2003). In a systematic review of the literature on female entrepreneurship in emerging and developing contexts, Corrêa *et al.* (2022a, p. 306) defend the relevance of inductive and exhaustive categorization, as they allow for eventual discoveries that may not express or reframe "a developed theoretical research stream". Indeed, several authors have shed light on the relevance of systematic reviews based on inductive thematic categorizations, allowing insights and discoveries from the underlying literature that are not plausible in deductive models (Conz & Magnani, 2020; Hägg & Gabrielsson, 2020; Mahmud *et al.*, 2022; Santos & Neumeyer, 2021). Following Conz & Magnani (2020, p. 402), we categorize articles employing "inductive qualitative content analysis, adopting the so-called 'conventional approach' to the coding process, which is generally used in studies whose aim is to describe a phenomenon, when existing theory or research literature is limited". Still following these authors, "we performed the content analysis individually and then discussed the results together, confronting emerging categories and subcategories of descriptions" (Conz & Magnani, 2020, p. 402). Aiming to allow readers to replicate the results and the primary and secondary categorizations identified here, we make available the truth matrix, containing all primary and secondary categories obtained from the inductive analysis of the evidence, enhancing the validity and reliability of the study. The truth matrix is available as a permanent link through DOI https://doi.org/10.6084 /m9.figshare.22811450.v1.

Table 1. Research protocol

Research protocol	Detailed description
Research various databases	Scopus Database and Web of Science
Publication Type	Peer-review journals
Language	English
Date Range	2012-2022.
Search fields	Title, abstract, and keywords
Search terms (*Scopus*)	(TITLE-ABS-KEY ("Artificial intellige*") OR TITLE-ABS-KEY ("machine learning") OR TITLE-ABS-KEY ("natural language processing") OR TITLE-ABS-KEY ("neural networks") OR TITLE-ABS-KEY (Robotic*) AND TITLE-ABS-KEY ("gender bias") OR TITLE-ABS-KEY ("gender disparity") OR TITLE-ABS-KEY ("gender imbalance") OR TITLE-ABS-KEY ("gender inequality")) AND (LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ARTS") OR LIMIT-TO (SUBJAREA, "PSYC") OR LIMIT-TO (SUBJAREA, "MULT") OR LIMIT-TO (

Research protocol	Detailed description
	SUBJAREA, "DECI") OR LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ECON")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))
Search terms (*Web of Science*)	(Topic ("Artificial intellige*") OR Topic ("machine learning") OR Topic ("natural language processing") OR Topic ("neural networks") OR Topic ("Robotic*") AND Topic ("gender bias") OR Topic ("gender disparity") OR Topic ("gender imbalance") OR Topic ("gender inequality")) AND (LIMIT-TO (SUBJAREA , "Multidisciplinary Sciences") OR LIMIT-TO (SUBJAREA , "Ethics") OR LIMIT-TO (SUBJAREA , "Communication") OR LIMIT-TO (SUBJAREA , "International Relations") OR LIMIT-TO (SUBJAREA , "Language Linguistics") OR LIMIT-TO (SUBJAREA , "Linguistics") OR LIMIT-TO (SUBJAREA , "Philosophy") OR LIMIT-TO (SUBJAREA , "Psychology Social") OR LIMIT-TO (SUBJAREA , "Political Science") OR LIMIT-TO (SUBJAREA , "Sociology") OR LIMIT-TO (SUBJAREA , "Humanities Multidisciplinary") OR LIMIT-TO (SUBJAREA , "Women S Studies") OR LIMIT-TO (SUBJAREA , "Development Studies") OR LIMIT-TO (SUBJAREA , "Environmental Studies") OR LIMIT-TO (SUBJAREA , "Regional Urban Planning") OR LIMIT-TO (SUBJAREA , "Urban Studies") OR LIMIT-TO (SUBJAREA , "History Philosophy Of Science") OR LIMIT-TO (SUBJAREA , "Education Scientific Disciplines")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))
Inclusion criteria	Article. Articles published in English.
Exclusion criteria	Grey literature (conference-published papers, non-peer-reviewed works); Works published in languages other than English.

Selection criteria

The following criteria guided the final selection of the articles: First, the articles should be listed in Scopus or Web of Science (WoS) "because their coverage and selective approach produce a curated collection of documents" (Machado *et al.*, 2020). The articles were searched in October 2022, considering the criteria presented in Table 1. Following Antony *et al.* (2020) and Corrêa *et al.* (2022a, 2022b), we included articles published within the last ten years of the search base date, considering only articles published in English.

Search process

After a previous search for articles related to gender bias and artificial intelligence, equivalent terms and/or most used synonyms were identified: "artificial intellige*"; "machine learning"; "natural language processing"; "neural networks"; "robotic*"; "gender bias"; "gender disparity"; "gender imbalance" and "gender inequality". To achieve broader coverage, the search combined existing terms in the abstract, title or keywords with the Boolean operator

"OR". The search yielded 121 articles (69 from Scopus, 52 from WoS). Of these, 58 were available in both databases. The authors then used an Excel spreadsheet to eliminate repetitions, leaving 63 articles. We excluded 16 articles unrelated to the social and applied sciences or the purpose of the research, leaving 47 articles. These 47 articles progressed to the next stage, where three authors performed independent readings. The goal was to allow each author to evaluate the articles that should advance to the next step.

Inclusion and exclusion criteria

Initially, the authors selected only articles published in peer-reviewed, open-access journals and written in English between 2012 and 2022. In addition, we excluded grey literature. We then evaluated the quality of the articles and selected 35 for the final sample. Figure 1 illustrates the SLR process.
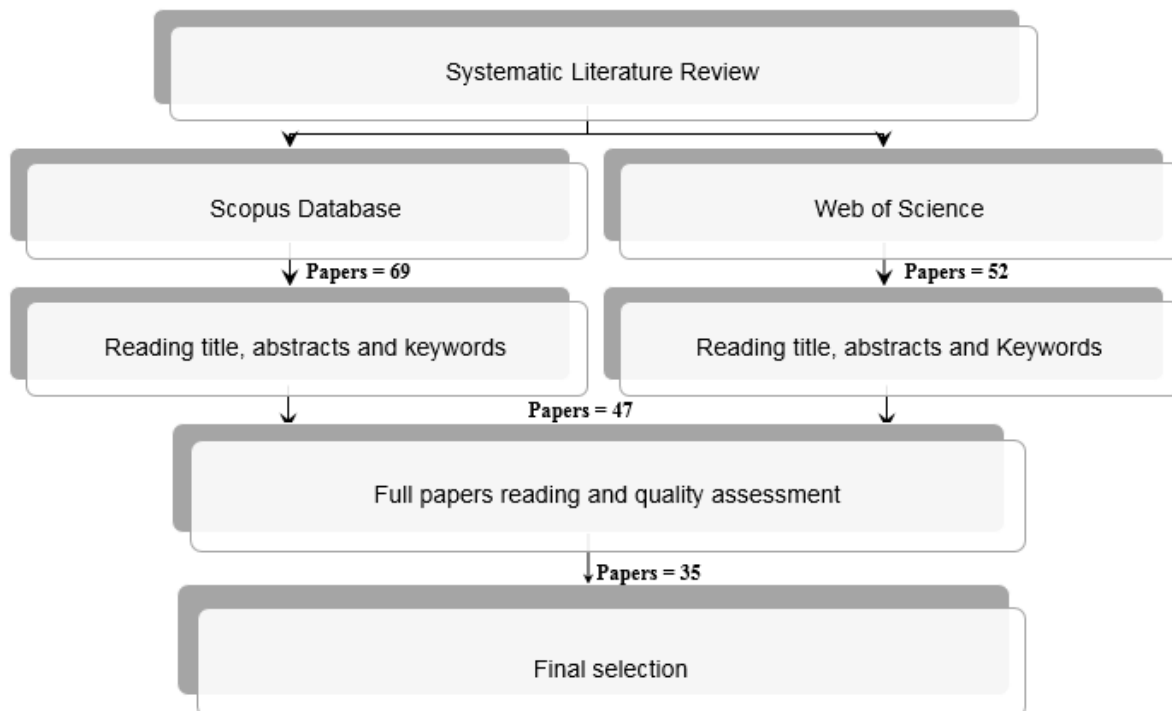
Figure 1. SLR process

Bibliometric Description of the Articles

Papers published by year

Figure 2 displays the publication of the articles per year. It is possible to see how the gender bias in AI themes has grown, with particular emphasis on the last three years (2020–2022). Some aspects stand out. Although the search period initially incorporated 2012 and 2013, no articles were found for either year. Considering the search terms and inclusion and exclusion criteria, the first study was published in 2014, with only one article. If we consider the 63

articles in the final sample, 51 (more than 80 %) were published in the last three years (2020–2022), demonstrating a notable growth of interest in the subject by researchers in the area.

It should be noted that the database search was conducted in October 2022; therefore, it only considered some articles on the subject published in 2022. Even considering only eight months of 2022, 22 articles were published on gender bias in AI, which was 38% higher than the number obtained a year earlier. The increase in the number of works expresses the growing relevance of the theme in empirical and academic contexts. Indeed, Shrestha and Das (2022, p. 1) have stressed how "algorithmic fairness has been a topic of interest in the academy for the past decade", including and not restricted to reflections on gender bias. In this context, Asr *et al.* (2021, p. 1) have emphasized how "Women's voices are disproportionately underrepresented" and how this underrepresentation reaches different areas of society. The increase in the number of studies that seek to understand such gaps is a growing concern in understanding this phenomenon. According to Shrestha and Das (2022, p. 1), "although the fairness discussion within the realm of ML [Machine Learning] and AI [Artificial Intelligence] is a recent development, discrimination has roots within human society". Only recently have studies on AI and gender bias begun to shed light on gender bias. According to the authors, "gender bias is most harmful when it is not as readily noticeable" (Shrestha & Das, 2022, p. 2).
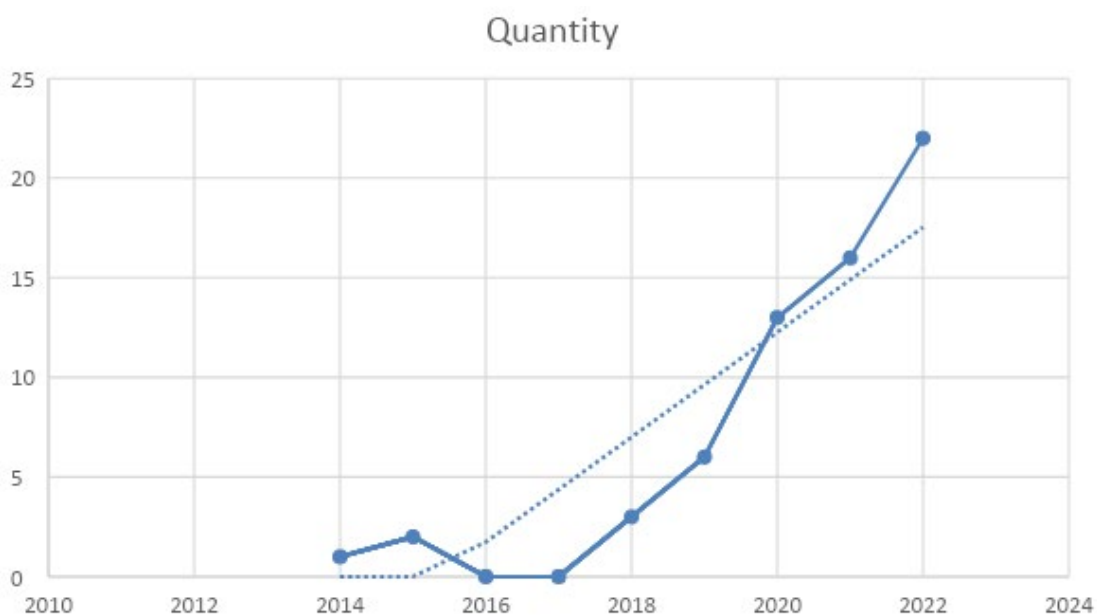
Figure 2. Publication of articles per year

Papers published by country

Table 2 presents the publication of the articles by the country in which the authors conducted the empirical research. The countries were counted individually when a survey was conducted in more than one country. The data indicated that the surveys were mainly conducted in the United States, with five studies. Next, we examine four emerging and developing economies:

Chile (2 papers), India (2 papers), Argentina (1 paper), and Bangladesh (1 paper). Considerable attention has been drawn to the fact that out of the 63 articles in the final sample, for 16 of them, it was not possible to identify the place(s) where the research was carried out, suggesting the need for the authors to be more didactic and transparent in the methodological aspects of their studies.

Table 2. Publication of the articles by country

Country	Number
USA	5
Chile	2
India	2
Argentina	1
Bangladesh	1
Canada	1
Bolivia	1
Colombia	1
El Salvador	1
Spain	1
France	1
England	1
Ireland	1
Mexico	1
Nigeria	1
Kenya	1
Switzerland	1
Several	11
Undefined	16

Paper published by author

A total of 228 authors published the papers of the final sample. Author repetition was low among the papers published. Only James Zou published two papers on gender bias in AI. All the other 227 authors published only one article from the final sample, demonstrating prominent fragmentation in the theme study.

Discussion and Implications

Regarding RQ1 (What are the main types of gender bias in AI?), Figure 3 presents a table of treemaps for the main types of gender bias in studies related to artificial intelligence. The 34 articles generated 137 records, subdivided into five primary categories: social and technical bias, individual bias, emerging bias, and linguistic bias. Although the inductive categorization generated five categorical levels, Figure 3 illustrates two main levels: primary and secondary. From this figure, it is possible to observe the main categories that came from the inductive analysis of the articles. For example, in addition to the five primary categories, this study identified several secondary subcategories, broadening reflections related to the theme. Figure 3 expands the field's understanding by projecting light onto new reflections that are still little explored by classical or more contemporary authors (Wajcman, 2004; Crawford, 2013, 2021; Noble, 2018; Kordzadeh & Ghasemaghaei, 2022). For example, although more recent studies such as those by Wajcman (2004), Crawford (2013, 2021) and Noble (2018), have advanced the discussion on gender biases and AI, they do not advance or propose related reflections.

Studies on gender bias in the context of artificial intelligence mainly comprised societal bias (88 % [n = 30] of the 34 studies analyzed), generating 115 records associated with this category. Among the societal biases, ten articles emphasized the biases in social structures that can be incorporated into artificial intelligence systems, compromising the results presented. (Vlasceanu & Amodio, 2022; Asr *et al.*, 2021; Bhardwaj *et al.*, 2021; Schopmans & Cupac, 2021; Schwemmer *et al.*, 2020; Fossa & Sucameli, 2022; Petreski & Hashim, 2022; Schwemmer *et al.*, 2020; Tomalin *et al.*, 2021).

The articles also highlighted other biases. For example, six studies sought to understand how human bias influences data generated by AI systems (Kuppler, 2022; Jones *et al.*, 2020; Tomalin *et al.*, 2021; Petreski & Hashim, 2022; Schwemmer *et al.*, 2020; Tannenbaum *et al.*, 2019). In addition, it highlights that pre-existing bias (Savoldi *et al.*, 2021; Draude *et al.*, 2020; Huluba *et al.*, 2018), racial bias (Chen *et al.*, 2022; Draude *et al.*, 2020; Martínez *et al.*, 2020; Scheuerman *et al.*, 2019; Schwemmer *et al.*, 2020; Waelen & Wieczorek, 2022), structural bias (Tubaro *et al.*, 2022; Draude *et al.*, 2020; Martínez *et al.*, 2020; Schopmans & Tupac, 2021; Schwemmer *et al.*, 2020; Tomalin *et al.*, 2021) and male pattern bias (Huluba *et al.*, 2018; Jones *et al.*, 2020; Vlasceanu & Amodio, 2022; Tomalin *et al.*, 2021; Petreski & Hashim, 2022) stand out among the investigated biases.

The second group incorporated those related to technical bias that could influence the responses of AI systems (59% [n=20]). The main preferences in this category include algorithmic (Savoldi *et al.*, 2021; Vlasceanu & Amodio, 2022; Jones *et al.*, 2020; Draude *et al.*, 2020; Thelwall, 2018; Schwemmer *et al.*, 2020; Waelen & Wieczorek, 2022; Tannenbaum *et*

al., 2019) and selection biases (Huluba *et al.*, 2018; Jones *et al.*, 2020; Witherspoon *et al.*, 2016).
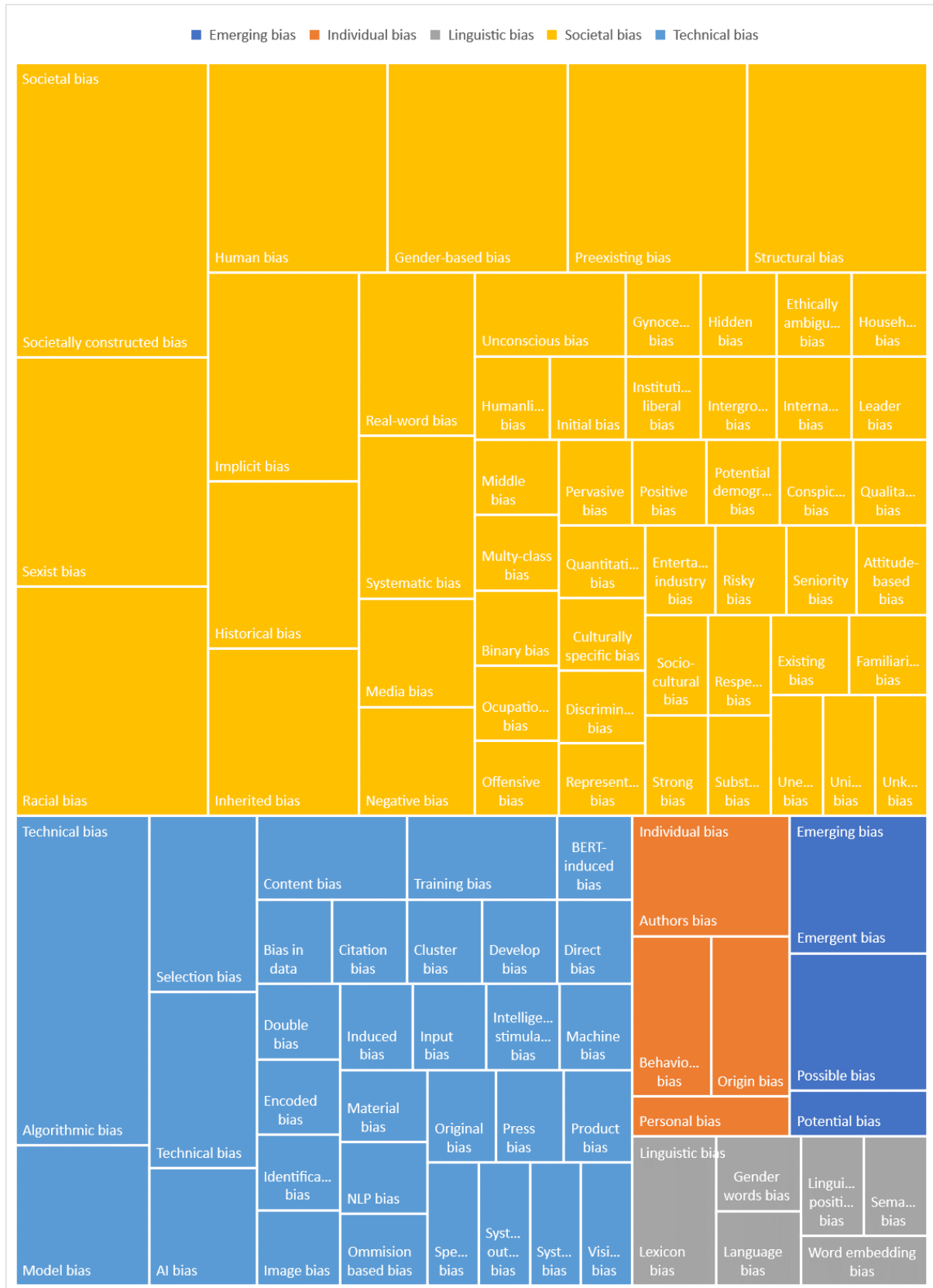
Figure 3. Treemap for the main types of gender biases in studies related to artificial intelligence

The third group was related to individual bias (n=8). Among them, factors such as pre-judgment of personal origin (Pair *et al.*, 2019; Kurpicz-Briki & Leoni, 2021; Asr *et al.*, 2021; Bhardwaj *et al.*, 2021; Schopmans & Cupac, 2021), prejudice from researchers and authors (Bardhan *et al.*, 2019; Jones *et al.*, 2020), and behavioural bias (Fossa & Sucameli, 2022) stand out. Finally, the fourth and fifth groups comprised studies that investigated emergent bias (n=6), followed by a linguistic bias (n=5). Studies on emerging biases are mainly related to the potential prejudice generated by the misuse of AI Systems (Asr *et al.*, 2021; *Draude et al.*, 2020; Martínez *et al.*, 2020; Tannenbaum *et al.*, 2019). On the other hand, linguistic bias studies have focused on word bias's impact (Pair *et al.*, 2021; Kurpicz-Briki & Leoni, 2021; Martínez *et al.*, 2020) and language bias (DeFranza *et al.*, 2020; Orgeira-Crespo *et al.*, 2021).

Regarding RQ2 (What are the leading causes of these AI gender biases?), Figure 4 presents a table of treemaps with the leading causes of these biases in the studies related to artificial intelligence. It is important to emphasize that, like the categorization in response to RQ1, the categorization of RQ2 was also inductive and dynamic. Forty-seven articles were read, and only 14 presented the causes; 33 articles described the types of existing biases, but the causes of these occurrences needed to be described. The 14 articles analyzed generated 39 records grouped into six categories: Systems, Prejudice, Culture, Inequality, Relationship, and Interaction. In addition, we classified the articles into more than one category that addressed the different causes of these biases.

Among the leading causes of the gender biases in artificial intelligence, the term "systems" is found most often (in 64% [n=9] of the 14 studies analysed) (Savoldi *et al.*, 2021; Vargas-Solar, 2022; Pair *et al.*, 2021; Chen *et al.*, 2022; Dwork & Minow, 2022; Jones *et al.*, 2020; Schopmans & Cupac, 2021; Scheuerman *et al.*, 2019; Thelwall, 2018; Fossa & Sucameli, 2022). Articles present contexts in which systems may have been developed incorporating constraints and technical decisions (Savoldi *et al.*, 2021; Chen *et al.*, 2022; Fossa & Sucameli, 2022), extraction (Chen *et al.*, 2022; Dwork & Minow, 2022), data patterns (Vargas-Solar, 2022; Pair *et al.*, 2021; Dwork & Minow, 2022; Jones *et al.*, 2020; Schopmans & Cupac, 2021; Scheuerman *et al.*, 2019; Thelwall, 2018), resulting in incomplete or defective AI systems (Vargas-Solar, 2022; Dwork & Minow, 2022; Thelwall, 2018) due to social prejudices and stereotypes transferred to algorithms by programmers (Pair *et al.*, 2021; Thelwall, 2018).

Prejudice was the object of attention in seven of the 14 articles analyzed, generating 13 records. Savoldi *et al.* (2021) and Huluba *et al.* (2018), Vlasceanu and Amodio (2022) and Pair *et al.* (2021), Petreski and Hashim (2022) and Schopmans and Cupac (2021) associated the causes of gender bias with social pressure for a standard that is considered acceptable, which may have influenced the ways AI systems were technically designed. Another striking reason found

is the prejudices and stereotypes of AI system programmers (Savoldi *et al.*, 2021; Huluba *et al.*, 2018; Jones *et al.*, 2020; Petreski & Hashim, 2022; Schopmans & Cupac, 2021).
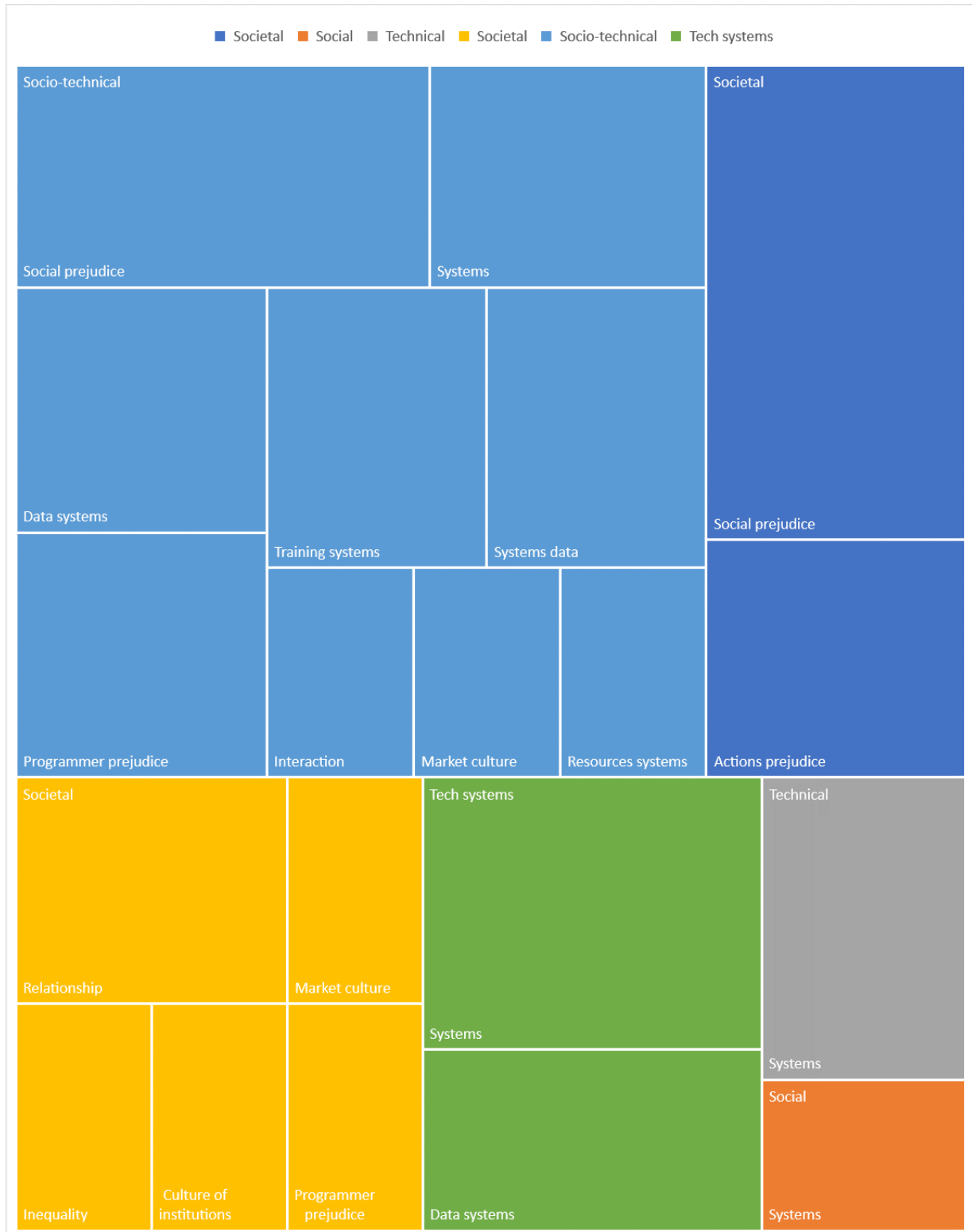
Figure 4. Treemap with the leading causes of gender biases in the studies on artificial intelligence

The third category of cause of bias is linked to the influence of the culture that permeates the internal and external environments in which the system is developed (n=2), such as referring

to the structure and composition of the formal labour market (Tubaro *et al.*, 2022), industry-related motives and skills in the sector, and initial institutional choices (Huluba *et al.*, 2018).

Other observed causes were related to inequality in the representation of women in technology professions (n=1), who could be professional programmers of these systems or involved in projects to make them more realistic (Tubaro *et al.*, 2022). Finally, the sixth category (n=1) points to the interaction between the user and the system as a cause of the emergence of biases in AI systems (Savoldi *et al.*, 2021).

Regarding *RQ3* on the main strategies for overcoming (mitigating) gender biases in AI, Figure 5 presents a table of treemaps with the leading strategies for overcoming these biases in the studies related to artificial intelligence. Out of 47 observed articles, only 14 debated the ways to overcome gender bias in artificial intelligence, resulting in 58 overcoming strategies, with 49 different records. Those 49 different extracted records were further organized into 12 categories for overcoming gender bias in artificial intelligence: Debiasing, Dataset design, Gender sensitivity, Inclusiveness, Transparency, Fairness, Sociotechnical entanglements, Word embedding, Monitoring, Regulation, Optimization and Certification.

Among the categories found to overcome gender bias in artificial intelligence, debiasing is most frequent, with 35.71% (n=5) of papers analyzed (Savoldi *et al.*, 2021; Vlasceanu & Amodio, 2022; Kurpicz-Briki & Leoni, 2020; Tomalin *et al.*, 2021). Savoldi *et al.* (2021) presented model debiasing patterns (with gender tagging, adding context, debiased word embeddings and balanced fine tuning) and debiasing through external components (black-box injection, lattice rescoring and gender reinflection). Also, different types of debiasing are found: gender, cultural, dataset, external, language and model debiasing (Bhardwaj *et al.*, 2021; Tomalin *et al.*, 2021). Vlasceanu & Amodio (2022) find bias de-propagation to break the cycle of bias propagation between society and AI, while Kurpicz-Briki & Leoni (2020) find solutions in debiasing through word embeddings.

Dataset design and Gender sensitivity categories follow, both with 28.57% presence share (n=4) encompassing over half of all overcoming solutions for gender bias in AI avoidance. As seen in Vargas-Solar's (2022) study, the dataset design should be completed by inserting missing women's history datasets, while Draude *et al.* (2020) find importance in the balance of dataset nutrition, accountability, context inclusion, fairness, justice, gender stereotypes removal, explainable AI, and dataset diversification. Savoldi *et al.* (2021) highlight domain adaptation, upsampling, downsampling and counterfactual augmentation as pathways for remodelling dataset design in overcoming gender bias in AI. Gender sensitivity is seen as mainstream in Bardhan *et al.* (2019), while gender gap-tracker, context-sensitive gender

inference and gender set self-identification are a cornerstone of balancing gender bias in AI
(Asr *et al.*, 2021; Das & Paik, 2021; Scheuerman *et al.*, 2019).
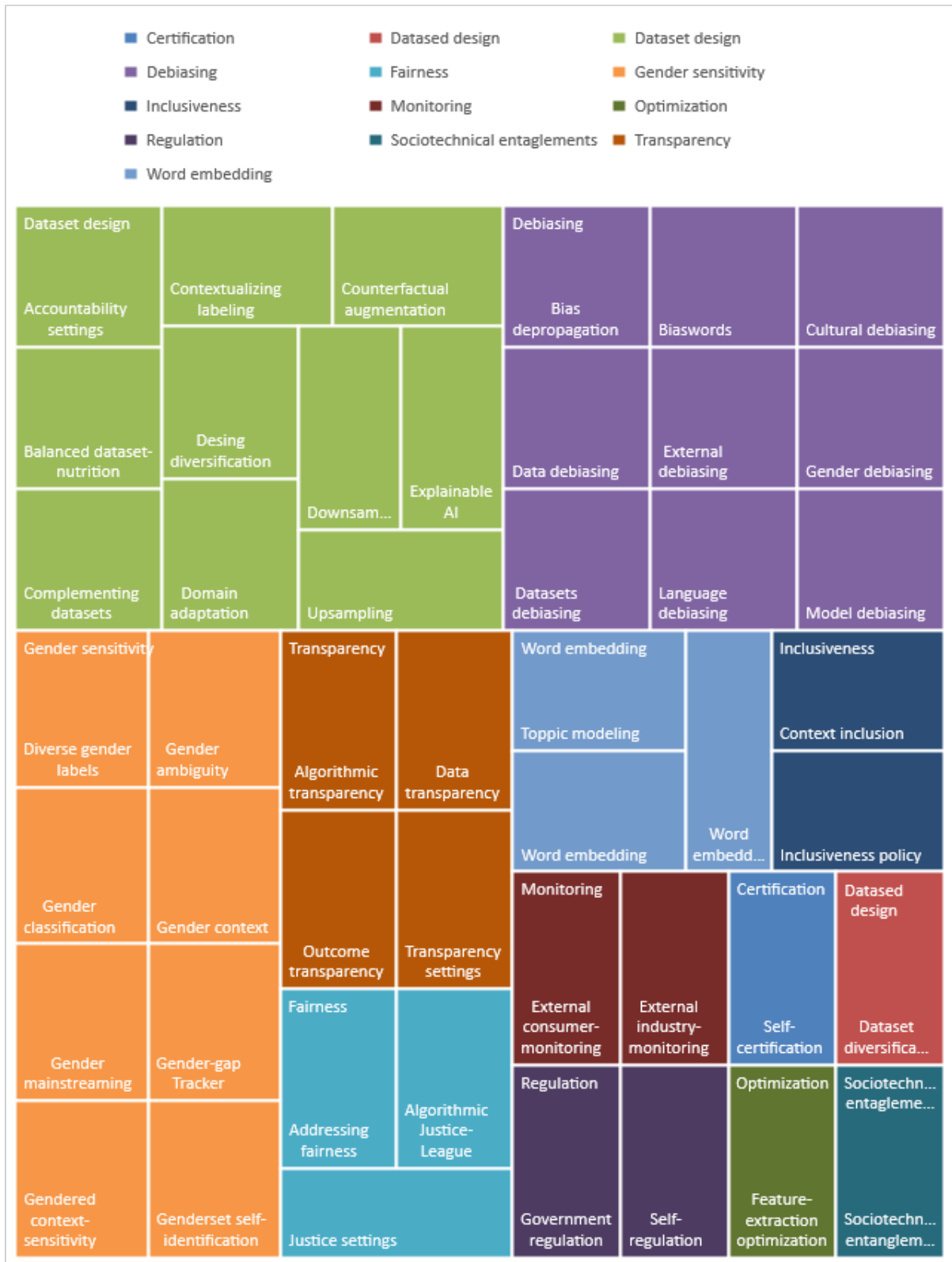
**Figure 5. Treemaps with the leading strategies for overcoming (mitigating) gender biases in the studies related
to artificial intelligence**

Word embedding and inclusiveness are represented with 14.29%, both categories found in two articles (n=2). Debating on biased language models and biased words, Kurpicz-Briki and Leoni (2020) reveal that, through language, our world is full of stereotypes; and they propose word embeddings as a solution to gender-biased AI. Similarly, Arseniev-Koehler *et al.* (2022) suggest word embedding to find solutions in avoiding gender biasing through topic modelling. Beside inclusiveness, Draude *et al.* (2020) also suggest sociotechnical entanglements, transparency, and fairness in elaborating different strategies of overcoming gender bias in AI. Finally, monitoring, certification and regulation solutions are found in Dwork and Minow's (2022) study, while optimization as a solution is recorded in Chen *et al.* (2022), all with 7.14% representation.

Conclusions

Theoretical implications

The results of this study have several theoretical implications. Regarding the categorizations created, fragmentation in the theme study was observed. Most authors on gender bias in AI have published only one article. This suggests the need for more in-depth research in the study area. Second, the survey of articles published by country revealed that most studies were conducted in the United States, highlighting the need for further studies in other developed and developing countries. Reflecting on this theme in other contexts may allow for greater depth of the subject. For example, of the 47 articles analyzed, only 14 presented causes of bias. Another 33 articles described only the existing types of bias without pointing out the reasons for them. Finally, this study contributes to the literature on gender bias and artificial intelligence by presenting and synthesizing concepts related to the types, causes, and ways of overcoming bias in AI by broad categories, contributing to research and researchers in the field.

Practical and managerial implications

This study has both practical and managerial implications. They are aimed at researchers in the field but also extend to developers of AI-related technologies, managers, women, and other stakeholders. For example, stakeholders can understand the types, causes, and ways of overcoming bias in AI, providing inputs capable of overcoming them. For example, a representative portion of the biases identified here could be addressed or diminished through initiatives such as audits conducted by managers. They can also create a kind of map or prioritization agenda for biases that need to be explored and mitigated, such as social and technical bias, individual bias, emergent bias, and linguistic bias. Managers should pay special attention to the extent to which social biases are most prominent in the literature.

Simultaneously, technology developers can reflect on the topic, seeking to more accurately identify possible biases while developing AI-based tools and finding ways to overcome the problems that arise when using this research as a guide.

As for academics, such categorization allows mapping new research opportunities from its analysis and prioritizing biases, understanding them according to the highest incidence of studies. For example, a practical implication for academics would be to investigate the biases identified here and the possible associations or influences between them. Another practical implication for researchers is the exploration of factors that cause gender bias. Indeed, of the 47 articles that made up the final sample, only 14 highlighted the causes, denoting a theoretical and empirical gap that still needs to be explored by researchers in the area.

Among the leading causes emphasized, six groups stand out: systems, prejudice, culture, inequality, relationships, and interaction. Such groups also suggest that managers and public policymakers should better understand these aspects and act on the essence of their manifestation, such as prejudice. Different authors point out how, in essence, such prejudice is theoretically associated with social pressure for a considerably acceptable standard (Savoldi et al., 2021; Huluba et al., 2018; Vlasceanu & Amodio, 2022; Pair et al., 2021; Petreski & Hashim, 2022; Schopmans & Cupac, 2021). However, how are these standards defined? Who stipulates them and their impact on systems? Such questions can help shed light on the cause's essence and help overcome it. Thus, it is hoped that this study can contribute to initiating reflection on this subject in the search for answers to these and other questions, as it identifies 58 overcoming strategies and the main types and causes of gender biases, representing a critical conceptual map from which managers and formulators can act.

Implications for capacity building

This study found that 88% of gender biases in AI were related to social biases, such as racial bias and male pattern bias, and the leading causes for these biases are social bias and the way data systems are designed. Thus, there is a need to encourage and support the creation of diverse teams with various perspectives, experiences, and backgrounds, including those from underrepresented groups, to work on all aspects and phases of AI projects. The findings of this study suggest, for example, the need to train software developers in the field of AI. Such training should primarily involve the main biases identified in this study.

Investing in and promoting the use of fairness and bias mitigation tools will help prevent and detect gender bias in AIs, building communities of practice and networks of experts in ethical AI and bias mitigation, including those explicitly focused on gender bias, encouraging public-private partnerships to support ethical AI capacity-building, including developing best

practices, training programs, and tools for bias mitigation. Finally, supporting and funding research and innovation will advance our understanding of gender bias in AI and develop new strategies for addressing it.

Policy implications

Governments may need to regulate the development of AI models to ensure that they are free from bias and align themselves with existing legal and ethical standards. Policies must be implemented to ensure that the personal data used to train AI models are collected, processed, and used transparently and ethically, with appropriate safeguards against bias. They also need to be established to clarify the responsibilities and accountability of AI developers, organizations, and other stakeholders in preventing and overcoming gender bias in AI.

Limitations

This study has significant limitations. One connects to the inductive categorization of the data. Although such inductive categorization may be subject to other interpretations if performed by different researchers or be subject to the subjectivity of the authors of this study, it allows the identification and creation of new categories, which still need to be explored by the literature in the area. The second limitation is related to the scope of refinement, which is restricted to social and applied science studies. Therefore, sex biases related to medical or technological areas, among others, were not explored in the present study. Another limitation is the restriction of articles published in English, while excluding grey literature. Although such choices sought to filter the most relevant articles published in a more widely accessible language, they were simultaneously restricted by ignoring reflections, such as those published in congress articles and books.

Suggestions for future research

Future studies should address this study's limitations. In this sense, they could analyze the primary and secondary categorizations identified here, investigating, for example, whether they are mutually exclusive or whether there are still opportunities for new groupings among them. Simultaneously, new studies could advance into other unexplored opportunities. For example, studies have yet to be conducted in emerging and developing countries, especially in Africa and South America. Studying gender biases in artificial intelligence in more disadvantaged contexts could shed light on new biases that are still little explored or unidentified in developing contexts. Other opportunities for studies that are still poorly explored are associated, for example, with types of AI bias in gender studies. Although studies have mainly identified societal and technical biases, including different perspectives of individual and linguistic biases, they still need to be explored. For example, only some studies

have addressed behavioural biases or their origins. Such studies are relevant because identifying the origin of biases can provide different practical suggestions to overcome them.

Another critical consideration in a future research study is the association between the research questions investigated in this study. This study sought to answer three fundamental research questions: 1) What are the main types of gender bias in AI? 2) What are the leading causes of these AI gender biases? 3) What are the main strategies for overcoming (mitigating) gender biases in AI? Further studies could, in turn, seek associations between more or less different RQs. For example, although this study has identified the main types of AI biases in gender studies, at the same time as the main strategies used to overcome them, it does not map or identify the strategies by type of AI bias. For example, are they recognizing overcoming strategies best suited to addressing societal bias? Are strategies that can be used for all biases denoting their relevance, or are they specific to each category? What is the association between AI bias and coping strategy? Is there any identifiable pattern between these two? These and other studies can broaden the understanding of the literature in this area and the corresponding policy and practical implications.

Concluding Remarks

Development and training with the deployment of gender-biased AI models may reinforce existing gender inequalities in society and contribute to their persistence over time, resulting in unfair or discriminatory decisions in various fields of social life (Deacon & Brooks, 1988; Kuppler, 2022). Gender bias in AI can also limit the ability of technologies to benefit all members of society, potentially leading to missed opportunities and unfulfilled potential for specific social groups (Deacon & Brooks, 1988; Breazeal & Brooks, 1997). It also raises ethical questions about the responsibility of AI developers and organizations to create and use these technologies (Fossa & Sucameli, 2022; Savoldi *et al.*, 2021). Therefore, it is essential to actively address and mitigate gender bias in AI to ensure that it benefits diverse social groups equally and fairly (Reyero Lobo *et al.*, 2022; Fyrvald, 2019; Nadeem *et al.*, 2022). This research can also serve as a theoretical foundation for systematizing and categorizing different types of bias, especially gender bias.

This study, contributing to reflections on gender bias in artificial intelligence, sought to answer three research questions: 1) What are the main types of gender bias in AI? 2) What are the leading causes of these AI gender biases? 3) What are the main strategies for overcoming (mitigating) gender biases in AI? Thus, we conclude that the main types of gender biases in AI are Societal, Technical, Individual, Emerging and Linguistic. Moreover, among the leading causes of gender-biased AI are Sociotechnical factors, followed by Societal and Technology systems. Finally, we highlight that the main strategies for overcoming (mitigating) gender-

biased AI are related to: Dataset design, Debiasing, Gender sensitivity, Transparency, Fairness, Word embeddings, Inclusiveness, Monitoring, Regulation, Certification, Optimization and Sociotechnical entanglements.

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"Is It OK That She Is a Woman?"

Social Perceptions of Professional Gender Segregation in IT among the Russian Brainpower

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Abstract: The article deals with Russian brainpower's perceptions of gender segregation in a technical university when training both IT-specialists and STEM professionals in general. The theoretical and methodological basis for interpreting the results of the empirical study are the main provisions of the theory of social representations, the concept of habitus and the concept of narrative identity. The assumption used as a research hypothesis is that gender "indifference" or neutrality, rather than gender discrimination, takes place in higher technical education in the Russian technical university. The analysis of the data obtained as a result of the study confirmed that there are gender professional distinctions in the group consciousness of brainpower. In Russian speech practice and culture, a thesaurus of non-binary perception of professional gender identity has not yet been formed. At the same time, there is a shift in perceptions of gender professional identity in IT towards gender "neutrality", which allows us to expect a relatively "soft" transformation of social attitudes and adaptability of professional consciousness to changes in the perception of gender in IT.

Keywords: IT-education, technical university gender identity, professional gender discrimination, professional gender segregation

Introduction

The study of gender inequalities in the social sciences has developed rapidly since the second half of the twentieth century, thanks to the conceptualisation of feminist epistemology (Harding, 1987) with its key methodological assumption that "it is the social position of the cognitive actor that affects the subject matter of his or her knowledge and how it is acquired" (Zdravomyslova & Temkina, 2015). It is known that the concept of "gender" received its meaningful content in linguistics, where it denoted the grammatical gender, the category of gender-based division of words and forms. After the American sexologist John Money used the concept of "gender" in his works on transsexual people to refer to the difference between the biological sex and the social roles of men and women, this concept was in demand by authors of feminist studies. In particular, the theory of the "new psychology of gender" with its key provision stating the absence of innate psychological differences between women and men was appealed to. Today, both academic and socio-political discourse uses it to describe and explain various manifestations of gender disproportionality (inequality, discrimination, segregation, asymmetry, etc.). We focused on research of such phenomena as professional gender segregation in the IT sphere.

Sources and Methodology

Among the most developed theoretical positions that set the sociological context for the study of gender issues are the following. Gender segregation is reproduced through gender stereotypes (Breda *et al.*, 2020) and educational institutions (Charles & Bradley, 2002). Boys and girls in most cultural groups socialize according to established gender stereotypes. Consequently, adolescents develop so-called "gender thinking", which determines the system of values, educational and life trajectory of an individual. In particular, the idea of girls' inclination towards "caring" professions and boys' inclination towards "technical" professions is formed. An important research observation is that, even if traditional forms of socialization change, gender-essentialist attitudes are very stable, and the service sector, which involves performing jobs similar to housework, continues to be stereotypically associated with women's professional occupations. Girls choose these professions at universities, which maintains gender inequality even in societies where gender parity is maintained (Barone, 2011). Gender stereotyping also has a significant impact on adolescents' assessment of their own abilities. It was found that boys' assessment of their mathematical skills (unlike girls) is higher compared to girls' assessment because they respond to the cultural expectations established in their social group. As a result, high self-esteem allows men to advance more successfully in careers related to quantitative calculations (Correll, 2011). Researchers of gender socialization draw

attention to the fact that, in the mass consciousness, stereotypes about women's social roles are more variable than stereotypes about male roles (Froehlich *et al.*, 2020). And it is the stability of the latter that becomes an influential factor in gender segregation, including occupational gender segregation (Cejka & Eagly, 1999).

A different perspective on understanding the nature of gender segregation and in particular occupational gender segregation is presented in economically oriented research. Most economists who study gender phenomena and processes follow the methodological framework of the neoclassical paradigm, represented by the theories of rational choice, economic utilitarianism, patriarchal capitalism and dual labour market (Blackburn *et al.*, 2002). Among the most important propositions developed within these theories to explain occupational gender segregation, we will highlight the following:

- Human economic behaviour is explained using the *Homo oeconomicus* model, or "rational choice model". The basic behavioural characteristics of *Homo oeconomicus* include: egoism (i.e., following one's own interests); rationality (i.e., consistent behaviour coordinated in time and space, choosing in any situation the behaviour option that best meets the goal set); utilitarianism (i.e., utility maximisation). The meaning of *Homo oeconomicus* behaviour is to allocate limited resources between some set of competing goals in an optimal way.

- The decision of a man or a woman to enter the labour market is seen as a rational decision of the individual. The specialization of each gender is linked to both biological factors (procreation) and social factors (discrimination in the labour market). Since each of the sexes specializes in an activity where it has a comparative advantage and therefore provides higher productivity in the respective sphere of activity (women in the household, men in the market), the economically rational strategy for the family as a whole would be for the husband to work in the market sector and the wife to work in the household.

- Women's entry into the labour market, where they are inferior to men in terms of the scale of human capital accumulated, explains the lower wage rates for women. The neoclassical approach in economic theory has been subject to serious feminist criticism, the main argument being that the neoclassical paradigm is built on a purely androcentric (i.e., modelling human behaviour according to the values of the 'male' world) view of the isolated individual preoccupied with his own interests and emotionally unconnected to other people. In other words, the sphere of market relations is presented as completely free of sympathy, altruism and a sense of solidarity. The search to overcome the conceptual limitations within the neoclassical paradigm has given rise to a new economic discipline, gender economics, which

synthesizes different methodological approaches in modern economic science and the latest advances in gender theory (Becchio, 2019).

In Soviet Russia, due to the specifics of its historical development, the position of women in the labour sphere was formed differently from that in Europe and the United States. In the Soviet Union, the period of industrialization, with its acute need for manpower, created a demand for the use of women's labour in a variety of industries. Accordingly, ideology, education, and propaganda cultivated the image of the female worker. World War II reinforced these attitudes. Although women were highly represented and hold significant importance in the world of work, only in the 1990s did the Russian Federation begin to discuss the global problems of gender inequality.

From a legal point of view, there is no occupational gender segregation in the Russian Federation. At the state level, the "Beijing Declaration and Platform for Action" adopted in 1995 by the Fourth World Conference on Women is recognized. The Russian Constitution contains an article that says: "Men and women shall have equal rights and freedoms and equal opportunities for their realization" (Article 19, clause 3). In January 2023, the National Strategy of Actions for Women for 2023–2030 was published, which declared the aims to increase the life expectancy of women, decrease the level of violence against women, increase the political activity of women, increase the number of women-leaders, reduce the difference in salaries between women and men, etc.

The establishment of gender equality in the professional environment was facilitated by the popularization of ideas of gender neutrality in the country. This was manifested in giving women the opportunity to work where previously only men could work. Thus, since January 2021, 356 previously prohibited professions have been available to women. At the same time, as in many countries of the world, de facto occupational segregation takes place in contemporary Russia (Vorob'eva, 2018). Thus, the level of wages of Russian women in relation to men's wages in 2021 was 72.5%. There is an imbalance at all levels. For example, female executives in 2021 earned, on average, about 89,000 rubles (about $1200), while men earned 128,000 rubles (about $1600) (Russian Federal State Statistics Service, 2022).

Educational strategies in contemporary Russia also show gender differences. Thus, more women get higher education (52% vs 48%), while skilled worker training programs are predominantly attended by men (70% vs 30%). Men prefer to continue postgraduate studies (53%) and more often finish doctoral studies (60.7%). Women choose residency (68%) and assistantship (55%), and therefore more often become mid-level specialists (51.9%), graduates of bachelor's, master's and specialist's degrees (Russian Federal State Statistics Service, 2022).

There are several trends in contemporary Russian scientific discourse in discussing the gender problem.

The most common is the observation of the gender inequality problem in modern society, the discussion of the indicators of women's access to rights and freedoms, and the balance of men and women represented in socio-political and professional spheres (Zadvornova, 2019; Luk'janova, 2021; Zaichenko & Savel'eva, 2020; Khotkina, 2020).

Another trend can be labelled as conservative. The authors of this trend argue that the concept of "gender inequality" sets a context that obscures rather than clarifies the specific gender roles established by historical tradition and the cultural specificity of a particular community. It is therefore more valuable for research to describe existing gender systems, rather than to problematise gender inequalities (Vorob'eva, 2018; Rudchenko, 2020).

A special category can include papers whose authors call for a revision of the results of earlier studies, recognising them as unrepresentative due to the imperfection of the procedural tools used. For example, according to the authors of these works, the inequality in pay between men and women is not very significant if hourly wages, rather than monthly earnings, are taken into account (Roshchin & Yemelina, 2022; Maltseva & Nesterova, 2009).

When describing situations in STEM occupations, in the IT sector in particular, American researchers pointed out that, because STEM (science, technology, engineering and mathematics) involves disciplines where male primacy (according to gender stereotypes) is expected and male agency is a factor for success, STEM can be a difficult environment of unequal gender opportunities for women, and, as a result, can cause them to lose motivation and confidence in their own abilities. This is confirmed by the fact that women quit their jobs in STEM fields twice as often as men. This phenomenon is called the "leaky pipeline": after receiving an education in STEM, women do not work in their specialty in the future (Sheltzer & Smith, 2014). In Russia the situation is similar. In the first decades of the 21st century, women hold less than 30% of jobs in the STEM sector, and in some industries this share is systematically decreasing. For example, in information technology, the percentage of women fell from 35% to 25% between 2004 and 2014 (Khotkina, 2018).

Empirical data collection procedures and methodological framework

This paper is part of ongoing research on the communicative and social aspects of Russian higher education, which has been carried out for several years at St Petersburg State Electrotechnical University.

The aim of this research has been to test the presence and impact of social perceptions of gender segregation in IT among Russian technical intelligentsia as an implicit (hidden) factor in the reproduction of gender segregation.

The research hypothesis was defined as follows: gender segregation in higher technical education in a Russian technical university is characterized not by gender discrimination, but by gender "indifference" (or neutrality).

The empirical data were obtained by conducting a focus group with 12 respondents with higher technical education, representing age groups from 22 to 55 years old, as well as work experience in information technology and experience of teaching relevant disciplines in a technical university. Heads of IT departments at the university and partner organisations, as well as university IT lecturers, were invited to participate in the focus group for the study. The composition of the focus group participants allowed the necessary information to be obtained, revealing a palette of opinions and judgements on the research topic.

The International Standard Classification of Occupations (ISCO) was used to define IT occupations, according to which IT occupations include: system analysts (ISCO code 083), programmers and other computer specialists not previously accounted for (084), card and tape punch operators, or key entry operators (322), and automatic data processing machine operators (342) (Tijdens, 1997).

The notion of "occupational segregation" is used in this paper to mean "the articulated hierarchical distinction between male and female professions".

The term "occupational discrimination" is used to mean negative or prejudicial treatment of a person based on his or her occupation.

Interpretation of the empirical data obtained was carried out using the key provisions of the theory of social representations (S. Moscovici); concept of habitus (P. Bourdieu); concept of narrative identity (P. Ricœur).

The methodological guidelines of these concepts are formulated as follows: social representations are viewed as mechanisms of cognition of the social world, whose structure contains three dimensions: informing, the field of representations, and attitudes. In this way, social representations exert a coercive influence on social behaviour and ways of adapting new facts and knowledge to already formed and pre-existing views, opinions, and evaluations (Moscovici, 2000).

The concept of habitus captures "acquired dispositions, acting in practice as categories of perception and evaluation or … as an organizational principle of action" (Bourdieu, 1979).

Dependence on early experience prevents people from quickly adapting to new social conditions and can generate dissonance (Ledneva, 1995).

The notion of "narrative identity" captures the mediation of consciousness by "stories", narratives that are understood as various models of narrative configuration of action. In other words, personal identity is proposed to be viewed as narrative identity. Only through a story is an attitude towards oneself constructed in which the narrator declares himself as himself and assigns to himself the actions that are attributed or can be attributed to him by someone else (Ricœur, 1996; Tétaz, 2012).

The thematic categories and the focus group guide aimed to test social perceptions of gender segregation and possible gender discrimination. Respondents were asked to share personal stories from their professional and social experiences. The questions were divided into three categories and were formulated as follows:

1. Can we say that professional gender segregation is reproduced in Russia, i.e., some professions are perceived as male and others as female? In your opinion, are there life spheres (social institutions) that determine gender segregation to the greatest extent (for example, preschools, schools, universities, families, mass media, language, etc.)? Have you encountered gendered occupational regulators in your own life? If so, what are some examples?

2. In your opinion, does Russian public opinion give the characteristics of "atypicality" "deviation" and "strangeness" to those who are engaged in activities that do not correspond to traditional notions of female and male professions? Have you ever heard from others or have you used (self)justification, (self)irony when choosing a "gender wrong" profession or occupation? Please give some examples.

3. Do you think there is gender segregation in the choice of a major study at university, and subsequent work in the major? If yes, how does it manifest itself? If not, what makes it possible to avoid it? Have you ever heard discriminatory evaluations of gender content in your university or in your organization when discussing an employee's professional activities? If yes, please give some examples. Do you use gender characteristics when discussing professional issues? If yes, why? What, in your opinion, can be the social and/or managerial justifications (grounds) for gender professional segregation in the IT sphere? If you describe a typical IT professional, what personal (behavioural) characteristics would you include in his/her portrait?

Results and Discussion

The analysis of the results of the group interview will be presented according to the thematic categories described above.

1. The notion of gender segregation is evident in the social perception and interpretation schemes of all respondents without exception. Even when focus group participants declare a gradual decrease in the acuteness of distinguishing between male and female professions, they use speech formulas containing clichés and value judgments within their ideas about gendered professional hierarchy.

   Examples of statements made by focus group participants:

   M1: I can't say that it [gender segregation] doesn't exist. Men and women, thank God, are inherently different. There are more men than women who are mathematicians. The maternal instinct makes women more suited to parenting. I haven't seen a single male kindergarten teacher.

   F1: Gender segregation is already established in kindergarten, when girls are offered snowflake costumes for the New Year's party and boys clowns. In schools, labour classes teach girls how to cook and sew, and boys how to repair furniture.

   F2: Gender occupational segregation exists. Why, for example, there are no women among subway train drivers. In school labour classes, I was offended that I was not allowed to learn to work with a planer together with boys.

   M2: It depends very much on the field, but in general yes [segregation exists].

   F3: I think the field of preschool and elementary school can be entrenched in society as something 'more feminine than masculine'. I think this is because of the attitudes in our society. In Russia, it is more usual for a woman to take care of children in the first years of life than a man; hence the fact that these spheres are reserved for women in the professions. But driving and working in mechanical transport, as well as hard work with equipment or in difficult conditions, for example, in mines, at gas or oil production stations, on shifts, [or] work in factories is more perceived as men's work than as women's work.

2. Assessment of professional gender segregation as gender discrimination is found in the following contexts:

   a) shift of coordinates from the assessment of professional qualities to physiological characteristics and gender stereotypes, as a consequence of non-acceptance of the idea of professional equality of the sexes.

   Examples of statements:

   F1: For some reason it is expected that a girl should be interested in cosmetics, not in playing robbers…

M1: As a child, my parents told me that a girl could not be hit even with a rose. In life, in the professional sphere, there were several cases when, faced with aggressive behaviour or manipulation by some women, I, stepping aside, behaved excessively politely, instead of giving a similar forceful rebuff.

M2: I love and know how to cook in the kitchen. Sometimes this comes as a surprise, since "cooking" is traditionally a woman's occupation. Many people think a man, at best, can cook meat, but not dessert. I like cooking desserts. Sometimes, if a button comes off, I hear from my wife: "Come on, I'll sew it on, you can't handle it". So needlework is only for women, and men aren't supposed to sew or knit? Sometimes I heard from acquaintances that a man must necessarily choose a "technical profession", so a male humanist is either lazy or a "lyricist, hovering in the clouds". But this was more often the case with unsuccessful men than with men who were successful in a "gender-nonconforming" profession. Women in "male" professions were more often treated with pity: why did she take on this burden when there were men around?

b) Use of humorous and ironic intonation to mitigate observed discrimination.

Examples of statements:

M1: There are few men in school, so they are valued more and children love male teachers.

M2: I won't forget my parents' phrase: we'll expel you from the will if you're not an electrician.

M3: At a meeting with the first year, there are only 12 girls among the 220 incoming students. The dean comes out and says: "How glad I am that there are only 12 women. You don't belong here."

M4: Gender-positive sexism, that is, over-grading female engineering students: they won't work anyway, we'll leave them as ornaments.

F1: I have encountered the opinion of some employees that "a woman cannot be a good programmer — either a woman or a programmer".

F2: ...the customer tends to trust the assertive man more, even if he's lax and weird — it's more in keeping with the image of a "programmer".

M5: I can over-evaluate a female student to avoid tears.

3. Contradictory, even mutually exclusive assessments in respondents' social perceptions of the personal profile of a male IT specialist and a female IT specialist.

Examples of statements:

F1: ... qualifications don't depend on gender — it's in the head. From my point of view, when hiring a person, you should assess not by gender, but by how suitable they are for the tasks assigned to them, in terms of competence, character, skills, experience... But thinking processes of men and women are different.

M1: I will name the most common, in my opinion, stereotypes about intellectual and professional features of men and women. I have to say that I share many of them. So:

Men usually think rationally, strategically, guided by formal logic, often put career and success in the first place; are more likely to have their career and success in the first place; often make strong independent decisions, but can give in to the strong; prefer to achieve the goal in the planned way. Abrupt changes in task setting can throw him out of his working rut or disrupt his work; in an emergency situation, men are more capable of reacting quickly and taking action; harassment in a team is more often shown by men to women. For normal work programmers perceive a woman as "their man", i.e., treated as a man. The image of the "beautiful lady" in the team can take away from the state of performance.

Women often think irrationally, emotionally, relying more on intuition; are better able to cope with a sudden change of task and are able to adjust more smoothly to the situation, scrolling through different variants of events in advance. They can do something extra just in case. Although, of course, there are people who behave according to the type of the opposite sex, i.e., for example, men with weak logic, capricious, adjusting, and women balanced, purposeful, capable of logical analysis, aimed at career growth; a woman's priority is more about pay check and family; in an emergency, women may become cranky or focus their attention on details, little things; if a woman in a male team is perceived as "my man", it may be burdensome or unpleasant for her; if a woman thinks she is right, she will not change her opinion, though she may submit. As a result, there may be conflicts; interpersonal communication in a team is more important for women. A woman can be bored among programmers.

M2: I am an employer, I work with students, I prefer women, they are responsible. But if a programmer is required, I will choose a man: there are more chances to get a lucky man who shows independence in his work than a lucky girl.

F1: There is no obvious difference in describing a man or a woman as an IT specialist. It takes a fine professional. However, men don't keep an eye on the state of the computer, and for women, the aesthetic line is important.

F2: Men are software developers and testers, women are analysts.

M3: With pure programmers, the gender distinction is blurred. However, I know a case where an IT woman got married, soon her spouse wanted to change her gender to female. Bisexual coming out is not uncommon in the IT environment... sometimes students say: call me by this or that, that is, not by the name on the document. My answer is: I will call your name as it is written in the document; when you change the document, I will call you differently, too.

F3: As a unit manager, I encountered a situation where I see a woman in a photo posted on an email page, but the correspondent introduces herself in the male gender in the email. I asked to clarify the gender identity. There was no response.

F4: A colleague of mine, when recommending me for an IT position in an organization, asked the human resources representatives: is it OK that she is a woman?

Conclusions

Thematic and structural analysis of the statements of the focus group participants on the topic "Social perceptions of professional segregation in the sphere of information technology among the Russian technical intelligentsia" allows us to establish the following features of social perceptions of this professional group.

The participants of the group interviews state that gender segregation is becoming less and less evident in the IT sphere. At the same time, the personal stories and observations of our respondents, which did not directly refer to professional behaviour in IT, demonstrate the presence and relevance of gender professional distinctions in group consciousness, the consequence of which are strong emotional reactions of discussion participants, influencing their choice of social behaviour scenarios with a high probability of reproducing the gender dichotomy.

The predominance of clichéd, stereotyped evaluations and descriptions of gender differences in respondents' answers and reasoning may indicate that Russian speech practice and culture have not yet formed a thesaurus of non-binary perception of professional gender identity.

The similarity in the recognition by most respondents of the shift in social perceptions of gender professional identity in IT towards gender "neutrality" allows us to expect a "soft" transformation of social attitudes and adaptability of professional consciousness of Russian professionals to changes in the perception of gender in IT.

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Not a Toy for Boys Only

Qualitative Insights into Promoting Women's Participation in ICT in Croatia

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Abstract: Digital transformation contains the promise of social inclusion and progress, but current data reveal lingering social inequalities. This paper looks descriptively into relevant reports and data with the aim to identify the size of the digital gender gap, the main barriers to bridging it, the factors causing it, and reasons why we should strive to achieve gender balance in ICT. The paper also provides a short overview of some initiatives encouraging inclusion of women in ICT. The main objective of the paper is to provide qualitative insights into gender-related challenges in ICT companies in Croatia based on semi-structured snowball sampled key informant interviews with six women who are top professionals working in ICT companies in Croatia and who were initiators of various events to promote inclusion of women in ICT. The approach taken here assumes that qualitative research can address social problems in powerful and meaningful ways when focusing on practitioners rather than only policymakers. The results reveal positive trends with existing role models and more aware younger generations, but also many socio-cultural factors hindering full capacity development not only of women but even more so of men and the entire society.

Keywords: women, digital gender gap, ICT, qualitative research.

Introduction

The digital transformation we are witnessing today is frequently seen in literature as providing new possibilities to empower the previously disempowered (OECD, 2018; WDR, 2016; Davaki, 2018). It is hard, however, to imagine that unjust structures of very long duration can cease to exist overnight or that political elites, structures and institutions that participated in the creation of the unjust social situation can be the sole agents of exiting this situation.

Although removing gender equality is widely recognized as a very demanding task, it is crucial for a prosperous society and a sustainable inclusively growing economy. The gender gap is, however, still widely visible, especially so in some areas, including, for example, engineering and ICT. It was in 2012 that G20 Leaders decided to commit to women's full economic and social participation, and in 2014 to implementing policies to improve the quality of women's employment and the provision of support services (OECD, 2018). Since then, most G20 countries have made progress, but it is not very quick and there is still much to be done.

The focus in this paper is on the digital gender gap, without assuming that gender is the most relevant or the only dimension of our social identities according to which social access, power or privilege is distributed. The digital gender gap can be defined as the unequal distribution of access, use, and skills related to digital technologies between men and women. It is a manifestation of gender inequality in the digital realm, where women may face various barriers that prevent them from fully benefiting from digital technologies. This gap can take different forms, such as disparities in Internet access, digital literacy, and the use of digital tools and platforms, which can lead to diverse specific definitions of the digital gender gap. It can also have far-reaching implications, such as limiting women's economic opportunities, social participation, and empowerment. The focus in this paper is on the socio-economic aspect of experiences of women working in ICT companies. Addressing the digital gender gap is crucial for achieving gender equality and ensuring that everyone can benefit from the potential of digital technologies.

Sociologist Manuel Castells (2000) states that we live in the Information Age or the Digital Age, which denotes the current era of technological development and widespread access to information through digital technologies. Castells argues that the Information Age represents a fundamental shift in the structure of society, driven by the development of new information and communication technologies that have transformed the way we produce, distribute, and access information. He describes the Information Age as a network society, in which power and social relations are organized around flows of information, rather than by territorial boundaries. Castells argues that the Information Age has led to significant changes in social and cultural practices, including the way we communicate, work, and engage with each other. Regarding gender gap, Castells argues that, while the information age has created new opportunities for women, it has also perpetuated existing inequalities and created new ones. For example, while women have gained access to new forms of education and employment through the Internet, they still face significant barriers to equal participation in the digital economy, such as the gender pay gap and the underrepresentation of women in ICT and some STEM (Science, Technology, Engineering and Mathematics) fields. Therefore, Castells argues that it is important to consider the ways in which the information age both brings new

possibilities for women and reinforces existing power structures and inequalities, in order to ensure that the benefits of the digital revolution are shared equitably by all.

It needs to be stated here, however, that there are differences across sectors and that ICT and STEM cannot be treated as the same without remainder. For example, women are currently overrepresented in many STEM fields, such as medicine and biology, and the level of gender inequalities significantly varies on a country level.

Firstly, in STEM fields, the gender gap is often more pronounced in certain areas, such as physics and engineering, while women are better represented in others, such as biology and medicine. In ICT, women are often underrepresented in technical roles, such as programming, software development, and network engineering. This is partly due to cultural and social norms that associate these roles with masculinity, the lack of access to education and training in these areas, and to differences in the perception of these fields and the types of skills and qualities that are associated with them. For example, biology and medicine are often seen as more nurturing and caring fields, which may be more attractive to women. The feminization of some areas like medicine does not have a direct impact on the digital gender gap in ICT. Women are still underrepresented in leadership and high-level positions in these areas, which can impact their ability to drive change and make decisions that impact the digital gender gap. Overall, the digital gender gap is a complex issue that requires addressing multiple factors, including access to education and training, cultural and social norms, and systemic barriers that limit women's opportunities. While the feminization of certain fields like medicine may impact the gender gap in specific contexts, it is important to address the root causes of gender inequality across all industries and fields to achieve greater gender parity in the digital economy.

Secondly, there is a debate on different country contexts regarding gender inequality in the digital sector. Hilbert (2011) discusses two narratives – the glass-half-full one in which ICT helps empower women (gain employment, obtain cost-effective health services and education, increase income etc.) and the persistent counter-narrative that women are at a natural disadvantage to benefit from the digital revolution because they are less tech. savvy, and more technophobic. If the second scenario is the case, ICT would only add a new dimension to the existing vicious circle between discrimination and women's backwardness, which can be expected to be particularly severe in developing countries (where 80% of women worldwide live).

In addition to the factor of the development status of a country, there are factors like age and varied use of Internet and digital tools that moderate this discussion. Fallows (2005, p. 1) points out that men like the Internet for the experiences it offers, while women like it for the

human connections it promotes, and World Internet Project (2009) confirms these findings that gender differences in usage of digital technology in developed countries have become smaller but remain, especially in usage. When it comes to developing countries, there is a lack of data, as technology-related research and policy advice are often focusing only on the roughly 20% of the world population living in the most industrialized countries. However, if ICT can empower women, there are greater potential gains in developing countries due to their weaker starting point. In providing explanations for the detected digital gender gap, the same women-are-technophobic arguments are frequently raised in developed and developing world alike – that women have a negative attitude to ICT (Varank, 2007) and that ICT reflects the needs of men rather than women, that it is a "toy for the boys" (Faulkner, 2001).

Contrary to these findings, some studies show that ICT can empower women in developing countries (Heeks *et.al.*, 2004; Brodman & Berazneva, 2007). ICT can enable meaningful participation and make female voices heard, as proven by the role of digital networks in feminist movements (Harcourt, 1999). Others have argued that ICT has the potential to completely redefine traditional gender roles, especially for women who have limited skills or who lack the resources to invest in higher education (Kelkar & Nathan, 2002). However, this potential to empower women in the developing world depends on access to and actual usage of these technologies, which is a necessary first step (see, e.g., Scott, 2001) Arguing that enduring gender-based inequalities are the reason for the digital gender gap is very different from arguing that women are naturally technophobic. To sum up according to Hilbert (2011), traditionally, longstanding inequalities prevent women from accessing ICT, leading to a vicious circle between digital exclusion, unemployment, low income and lack of education. However, once having access to ICT, this vicious circle can be ended and positive attitudes of women toward ICT can enable them to circumvent and fight existing inequalities.

Additionally, it should be explained how digital gender gap relates to the unequal participation in the digital economy**.** Studies (OECD, 2018; UNICEF, 2021) have shown that women are underrepresented in the digital economy. This can be seen in the low number of women in tech-related fields, such as computer science and engineering, as well as in the lower number of women who own or run digital businesses. The gender gap in the digital economy is a result of a combination of factors, including cultural and social norms, discrimination, and lack of access to education and resources. These factors can make it harder for women to enter and succeed in the digital economy. Another factor is the lack of representation and role models for women in the digital economy. The tech industry has traditionally been male-dominated, which can make it harder for women to envision themselves succeeding in this field. This lack of representation can also contribute to a culture that is less welcoming to women and can make it harder for them to advance in their careers.

The main research questions in this paper are: Is there a digital gender gap globally and in Croatia; and what is its size? What strategies are employed to decrease the gender gap? What common factors influence the existing digital gender gap? What qualitative insights can we gain from analysing experiences and opinions of top professional women working in ICT companies in Croatia about the current situation regarding the digital gender gap in ICT in Croatia?

The paper investigates official public data to illustrate the size of the gender gap in ICT and engineering education, employment, and salaries. Common factors behind the digital gender gap are discussed, together with common suggestions for shrinking it. Also, there is an overview of some initiatives designed by global institutions and implemented also in Croatia to promote the participation of women in STEM and ICT. The main original contribution is the analysis and discussion of six semi-structured interviews with women working in ICT companies in Croatia who were the force behind various initiatives to include women in the field. The sample was collected based on chain referral; it is non-probabilistic and key informants were selected to provide thick descriptions of the situation from the practitioners' point of view. Thematic analysis of transcripts has revealed that providing powerful role models is very influential in this regard and that there are positive and welcome developments with many success stories for women. However, there are still social and cultural factors that pose obstacles for gender balance in ICT. These obstacles are seen as doing damage to women and men alike. Constant auto-reflection regarding the politics of the applied method will be practiced throughout the paper. The conclusion summarises the main results and gives relevant recommendations.

The Size and Factors of the Digital Gender Gap and Why it is Smart to Reduce it

Despite significant advancements in gender equality, the ICT industry remains one of the most male-dominated fields, with women often underrepresented in leadership positions and facing discrimination and bias in the workplace.

An OECD report (2018, p. 5) states that 327 million fewer women than men have a smartphone and can access the mobile Internet. Women are under-represented in ICT jobs, top management and academic careers and men are four times more likely than women to be ICT specialists. At 15 years of age, on average, only 0.5% of girls wish to become ICT professionals, compared to 5% of boys. Women-owned start-ups receive 23% less funding and are 30% less likely to have a positive exit compared to male-owned businesses. UN (2023) data on the global situation regarding women and girls in science also stress there is a significant gender gap persisting throughout the years at all levels all over the world. Even though women have

made tremendous progress towards increasing their participation in higher education, they are still under-represented in engineering and ICT. In cutting-edge fields such as artificial intelligence, only 22% of professionals are women. Despite a shortage of skills in most of the technological fields driving the Fourth Industrial Revolution, women still account for less than a third of engineering graduates.

According to the Croatian Bureau of Statistics (2022), the total population of Croatia is 4 047 680, with women comprising 51.4 %. In higher education in the Republic of Croatia, women continue to make up the majority of graduates. In 2020/21, the percentage of women among students enrolled in institutions of higher education was 57.3% and 60% among higher education graduates. Of the total number of Master of Science degrees, 66.2% were awarded to women, and among doctors of science 54.1% were women. According to the number of enrolled and graduated students, women are in the majority in all fields of science, except engineering (28%). Among persons employed in legal entities in 2020 there is, on average, 36.7% women in the field of ICT. Women's salaries are only 82% of men's in average monthly net paid earnings in legal entities in ICT in 2020. According to EIGE (2019), among those graduating in ICT there are 21% women, and in engineering, machinery, and construction 18%. This indicates a relatively low level of gender balance in the education sector, which may contribute to the low representation of women in the ICT industry. In comparison, the share of women in the ICT sector in some EU countries, such as Sweden, Finland, and Lithuania, is higher, with the highest percentage being in Sweden at 38.7%. This suggests that there is still a long way to go in terms of achieving gender balance in the ICT industry, not only in Croatia but also in other countries. According to the European Commission (2022), Croatia ranks 21st of 27 EU Member States in the 2022 edition of the Digital Economy and Society Index (DESI). Despite performing well in digital skills, there is still a persistent gap as regards ICT specialists, which in Croatia accounts for a lower percentage of the workforce than the EU average.

Let us inspect the factors behind the illustrated digital gender gap (Blau & Kahn, 2017; Goldin, 2014). The participation of women in digital society can be hindered by social, economic, and cultural barriers. In Croatia, for example, the following barriers may affect women's participation in the digital world: lack of digital skills and knowledge, economic and social barriers, lack of role models, discrimination and violence, and work-life balance challenges. To increase women's participation in digital society, it is important to address these challenges through education, access to technology and the Internet, and promoting gender equality in digital fields.

Finally, let us explore the reasons why the digital gender gap needs to be reduced, according to the European Parliament (2016) and EIGE (2016). Firstly, there is considerable potential that digitalisation can have regarding an inclusive, equal and participatory society. ICT enables

the acquisition of new skills and acts as a catalyst in the delivery of public services, such as education, employment, healthcare and financial services. Ensuring equal access to ICT and the Internet is not seen only as a matter of human rights (e.g., freedom of expression), it would also improve women's health and the health of their families and communities, support women's access to education and other social services, and contribute to women's employment, economic independence and the sustainable development of their livelihoods. ICT inclusion would also enable women (and other under-represented groups) to participate more actively in political processes and engage in participatory democracy. Building on these premises, the Broadband Commission report (2013) examines how access to the Internet and ICTs can help redress some of the inequalities women and girls face in their everyday lives. Conversely, however, it expresses concerns that unequal Internet access will reflect and reinforce offline gender inequalities; additionally, the type of content available online might also strengthen gender inequalities and certain attitudes (e.g., sexist) towards women. There is a discussion on information literacy (Hafkin & Huyer, 2007; Dighe & Reddi, 2015), which is defined as the ability to access, know where to find, evaluate and use information from a variety of sources. It involves communication, critical thinking, and problem-solving skills. Education is seen as a crucial factor in ICT adoption, as more educated individuals are more competent to understand the (increasing) complexities of technological artefacts, while they are also more exposed to the use of ICT in both personal and professional life (Cruz-Jesus *et al.*, 2016).

There are, as we have already discussed, several reasons why women can be underrepresented in the IT sector, even in countries with high levels of development and access to digital tools. Some of these reasons include gender bias and stereotypes that IT is a "male" field, lack of female role models, and unequal access to education despite the availability of digital tools and resources, and workplace culture: even in companies that actively seek to hire and promote women in IT, the workplace culture may still be male-dominated and unwelcoming to women. This can lead to a lack of opportunities for women to advance, or to women leaving the industry altogether, due to a hostile work environment.

Initiatives to Raise Awareness and Promote Women's Participation in ICT

There are initiatives globally and in Croatia to include women in STEM and ICT. Gender equality has always been a core issue for the United Nations, who promote gender equality and the empowerment of women and girls as a crucial contribution not only to economic development of the world, but to progress across all the goals and targets of the 2030 Agenda for Sustainable Development. According to the European Commission (2022), Croatia

promotes digital literacy during EU Code Week and was, in 2021, among the top 10 countries in the number of activities organised (1,111). Croatia also awards talented students with scholarships in STEM studies (3,400 scholarships per school year). There is also an initiative, "Women in IT", aiming at empowering women and promoting gender diversity in the ICT launched by the Croatian Association of IT Companies and the Croatian Chamber of Economy. The initiative works closely with schools and universities, providing resources and support to help girls develop an interest in STEM and ICT.

Among initiatives by Croatian ICT companies there are Girls Who Code, STEM Academy, Women in Tech and Tech Girls. These are platforms for women to learn about technology and network with other women in the industry. The initiatives offer workshops, events, and mentorship programs to support women in their careers. These initiatives are important in addressing the current gender imbalance in the ICT sector and creating a more diverse and inclusive industry.

The international "Girls in ICT Day" is also worth mentioning, organised in Croatia under the name "ICT Supergirls", traditionally celebrated in April. Since 2011, over 377,000 girls and young women have taken part in more than 11,400 International Girls in ICT Day celebrations in 171 countries. The purpose of the event is to raise awareness of girls and young women about the opportunities in ICT, and to encourage them to consider their future career in the growing field of ICT. The event offers lectures and workshops presented by leading women of the Croatian ICT scene. They share personal stories about their own career growth and the challenges they had successfully overcome, to encourage girls to pursue a career in ICT and to recognize the opportunities and challenges that lie within. Such co-ordinated action driven by not only policymakers but also, very relevantly, by practitioners can help narrow the digital gender gap.

Key Informant Interviews

There are several reports on the digital gender gap recommending qualitative research (to get thick descriptions and as a check against the potential bias of narrowly specified quantitative targets) as well as making the changes in ICT people-driven (Davaki, 2018; WDR, 2016). This motivated the choice of key informant interviews as a study method for this research.

Method

Key informants are selected based on their expertise, experience, or position within the studied community and interviewed to gain a deeper understanding of a particular phenomenon (Silverman, 2022). Six women were selected for this study based on their professional careers in ICT companies in Croatia. They are all aged 36 to 43 with higher

educational background in economics or engineering. They were reached based on the chain referral of acquaintances working in the ICT industry in Croatia. They were selected on purpose, not randomly, based on their unique perspective, because they all are the initiators of various events promoting inclusion of women in ICT within their respective companies. The sample description is given in Table 1. The interviews were semi-structured, with a protocol of questions to guide the interview, but allowing the interviewees to expand on specific topics. The guiding questions asked about the motivation to work in ICT, what gender equality means and whether (and, if yes, why) it is necessary, their experience with career development and obstacles and/or possible resistance in their environment regarding the issue of digital gender gap, and about quotas and other specific measures for including women. The purpose of the study and the reasons for conducting it were explained to the interviewees and informed consent was granted. The interviews lasted between 40 and 90 minutes. Three of them were conducted face to face, two via a video meeting, and one via telephone. Transcripts were then coded and merged into topics that relevantly and frequently appeared in interviews. Empirical findings are presented in the form of quotes under constructed topics, derived based on iterative thematic analysis (Lichtmann, 2013).

Table 1. Sample description

Key informant interviewees	Gender	Education	Job	Age	Interview duration in minutes
Interviewee 1	Female	Master of geodesy engineering	Software implementation team lead	41	45
Interviewee 2	Female	Master of computing science	Group project manager	42	90
Interviewee 3	Female	Master of electrical engineering	Product manager	36	70
Interviewee 4	Female	Master of economics	Customer support manager	39	40
Interviewee 5	Female	Master of electrical engineering	Group project manager	37	80
Interviewee 6	Female	Master of information sciences	Training consultant	43	50

Analysis

The topics presented here emerged from the analysis of the collected data, all shown in Table 2.

Table 2. Six constructed topics resulting from key informant interviews

1.	Socialization aspects, social norms that favour men in ICT and unconscious bias
2.	New generations more aware and active
3.	The lack of the know-how to join the ICT industry
4.	Relevance of role models and mentorship

5.	Encouragement to start a career in ICT
6.	Fewer women than men in engineering and technology-related education and careers

All participants were included in an initiative to promote inclusion of women in ICT and they, without exception, say that they experienced no direct abuse or violence, but that there are socio-cultural factors discouraging women from starting education or a career in ICT. However, they all stated there are recent positive trends. Interviewee 1 commented on the situation with gender equality in ICT as follows:

> "There were twenty high school kids participating in ICT Supergirls in 2015 and we talked about their wish to choose a career in ICT. Only one girl said she was thinking about choosing this education and career, and all the rest commented that their parents discouraged them from STEM, frequently saying that STEM is for boys. Only seven or eight years later, today, we do not get such disproportion anymore. The girls know they can opt for STEM and that careers in ICT pay well, but they say they do not know how to start or how to achieve this."

A typical answer representing the opinion of interviewees when asked about the reasons for including girls and women in the industry, reasons justifying all investment in shrinking the digital gender gap revolve around socialization residues or unconscious bias (interviewee 3):

> "I feel bad, I am sorry to see that girls hesitate to choose this profession because they feel they are not good enough or smart enough. This attitude was perpetuated through their upbringing, not on purpose of course, the parents advised them the way they thought was best for their daughters, but we all I guess do much wrong we are not aware of."

Some of the challenges our interviewees mentioned included the lack of know-how to join the ICT industry in case one's educational background is not in STEM and being motivated only or dominantly by money. Interviewee 6 says:

> "It is not necessary to have an education in STEM, you can have a career in ICT after studying economics, or anything else for that matter. But the girls who studied something else do not know how to switch to a career in ICT. Often the motivation is money: people earn good money in ICT. But I think that money is not the best motivator. We need to provide them with tools, education, and training primarily and give them a cookbook containing detailed steps to lead them. Educational background is less important – you must understand the software, but you do not learn how to implement software at the university, you do it at work."

Important keywords appearing in interviews are inspiration, effort, and meaningful contributions. Our interviewees pointed out they do not organize initiatives to promote the inclusion of women in ICT for profit or to attract sponsors, but to contribute to the development of society as a whole and to give back to the community, wishing to have socially

responsible business models in their companies. Another important reason for promoting women in ICT is found in role models, and additional unexpected benefits were mentioned, including networking and personal branding. The following two quotes are by Interviewee 1:

> "If you work hard and put effort, with an open heart, you will climb up and be promoted. One girl who came to ICT Supergirls, a graduated economics major, found so much inspiration there. Now she leads our support in the company and the following year she was the speaker at the conference motivating new women and girls."

> "People get really inspired at our events. First there are younger girls, in their mid-20s addressing the audience. And then we have senior speakers, aged 35 to 45, women who already have successful careers and who serve as powerful role models. When they see a corporate highly successful woman share her experience, see her as an ordinary woman, many things start to demystify, and this is very powerful and inspirational. There were so many excellent outcomes and effects that we had not even expected, like broadening networking of younger women with role models and working on personal branding or developing socially responsible projects in different companies."

Interviewee 2 stressed the importance of mentoring programs:

> "Mentoring is extremely important; we have developed a programme to popularize mentoring in IT. Because you do not learn this during your studies and the industry is quick-paced and demanding, with not much space or time for extensive mentoring. We now have over 130 mentors and over 200 mentees. It is all online, we started in the context of the pandemic. In addition to role models, I feel that mentoring programmes, with many profiles of mentors, from programmers to directors, business analysts and project managers, are strong drivers of development in ICT and in the entire country too."

> "I never take sponsored lectures for the conference, but exclusively what I think is interesting and relevant. Many people say they find our conference special in some way. People in Croatia often complain about corruption and nepotism, but it is not like that in our company, maybe young people hear that from their parents who think nothing is possible without some kind of connection." (Interviewee 4)

> "We want IT to become a development driver for this country. We want more people to earn well and not worry about existential aspect of life because then they can think about excellence and how to make this country a better place for all. We need to teach people in ICT how to think in broad terms and how to give back to the community. Financial empowerment of women is very important for the entire society." (Interviewee 5)

When asked about the measure of introducing quotas, all our interviewees had ambivalent views. On the one hand, they felt that the ideal is to be gender blind and let excellence speak for itself. But they also recognized the unfairness of previously accumulated inequality and the difference of starting positions. Here is a quote from Interviewee 3 to illustrate:

> "I really am not sure about the quotas. People generally do not like this measure. I get both sides. I would like to see some research done about this. It seems stupid to push something, but then again so many people react negatively to gender equality in general. Then I think to myself, wait a minute, you are a white man, you do not get all nuances of challenges that women face. I feel so sad when I see girls not believing they are good enough for ICT or business world in general. Many men do not get that, it seems to me."

When asked about the phenomenon of a glass ceiling in ICT, Interviewee 1 says she feels she did not experience it, but also auto-reflects on some heavily masculine manners of conduct and speaking:

> "I cannot say I personally had the experience of hitting the glass ceiling, it seems to me that anyone who works very hard and invests in lifelong education can move upwards. But then again, I think to myself that maybe everything would look completely different if women had created the business world, maybe with more sustainability and less competition. I do not know. But we all say a cleaning lady, not a cleaning man, and, when we imagine a director, the image is typically of a senior white male. Or if we imagine a doctor. These images are automatic, and we do not do it on purpose, but they reflect the way this world had been formed. Women can succeed, and they do, but often they must assume a masculine position in talk or behaviour. The changes cannot happen overnight, another generation needs to mature, it seems to me."

Interviewee 1 commented on the changing roles for men in society and the success of women in new generations.

> "I have read a book based on research on cardboard men and plastic women. It is about brutally successful, capable, flexible and adaptable – brilliant women. They keep finding new ways to succeed and do not want or accept to be second-order citizens anymore. It seems that there are still quite a few men who have a hard time – their role is changing as they are not sole breadwinners anymore. Many of them want to traditionalize the position of women. Women see such men as a burden and have economic independence that allows them to exit such relationships. Maybe we should focus on men to help them find new identities. In our generation there is still inequality because we cannot stretch the boundaries very much very quickly and change the situation overnight."

Discussion

Key informant interviews have been conducted in line with a frequently appearing call for more qualitative research on the digital gender gap (OECD, 2018). Qualitative research can help to uncover the experiences, perspectives, and contextual factors that shape women's access to and use of digital technologies and shed light on the underlying social and cultural dynamics that perpetuate gender inequalities in this domain.

There are several important findings in line with other research. Firstly, the results show there are old structures of long duration transmitted via socialization and buried in values, norms and ways of thinking and conduct, which are traditionally masculine in the business world. The research here is not about tracking down the presence of women in ICTs, but it is the investigation into why this domain was and still is too often considered masculine. According to Wajcman (1991, p. 166), technologies reveal the societies that invent and use them, their notions of social status and distributive justice. In so far as technology currently reflects a man's world, the struggle to transform it demands a transformation of gender relations.

Addressing the underlying causes of digital gender disparities is vital, as dealing with the symptoms without fighting the causes would lead to superficial and ineffective measures. Many things can come between women and the new technology that are mentioned in this research and are confirmed in other studies too: social and cultural norms about appropriate behaviour of women hindering women to pursue education and a career in ICT (Antonio & Tuffley, 2014), including traditional family arrangements (Dehghan & Rahiminezhad, 2010), cultural attitudes, gendered division of labour and gender stereotypes. The results suggest there is more freedom of choice and action in the new generations, which compares to OECD data (2018). Women may also have more to gain from ICT than men, in time, freedom and opportunities (ITU, 2012, p. 8), and key informant interviewees often stress how successful, capable, and independent they are becoming.

Our results demonstrate that, to overcome the digital gender divide, we require an entire social response and socio-cultural changes, not only top-down measures. The point of view of practitioners is here made focal rather than that of androcentric institutions that helped create the digital gender gap and are now the ones trying to solve it. Wider socio-cultural reasons for the digital gender gap seem to lie behind the reproduction of inequality that exists in the offline world despite great opportunities offered by ICT for women (Castells, 2000).

Conclusion and Recommendations

This paper brough some descriptive illustration of the existing gender gap in education and employment in the field of ICT globally and in Croatia, answering affirmatively to the first research question. The size of the digital gender gap is considerable, but the trend is upward regarding the inclusion of women in ICT and the attitudes of new generations. Still, there are persistent inequalities that remain, linking virtual and material world and calling for further research that takes intersection of gender with class and other social factors into account.

Regarding the second research question about the strategies employed to decrease the gender gap, there are many UN, OECD, EU, and EC global initiatives that promote the inclusion of women in ICT, from conferences, training, awareness raising, mentorships, grants etc. There

are also Croatian agencies and initiatives. The ones led by practitioners in the ICT industry are seen as particularly important, as they are more active and agile than the state and policy makers.

The third question refers to common factors influencing the existing digital gender gap, which include economic, digital, social, cultural, work-flexibility related and other factors. However, according to our results, socio-cultural factors, educational background, traditional gender roles and stereotypes, as well as androcentric modes in the business world and conduct, seem to play a highly relevant role in creating the existing digital gender divide.

The recommendation is to conduct diversified quantitative and qualitative research to contribute to decreasing the digital gender gap, because greater inclusion of women in the digital economy and increased diversity bring value, both social and economic. Also, awareness raising, education and training, increasing technological literacy and trying to fight unconscious bias are recommended, as they are likely to minimise the reproduction of existing social inequalities. There is no reason for women to be behind in the digital transformation. The cost of passivity is high and, in the face of slow growth, ageing societies and increasingly feminized higher education excellence, the case for digital gender equality is clear.

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Being Digitally Savvy

Australian Women's Access and Ability to Use Broadband

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Abstract: Research into the rates of digital inclusion over the last three years, from the Australian Digital Inclusion Index (ADII), has shown differences in digital access and abilities of women compared to men. Deploying a gendered analysis, it is possible to explore the drivers behind differences in some areas where women scored above men and in other areas below. This paper reviews data from the Australian Digital Inclusion Index (ADII) and NBN Co's Online Skills Check and Resources (OSCAR). Focusing on the perspectives of women living in regional areas, living with a disability, from low-income households and senior women allows parallels to be drawn between digital inclusion and social inequality. Understanding factors that increase women's agency remains significant in the context of also improving women's digital inclusion. Factors that increase agency are required to fulfill women's digital potential. Solutions presented to address these gaps and narrow the gender digital divide include education and capacity building to provide opportunities and support for women, the importance of social networks, addressing narratives and, finally, targeting gaps in research. A continuous theme in this paper is the importance of an inclusive approach to investing time, effort and research to address gender equality within digital inclusion.

Keywords: women, digital inclusion, ADII, Online Skills Check and Resources (OSCAR)

Introduction

When considering the topic of gender equality, there is often a focus on closing the gap across employment, education and policy, but, what about gender equality for digital technology such as the Internet? Globally, the gender gap between men and women for Internet use is closing. Within Organisation for Economic Co-operation and Development (OECD) countries, 61% of men and 55% of women were Internet users in 2005 (a 6% difference), compared to a 2% difference between men and women 10 years later (OECD, 2015). One would assume that Australia would be no different from its OECD counterparts in experiencing a digital gender divide.

Usage of the Internet in Australia was captured by the Australian Bureau of Statistics (ABS) Household Use of Information Technology Survey 1996–2017 (ABS, n.d.). Australia also participated in the World Internet Project (WIP) from 2008 up until 2014, which was an international study on the social, cultural, political and economic effects of the Internet and which focussed on Internet users as well as non-users. During this period of research, Australia saw consistent trends on the digital participation of women. In 2013, 93% of men used the Internet compared to 89% of women (Ewing, van der Nagel & Thomas, 2014).

Following on from the WIP, the Australian Digital Inclusion Index (ADII) was developed in 2015, based on data from the Australian Internet Usage survey (Thomas *et al.*, 2021). To create a measure of digital inclusion, the ADII looked at three factors: digital access, affordability and digital ability (Thomas *et al.*, 2021). Digital inclusion can be defined as an individual's access to and use of the Internet, how this positively impacts their lives and the benefits it delivers. ADII data used in this paper relates to 2020 and 2021 research, as the index measurement had been revised and previous data is, therefore, not comparable (Thomas *et al.*, 2021).

Another resource for measuring digital ability is NBN Co's Online Skills Check and Resources (OSCAR). OSCAR (which is available at https://onlineskillscheck.com.au/) allows an individual to check their digital skills through a survey that results in a score across five levels: beginning, foundational, developing, proficient and mastery, where a higher OSCAR score means a higher digital ability. OSCAR's resource library also supports an individual to upskill their digital skills across knowledge, device usage, data, e-safety and online communication (Dimarco, 2021).

The background and context of women's use of broadband, cannot be understood without first examining the history of broadband infrastructure in Australia. In 2009, the Australian Federal Government established NBN Co to deliver high-speed broadband across the country and to support the way Australians work, learn, access health and connect with family and friends.

NBN Co's mandate is set by the Statement of Expectations (SoE) issued by Shareholder Ministers for NBN Co, with the latest statement issued on 20th December 2022. The SoE focusses on improved connectivity for regional and remote Australia by addressing access challenges (NBN Co, 2022). Compared with the previous SoE (NBN Co, 2021b), the challenges of commercial returns for activities in parts of regional and remote Australia compared to capital cities are still relevant. Because of the cost limitations and legacy telecommunication infrastructure utilised, the broadband network has resulted in a mixture of technology types across Australia and for regional and remote areas, with the latter predominantly involving fixed wireless and satellite services (NBN Co, 2015). Another important expectation on NBN

Co, in the context of this paper, is engagement with communities and stakeholders to support programs that will increase digital capability and inclusion for all Australians (NBN Co, 2021b). The importance of understanding the history of broadband infrastructure in Australia highlights the challenges of addressing existing social inequality (Goedhart *et al.*, 2019), especially those inequalities that already exist for women in regional and remote Australia.

This paper examines the differences between digital access and ability of women in Australia when compared with men in Australia, using the ADII and OSCAR data. The data will focus specifically on groups of individuals that are classified as living in regional vs cities (metro), living with disability, from low-income households and seniors (aged 65 and over). In reviewing the data of women's digital participation and ability, other research is used to compare and discuss insights, along with the role of agency in digital inclusion. Finally, three nuanced solutions targeted at narrowing the gender digital divide include: education and capacity building for women, the importance of social networks and addressing narratives and, lastly, targeted research and programs.

Digital Participation

Improving women's Internet access over time is important, not just for enabling an inclusive digital future, but also to support the equal opportunities, flexibility and independence that life online can provide. Research on the connectivity of women, conducted by AlphaBeta found that in 2017, there was a 2.3% growth in self-employed women for regions connected to the NBN relative to self-employed women in non-NBN connected regions (NBN Co, 2018). Even before the COVID-19 Pandemic, flexible work arrangements were important to women who had to juggle both work and caring responsibilities.

The ADII shows differences in digital access scores for women compared to men in low-income households, senior women, women living with disability, regional and metro areas (Figure 1). Looking at the comparison of results from 2020, women scored less than men across digital access in all groups except for the group identified as women living with a disability (in this group, women scored 1.5 points higher than men in the equivalent group) and there was no difference between women and men in the group identified as the regional group. This gap increased again in 2021, except that women scored higher on digital access than men in the groups identified as low-income households (+3.8), disability (+3.5) and regions (+2.8). Arguably, for the groups in which women scored higher than men, these groups may experience greater social and geographical isolation and therefore rely on and understand the importance of digital access to address their individual needs. The ADII survey sample is stratified and weighted to reflect the Australian population with the 2020 sample surveyed 2,798 people and the 2021 sample surveyed 2,287 people (ADII, 2021a).
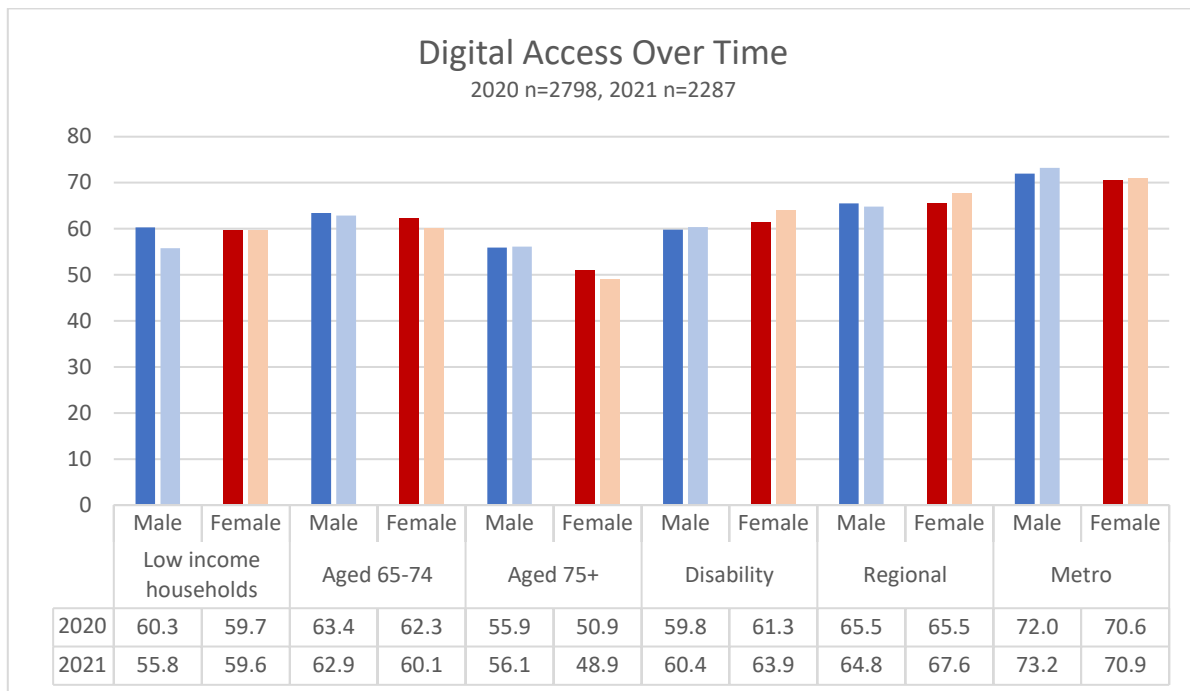
Figure 1. Digital access across 2020 and 2021 for males and females ([ADII, 2021a](#))

From National Seniors Australia, research on older Australians shows an increase in digital engagement, although the data focussed on gender in the context of types of devices used. Senior women used tablets and mobile devices to access Internet search engines, online banking and online government services. Seniors' comfort in using digital technology has declined over time ([Orthia, Maccora & McCallum, 2022](#)). Verbatim comments referenced in this report had respondents feeling 'forced' into the use of digital technology, while the COVID-19 pandemic had accelerated this through the use of QR codes, online shopping, and access to government services ([Orthia, Maccora & McCallum, 2022](#)).

According to the *Digital Australia 2022* report ([Brand & Jervis, 2021](#)), female participation in video games is 46%, an increase of 8% since 2005. For senior women who play video games, play time was longer for those aged between 55-84 compared to men ([Brand & Jervis, 2021](#)). Interestingly, these results are not represented in the ADII scores for seniors aged 65+ as digital access has decreased over time. One explanation for the difference in these results is how senior women access video games, which may not need broadband access as game subscription services make up 48% of game households ([Brand & Jervis, 2021](#)). A limitation with this research is how 'players' were defined, as being a person who play computer or video games, regardless of the device used to access the games. The *Digital Australia 2022* data included 1,204 Australian households, randomly sampled, with age, gender, and geographic representation consistent with population proportions ([Brand & Jervis, 2021](#)).

Recent research commissioned by NBN Co ([KPMG, 2022](#)) surveyed 2,021 Australians on their values, attitudes to, drivers of, and barriers to digital participation. When asked about their

preferences, more women indicated that they preferred to conduct day to day activities online than men did (KMPG, 2022). When grouped by gender, the insights provide a different behavioural profile between women and men. Although men rated their capability of Internet use higher, generally, they preferred face-to-face methods, were more nervous on data security and did not see the value in doing things online. Affordability of the Internet was a rated as a more significant impediment by women than by men (-3%), while women preferred to use the Internet to communicate more than men (+7%) (Table 1). Although there is a small difference in results between men and women's participation, as well as a variance in sample size, the data was tested and resulted in a low false discovery rate (the expected proportion of errors resulting in a false positive) and therefore the means are statistically significant.

Table 1. Digital participation values and attitudes between women and men from the digital participation research (KPMG, 2022)

	Male n= 835	Female n= 1186	Gender-Gap
Self-rated capability of Internet use	79%	77%	-2.0%
Strong preference to conduct day to day activities online	49%	51%	2.0%
Easily afford Internet connection in my current budget	72%	69%	-3.0%
Communicating via the Internet - sending and receiving messages	82%	89%	7.0%

Prevention from doing more online	Male n= 835	Female n= 1186	Gender-Gap
I prefer face to face methods	36%	32%	-4%
I'm nervous about doing more online because of data security	24%	23%	-1%
The companies I interact with do not have an online offering	13%	11%	-2%
My budget prevents me from upgrading my Internet connection	10%	12%	2%
My Internet is too slow	11%	10%	-1%
I don't see the value in doing things online	11%	9%	-2%
My Internet connection is unreliable	9%	10%	1%
I am not sure where to go to learn new online skills	7%	8%	1%
I am not confident in using the Internet	6%	6%	0%
Don't have the technology required	5%	6%	1%

Research from ADII and others referenced in this paper provides insights into the attitudes and preferences of men and women for which differences and similarities can be compared and validated. Social factors are more important to women's digital participation seen in both ADII (Table 2) and the digital participation research (Table 1). A poll of Australian women showed that 30% of respondents had experienced online abuse and harassment (Amnesty International, 2018). The lack of digital participation and engagement of some women could be due to the impact of abuse and harassment on social media. ADII's data on life online

revealed that a higher percentage of women were accessing health services (+9.6%), interacting with people or content to feel connected to community (+7.1%) and keeping in touch with family or friends (+4.2%) (Thomas *et al.*, 2021). In summary, the common themes from the above research on digital participation is the value of the Internet for strengthening wellbeing and social connection for women.

Digital Ability

When measuring an overall digital ability score, the ADII considers the following factors: operational basics and advanced skills, information navigation, social, creative and automation skills. Results from the 2021 ADII report (Table 2) indicate that women consistently score lower than men across all digital ability areas except for social. The digital participation research (KPMG, 2022) also found a greater percentage of women prefer to communicate via the Internet than men.

Table 2. Digital ability gender-gap. From 'Measuring Australia's Digital Divide: Australian Digital Inclusion Index: 2021' by Thomas *et al.* (2021), Australian Digital Inclusion Index (Copyright 2021 by Australian Digital Inclusion Index)

	National	Male	Female	Gender-Gap
Digital Ability	64.4	65.4	64.0	-1.4
Operational basic	73.1	74.7	72.1	-2.6
Operational advanced	64.4	66.4	63.2	-3.2
Information navigation	62.8	64.4	62.1	-2.3
Social	63.0	61.9	64.8	+2.9
Creative	55.6	56.8	54.9	-1.9
Automation	67.4	68.3	66.8	-1.5

Gender differences of ADII digital ability scores from 2020 and 2021 show comparable results to those for digital access. In the results for 2020, women scored less than men for digital ability except for women living with a disability (+1.4). Results from 2021 show women in low-income households (+6.5), living with a disability (+15.3) and regional areas (+4.7), with higher digital ability scores compared to men. The largest growth in digital ability compared to the previous year is with women living with a disability (Figure 2).

There is a lack of comprehensive national data on the accessibility of goods, services and facilities that use Digital Communication Technology (Farthing *et al.*, 2021). Assistive technology is designed to support people with a particular disability to perform a task, for example a screen reader for assisting a person who is blind, or who has a vision impairment, to read the content of a website. The Australian Human Rights Commission (Farthing *et al.*, 2021), identified several problems with inaccessibility, which further hinder digital inclusion for people living with a disability.

Results from the ADII report in 2020 had ranked the group of people living with a disability as fifth amongst the groups with low digital inclusion compared to the Australian average (Thomas *et al.*, 2020). Low-income households and individuals over the age of 65+ were also listed in the top 5 groups with low digital inclusion. If we look at women's digital ability (Figure 2) the lowest scores are senior women and women from low-income households. Although the 2020 and 2021 ADII reports are designed to be a summary of the findings, commentary and insights on the gender-gap is brief.

		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
		Low income households		Aged 65-74		Aged 75+		Disability		Regional		Metro	
2020		48.6	45.2	42.7	39.2	28.1	19.1	45.8	47.2	58.4	54.9	69.0	64.9
2021		42.7	49.2	45.0	38.5	28.4	25.6	44.3	59.6	57.5	62.2	69.0	64.9
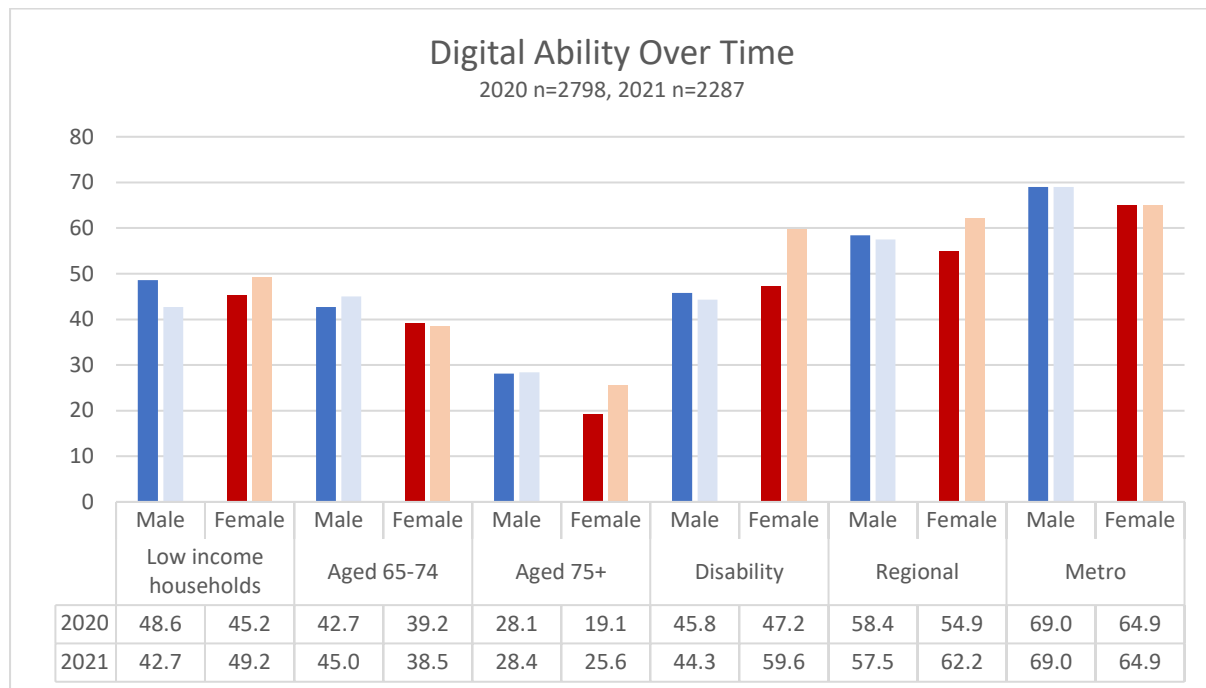
Figure 2. Digital ability across 2020 and 2021 for males and females (ADII, 2021b)

The OSCAR survey measures an individual's online knowledge, device usage, data and e-safety skills and online communication to be able to provide an overall score. Digital ability is the accumulation of learning digital skills and knowing when to use them. It is important to note, although ADII and OSCAR assess different factors when measuring digital ability and online skills, there are shared themes such as an individual's knowledge level, operational and device navigation and online communication skills. The sample size for OSCAR is comparable to ADII, although OSCAR data is selectively sampled through targeting groups and individuals that are likely to have engaged with the OSCAR survey through NBN Co. The survey also relies on voluntary responses and could be subject to self-selection bias; when individuals who choose to participate in the survey differ from those who do not.

Within the OSCAR data (Figure 3), men scored higher in all categories for online skills, except for regional women in 2022 (+1). Comparing with ADII data, regional Australian women scored much higher than men across digital ability in 2021 (+4.7), compared to the previous year (-3.5) (Thomas *et al.*, 2021). When assessing OSCAR scores with the overall average score

for women as a benchmark (68.0 in 2021 and 65.6 in 2022), only women living in metro areas have a higher digital ability score. It is important to note that the sudden decrease in scores for these women from 2021 to 2022 is likely to be attributable to the difference in sample size.

OSCAR
2021 n=2355 (f), 2006 (m)
2022 n=4567 (f), 2811 (m)

	Male (Aged 66-75)	Female (Aged 66-75)	Male (Aged 76+)	Female (Aged 76+)	Male (Regional)	Female (Regional)	Male (Metro)	Female (Metro)
2021	66.5	61.5	50.3	45.9	68.8	65.5	80.1	76.6
2022	64.4	63.7	55.0	52.2	63.8	64.8	72.3	67.4
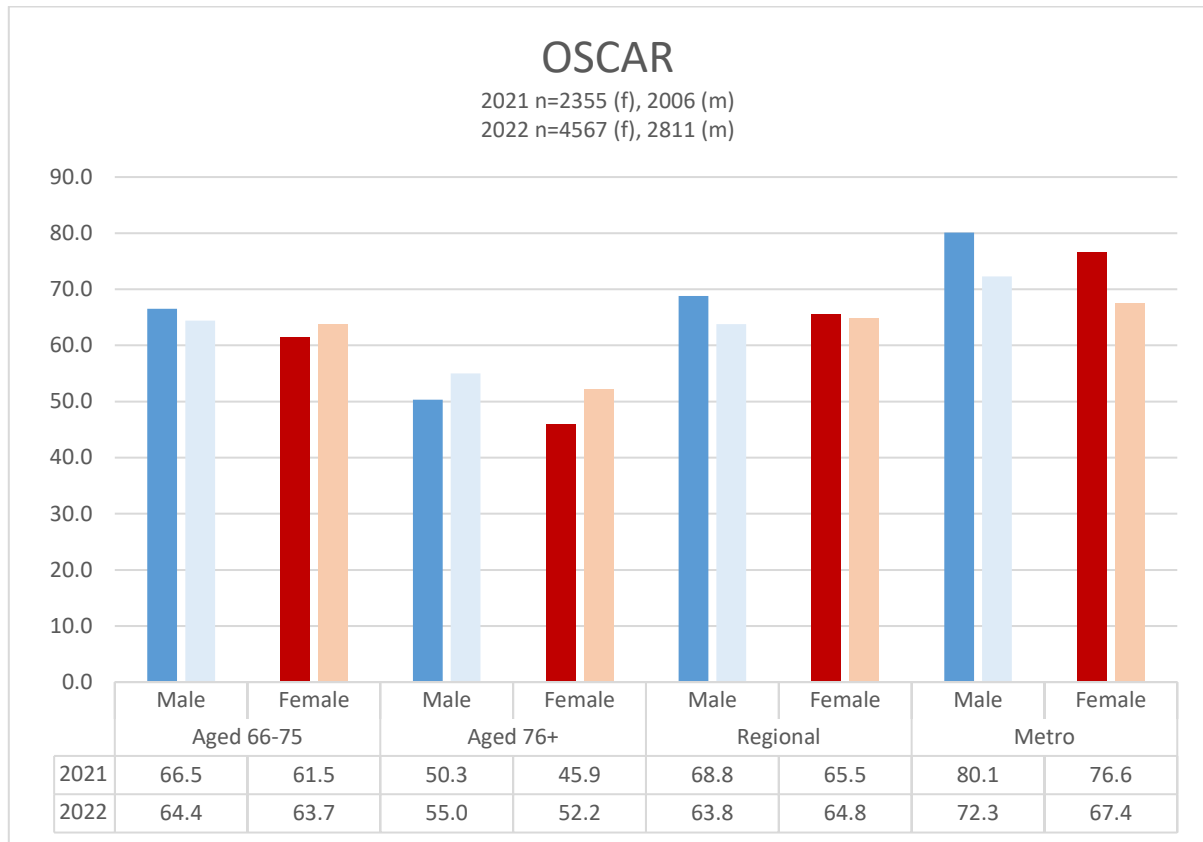
Figure 3. Online skills across 2021 and 2022 for males and females (OSCAR, 2022)

Table 3. Importance placed on digital skills and tech adoption by gender (OSCAR, 2022)

	Male		Female		Gender-Gap	
	2021 n= 1992	**2022** n= 2751	**2021** n= 2338	**2022** n= 4482	**2021**	**2022**
Digital Skills Importance	79.1	78.7	81.5	82.0	2.4	3.3
Technology Adoption Importance	44.2	34.5	26.4	24.2	-17.8	-10.3

Table 4. Competency areas by gender (OSCAR, 2022)

	Male		Female		Gender-Gap	
	2021 n=1984	**2022** n=2734	**2021** n=2330	**2022** n=4439	**2021**	**2022**
Online knowledge	74.4	71.6	72.4	70.8	-2.0	-0.8
Device usage	74.0	69.4	67.8	65.8	-6.2	-3.6
Data and eSafety	74.4	70.6	69.6	68.2	-4.8	-2.4
Online Communication	74.8	72.2	75.0	73.6	0.2	1.4

Drivers behind OSCAR scores also include valuing digital skills and technology adoption and when looking at the gender differences based on these drivers, women placed great importance on digital skills, while men placed a far greater importance on technology adoption (Table 3).

Women scored less than men for online knowledge, device usage and data and eSafety (Table 4) although the gap has decreased when compared to the previous year. These results align with the lack of importance placed on tech adoption for women seen in Table 3.

When comparing digital ability from ADII with OSCAR data (ADII 2020, 2021 and OSCAR 2021, 2022), regional women scored higher than regional men in the most recent result compared to the previous year. Women 75 years of age or older have the lowest digital ability scores when compared with scores for women overall, thus being some of the most digitally excluded Australians. Considering these trends between ADII digital ability and OSCAR, women with the least digital ability are senior women and the greatest digital ability being women living in capital cities. The OSCAR data is likely not entirely representative of the Australian general population, but, given the similarities with the ADII data (which is representative of general population), an argument can be made that OSCAR data is significant even considering the sampling limitations. The OSCAR survey does not include questions on disability or income so these groups cannot be compared with the ADII. Overall, women scored higher in online communication than men, and understand the importance of digital ability and skills to successfully communicate and effectively navigate online.

The Role of Agency in Digital Inclusion

In this context, agency is defined as individual actions, capability and practices which positively influence, determine and shape an individual's desired outcomes and experiences. The agency of women is a determining factor when assessing their participation in digital inclusion. Furthermore, taking the level of agency into consideration allows the identification of nuanced factors that drive fulfilment of women's digital potential. Becker's (1985) research on human capital, labour and gender is relevant in understanding the challenges for women to be digitally included. In his research, married women would invest less in market human capital due to their primary responsibilities for housework and childcare compared to married men, regardless of the same amount of time spent in the labour force (Becker, 1985). Domestic responsibilities create an occupation divide between women and men, as women seek work that is less intensive and provides more flexibility (Becker, 1985). Helping family institutions to promote female agency, will ultimately help advance women's positions in labour force participation, human capital formation and political participation; all critical factors for economic development (Dilli, 2017).

There is a relationship between agency and social structures that needs to be considered because women who possess agency have that agency constricted by social structures which give greater privilege to men, and that are continuously being reproduced and reinforced by individual actions that form part of society. Casey *et al.* (2021) discusses the focus and

amplification in the press of mental health and wellbeing of male farmers during droughts. While this ultimately shadows the long-standing issue and impact on rural women's emotional, physical and social wellbeing. Women in drought-impacted regional Queensland applied entrepreneurial bricolage, by using digital technologies that were often self-taught, providing them with an off-farm income (Casey *et al.*, 2021). Casey *et al.* (2021) explains entrepreneurial bricolage to mean 'agents using any resources that come in handy, improvising and testing solutions, accepting imperfection, and constructing the existing practices as open to re-interpretation', relying considerably on the feedback of the relevant stakeholders. O'Grady (2005) relates Michel Foucault's 1979 work to study the effects of power at an intra-subjective level and how it holds relevance for women in understanding the importance of the role of self-policing on identity formation. Without addressing the role of power and knowledge on an individual's capacity, unwanted power relations will not change (O'Grady, 2005). This point is relevant in understanding that negative relationships women may have with themselves affirms social and cultural factors that declares women as vulnerable.

Women (and men) that are at risk of digital exclusion are those living without support such as low-income households. Research from Accenture (2023) draws on insights from 2022 data, information on services over the NBN network, international broadband prices, Australian household characteristics and the results from a bespoke consumer survey. From an affordability perspective, access to the NBN network appears to not be a prohibiting factor, with the average Australian spending $16.90 a week on a service, or 1.1% of the average weekly household income of $1,600 post tax (Accenture, 2023). Nevertheless, the Australian Communications Consumer Action Network (ACCAN, 2019) argues that over one million low-income households are at risk of not switching over to an NBN service because of cost. For households that earn less than $31,199 per annum, only 18% of males and 17% of females found their NBN service unaffordable (Accenture, 2023). Compared to men, more senior women and regional women found an NBN service less affordable (Table 5).

Table 5. NBN affordability gender-gap (Accenture, 2023)

	Male		Female		Gender-Gap Unaffordability
	Affordable	Unaffordable	Affordable	Unaffordable	
Income <$31,199 households n= 109 (m), 169 (f)	50%	18%	43%	17%	-1%
Aged 65+ n= 253 (m), 154 (f)	63%	9%	62%	10%	1%
Regional n= 256 (m), 309 (f)	61%	8%	52%	12%	4%
Metro n= 538 (m), 690 (f)	62%	12%	51%	9%	-3%

A safe way for women to provide collegial support can be closed online groups, communities and platforms. Nan Berrett, an older South Australian woman setup an online platform called 'Silverpreneurs', which aims at supporting older women in regional and remote communities across Australia to start their own small business (Bottrall, 2019). Having access to high-speed Internet has provided opportunities and confidence for women to start small home-based businesses. Another example of an initiative that enables regional women in business is the 'innovate with NBN' grants program, which NBN Co offers in partnership with the Regional Australia Institute. Applications for the "women in regional business" category have trended up over time, with "women in regional business" making up 18% of total applications in 2020, 30% in 2021 and 32% in 2022. Previous winners have built apps to extend their business online and expand businesses into new locations (NBN Co, 2021a; Williams, 2022). In these examples, women in regional Australia have demonstrated ability, resilience, and engagement to embrace digital technologies and tap into a different rural female endeavours that are distinct from traditional agriculture and farming roles.

Dilli (2017) believes that research on the role of female agency in the household suggests the gender differences in educational attainment. Women with more bargaining power within the household have an increased likelihood of school enrolment of children. Dilli (2017) noted that women participation in the labour market varied due to the use of different forms of agricultural practice, different per capita incomes and specialisation in female-friendly industries and differences in cultural beliefs about the appropriate role of women in society. Testa (2017) explains that the relationship of recognition and power is understood in terms of social power, for an individual's capacity to enable action and affirm a quality or value in some specific way.

Social power has positive and negative effects on other agents (Testa, 2017) such as those active in the public sphere of social media. Benhabib (1997) argues that the public sphere, especially in social media, has become a place for anonymous conversation, discourse and debates, which encourages inappropriate speech and can lead to negative effects on the regard for, and thus lower participation of, women and marginalised groups.

Maintaining a voice (and power) while expanding upon capacity of women, can be key to enabling digital engagement (Testa 2017). Greater representation of feminist voices through online, social media and the news, strengthens feminist discourse (Casey & Watson, 2017). By providing and sharing stories online, women can support each other and enable other women to seek and access digital opportunities.

A Pathway Forward

Based on the research and insights discussed, the following reoccurring themes can be turned into solutions to narrow the gender digital divide.

Education and capacity building to provide opportunities and support

Deliberate focus on upskilling of digital ability across different cohorts is an investment that results in economic benefits. The OSCAR tool is one example to increase skills and awareness. Another example is the *Shaping Connections* platform that helps older Australians increase their knowledge of ICT and develop improvement strategies (Shaping Connections, 2021).

The eSafety Commissioner provides information and awareness on online safety, in its capacity as Australia's independent regulator. The recent *Online Safety Act 2021* (Cth) protects Australians across most online platforms and forums where people can experience abuse or be exposed to harmful content. The Tech Council of Australia advocates for the policy, research and engagement of the tech-enabled sector and in doing so, strongly encourages investment in digital skills for women (Tech Council of Australia, 2022). Simple activities such as the utilisation of online forums and platforms, versus enquiring in person or over the phone, have demonstrable savings for companies and service providers. Connection to the Internet is not the only singular factor to ensure digital inclusion, but people require adequate skills and knowledge to use the Internet (Thomas *et al.*, 2021).

The importance of social networks and addressing narratives

There are well-established narratives of inequality for people living in regional areas compared to in the cities. Kate McBride, a researcher and Parliamentary Liaison Officer for the Australia Institute, referred to regional Australians as the 'forgotten people' (Australian Broadcasting Corporation Q+A, 2022, 0:58), and for that to change, there needs to be increased agency for regional Australians to be decision makers in the investment of services for regional and remote areas. Reinforced narratives of life in regional Australia are perpetuated by mass communication media. Media enterprises are required to broadcast Australian content on commercial TV as the Australian Communications and Media Authority (ACMA) have set transmission quotas for at least 55% Australian content (ACMA, 2022). Reality television series such as *The Farmer Wants a Wife* (2007), and *Outback Truckers* (2012) actively reinforced narratives of life in regional Australia. They appeal to audiences by focusing on the hardship and perspective of Australian males in the outback (although more recently some series have attempted to introduce female perspectives). Series like these examples show how mass communication media has the power to maintain narratives that reinforce gender roles and inequality.

Casey and Watson (2017) comment on the risk of naming oneself as a feminist and having the ability to speak out in contemporary media, which would attract online harassment and abuse for women. According to Hootsuite (2022) *Digital 2022* report, 46.1% of social media users are female. An example of content used as an educational tool is the use of photography to show the role women play in farming and agriculture, which again, challenges the masculine stereotypes within Australian farming (Di Iorio, 2022). To move forward, addressing the intersection of social networks and feminist narratives is critical, especially the pervasive rural and regional female narratives in the media. Doing so will ensure social networks are spaces for diversity, inclusion and empowerment.

Targeted research to address gaps and dive deeper into focus areas

There are fundamental risks with statements made from research that is only representative only at a macro level. An example of this is from the *Digital Nation Australia 2021* report, which states that women in Australia follow the global trend of being less digitally included than men. Although this is based on the national average of women from 2020 ADII data, there is a different perspective when probing deeper into the factors that make up digital inclusion. This paper highlights that women living with a disability have higher digital access and ability compared to men. The differences between men and women's digital access and ability differ again in the 2021 ADII results.

Researchers have the challenge of addressing gaps in data, like the Australian Bureau of Statistics (ABS) discontinued Household Use of Information Technology Survey and the 2021 ABS Census, which did not include questions on Internet access. The ADII (Thomas *et al.*, 2021) also highlights gaps in the capture of First Nations digital inclusion, due to an inadequate sample of survey data. A separate initiative is seeking to address this data issue, it is called Mapping the Digital Gap, conducted by the ARC Centre of Excellence for Automated Decision-Making and Society at RMIT University (ADII, 2023). This program aims to work with around eight to ten remote communities to generate a First Nations Index score and track changes in digital inclusion over a four-year period (2021-2024).

Averages from the OECD countries observed different Internet usage between genders, as men listen more to web radios, watch web TV, play and download games, films or music, sell goods or services, create websites or blogs and download software more than women (OECD, 2015). For Australian women Internet users in 2012, 77% conducted online purchases, 73% used e-banking, 69% used social networking and 59% used the Internet for travel and accommodation (OECD, 2015). Gaps in data need to be addressed by asking women and men questions about how they use the Internet at a granular level, while encouraging researchers to present more findings by gender.

Conclusion

The results of surveys, the creation of capacity building tools and research on digital inclusion over the last three years indicates a greater focus on closing the digital divide, which is ultimately beneficial to groups that are digitally excluded, men and women alike. Women are changing the way they access and participate digitally, especially regional women. Constant opportunities to utilise digital abilities are needed, to stay relevant in an ever-changing digital landscape. There needs to be a continued focus by government, industry and services providers on research which explores the specific factors that contribute to particular groups of women being digitally disadvantaged, such as senior women and those from low-income households. Further efforts to address digital inclusion will continue to result in increased economic development, further social connection and engagement. This is particularly important when observing the gap between digital ability for low-income households compared to other categories; suggesting a need to deeply invest in digital access, training, and engagement for low-income households.

Women and men have made progress towards closing the digital divide. Being conscious of the varied boundaries and limits of agency held by intersectional groups of women, is critical for understanding the factors that contribute to the gender digital divide. Positive results stem from advocacy, awareness and capacity building by organisations and programs that further enable women's agency in digital access and ability. A continuous theme outlined in this paper is the importance of investing in time and effort to address gender equality, not just within digital inclusion, but also for the benefits of an inclusive approach for society as a whole.

In addition, there is a need to address negative risks from increased digital activity (such as the security of personal data, exposure to scams and online harassment). This is particularly relevant for those most vulnerable to exploitation. This paper provides a foundation for researchers to continue to address research gaps and track progress on digital access and ability of Australian women. Conducting such research in a more nuanced way will help develop a collaborative and integrated approach to increasing equality of digital participation.

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[i] The views and opinions expressed in this paper are the author's own, and may not reflect those of NBN Co.

Telecommuting on Women's Work-Family Balance through Work-Family Conflicts

Mindfulness

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Abstract: This study draws on the work-family border theory to examine the impact of telecommuting on work-family balance through work-family conflicts and managing psychological borders. Since telecommuters lack physical boundaries and work within psychologically created borders, it is more challenging for women telecommuters to balance work and family responsibilities while working from home as telecommuters. Although available literature has illuminated this concern, there is a dearth of literature on managing psychological borders. Addressing this gap, this study explores the impact of telecommuting on work-family balance (WFB) through the bi-directional nature of the mediating effect of work-family conflict and the moderating impact of mindfulness, which will be empirically tested. The research adopted a cross-sectional survey strategy to conduct quantitative research on women telecommuters in the information technology industry in Sri Lanka. Interestingly, the findings of this study reveal that telecommuting has an impact on WFB, and that the trait of mindfulness was found to impact women telecommuters' WFB significantly. The study contributes to the existing literature by incorporating mindfulness as a moderator and highlights the importance of developing the trait of mindfulness, since it is not innate in most people.

Keywords: Telecommuting, Women, Work-family balance, Work-family conflict, Mindfulness

Introduction

With the increasing number of telecommuters globally (Golden *et al.*, 2006), telecommuting has become a pervasive alternative work mode that permits employees to be spread across remote sites (Auryn & Marion, 2022; Gajendran & Harrison, 2007; Leung & Zhang, 2017; Priyashantha *et al.*, 2022a). In the past, most computer-based work performed by telecommuters was regular, clerical tasks done by a few people. However, as information technology has advanced, telecommuters' ranks have been expanded by a considerable number of professional-level workers who perform a part of their responsibilities outside the company's physical boundaries, using information technology as their primary tool for operation and communication (Bailey & Kurland, 2002; Wessels *et al.*, 2019). Telecommuting, also called homework, remote work, virtual work, telework, or distributed work, entails working a portion of the time away from the conventional workplace, frequently from home, and communicating through computer technology (Bailey & Kurland, 2002; Baruch, 2001). Moreover, many employees allocate extra working hours to work on office-related activities from home rather than working specific hours at the office (Toniolo-Barrios & Pitt, 2021).

Sri Lanka is a middle-level-income country in South Asia, with a 52% female population (Department of Census and Statistics, 2021). Of the 8.9 million economically active population, 65.7% are men, and 34.3% are women (Department of Census and Statistics, 2021). However, substantial progress has been made in introducing more women into male-dominated industries, such as the automobile, transportation, and logistics. In many fields, including law, medicine, banking, finance, ICT, and education, women have contributed substantially to the development of the country. (Twigg & Arunasalam, 2023). In addition, Sri Lankan labour laws and policies have been revised to reduce obstacles to women's workforce participation. In addition, the nation's annual GDP is projected to increase by 14% ($20 billion) by 2025 due to increased female labour-force participation. (Arudpragasam, 2022).

When women entered the workforce in more significant numbers (Kailasapathy & Jayakody, 2018), balancing Work and Family became a challenge; and essential when they perform their duties at home (Kulatunga, 2020). According to a survey conducted among 15 leading Sri Lankan companies, including banking, IT, and finance, women who work from home as telecommuters and have additional family-related responsibilities confront difficulty balancing work and family obligations. Therefore, the survey findings highlight that the bi-directional nature of the work-family conflict (work to family and family to work) causes the work-family imbalance (Pathirana, 2020), and this has become a challenge for women telecommuters compared to men (Cook, 2021; Dissanayake, 2017; Jyothi & Jyothi, 2012; Mousa & Alas, 2016; Pathirana, 2020).

Studies on the impact of telecommuting on work-family balance have yielded contradictory findings. Some researchers have claimed that telecommuting enables individuals to balance the competing needs of work and family, minimizing conflicts (Rau & Hyland, 2002; Tremblay, 2002). Other scholars have contended that it creates conflict as a result of increased work and family obligations arising from greater proximity and accessibility (Bailey & Kurland, 2002; Golden *et al.*, 2006; Novianti & Roz, 2020). The primary challenge to telecommuting is blurring the boundaries between work and family (Belzunegui-Eraso & Erro-Garces, 2020; Pattnaik & Jena, 2020; Toniolo-Barrios & Pitt, 2021). Consequently, to prevent conflicts between work and family, telecommuters must be able to manage psychological borders. To address this problem, the present study examines the impact of telecommuting on work-family balance to comprehend how psychological boundaries can be managed when working as a telecommuter.

According to the work-family border theory (WFBT), telecommuters have no physical borders, and the concept of borders is no longer applicable (Clark, 2000; Leung & Zhang, 2017). This creates a borderless and less time-consuming experience for telecommuting employees. WFBT conceptualizes work and family as two distinct but interactive domains, each with its own rules, emotions, values, behaviours, and thoughts (Clark, 2000). According to the WFBT, telecommuters must adhere to psychological boundaries. Psychological borders are rules formed by individuals that specify when specific ways of thinking, behaviours, and emotions are appropriate for one domain but inappropriate for another (Clark, 2000; Karassvidou & Glaveli, 2015). Borders demarcate the separation between work and family, allowing an individual to concentrate more on the domain that is now stronger (Karassvidou & Glaveli, 2015). Although this theory's central emphasis is on the borders between the work and family domains, it has yet to explain how the psychological borders required for achieving the desired balance between work and family are to be managed. This has also been identified as the theoretical gap of the present study.

The association between telecommuting and work-family balance has been highlighted in the recent literature (Bailey & Kurland, 2002; Golden *et al.*, 2006; Greenhaus *et al.*, 2006; Leung & Zhang, 2017). Also, telecommuting and its impact have been studied in relation to work-family conflict (Gajendran & Harrison, 2007; Golden *et al.*, 2006) as one concept. Further, it has been discovered that, when working from home, telecommuters face conflicts between work and family, as questions on these conflicts may entail challenges related to the roles of the individual (Soares *et al.*, 2022). Therefore, this situation will cause the creation of an imbalance between work and family (Mustafa & Gold, 2013). Hence, work to family conflict and family to work conflict have mediated the relationship between telecommuting and work-family balance. Moreover, only a few researchers have studied the impact of telecommuting in

relation to work to family conflict ([Vander Elst *et al.*, 2017](#); [Golden, 2006](#); [Hornung & Glaser, 2009](#)), while some have stated that work has a more negative effect on family-related activities than the family has on work-related activities ([Darcy & Mccarthy, 2007](#)). Therefore, many researchers have focused only on telecommuting and its impact on work to family conflict and reported more frequently on work to family conflict than on family to work conflict ([Golden, 2006](#)).

Against the backdrop of increased research attention on telecommuting and the work-family balance construct ([Belzunegui-Eraso & Erro-Garces, 2020](#); [Pattnaik & Jena, 2020](#)), the current study sought to make two significant contributions. First, this paper addresses the lacuna in empirical studies examining the impact of telecommuting on work-family balance through the bi-directional nature of work-family conflicts, since the lack of empirical evidence to date validates Clark's ([2000](#)) work-family border theory. Second, the study makes a significant theoretical contribution by examining the moderating impact of mindfulness and the bi-directional nature of the mediating roles of work-family conflicts to explain the impact of telecommuting on work-family balance in the extant literature. Further, this study emphasises the importance of managing psychological borders that supports the work-family balance of telecommuters. Therefore, the current study addresses the lacuna in empirical findings and theoretical explanations, building on the aforesaid theory to examine the work-family balance of women telecommuters in Sri Lanka.

The rest of this paper is structured as follows: in the subsequent sections, the existing literature related to work-family balance, the bi-directional nature of work-family conflicts, and mindfulness is reviewed, and hypotheses are advanced, followed by the conceptual framework. Next, the research methodology is presented since the study was undertaken to identify the method of managing psychological borders while working from home. The data analysis, the findings, and the implications follow this. Finally, limitations and reflections for further research and the concluding remarks are presented.

Hypotheses & Conceptual Framework

The extent of telecommuting and work to family conflict

With the development of technology, telecommuting has become a widespread alternative mode of employment. Although telecommuting is often thought of as a means to balance work and family life better ([Toniolo-Barrios & Pitt, 2021](#)), it frequently exacerbates work-family conflict ([Bailey & Kurland, 2002](#)). Since teleworkers perform their duties from home, research has shown that telecommuting has sometimes exacerbated work-family conflicts. ([Vander Elst *et al.*, 2017](#); [Golden, 2006](#)). The most fundamental challenge of telecommuting is the blurring

of work and family borders. After completing their office domain at home, women must also attend to their family domain. There is a requirement for psychological detachment between work at home and home at work, since there are no physical or temporal borders between these two domains (Vander Elst *et al.*, 2017). Therefore, the most incredible difficulty of working from home is not being able to disconnect after office hours and working more hours (Toniolo-Barrios & Pitt, 2021). Thus, the following hypothesis is advanced based on theoretical reasoning and empirical evidence:

H1: The extent of telecommuting impacts work to family conflict.

The extent of telecommuting and family to work conflict

Telecommuting allows employees to manage their family demands while working from home. Although better able to manage family needs through working from home by allocating time and emotional energy saved, telecommuters also face the challenge of increasing pressure, some of which is self-imposed, and more involvement in the family role that could interfere with work (Golden *et al.*, 2006). For example, telecommuters may take the family responsibilities of home care to play a more significant role in child-caring activities. For example, they may feel that, rather than sending their family to medical appointments, they should accompany the family member to the meeting to provide emotional support, since they have blurred their office roles through telecommuting. Because of involvement in these family activities, telecommuters may increasingly encroach upon work time for family work because of not having boundaries separating the work and family domains (Ashforth *et al.*, 2000) and making themselves more accessible to becoming involved in family needs. Further, it has been found that family members are more inclined to disturb teleworkers when they perform their duties from home (Bailey & Kurland, 2002). Thus, the following hypothesis is advanced based on theoretical reasoning and empirical evidence:

H2: The extent of telecommuting impacts family to work conflict

Work to family conflict and work-family balance

WFC (Work to Family Conflict) causes work-family imbalance (Allen *et al.*, 2000; Leung & Zhang, 2017). When work activities interfere with family activities, it causes a role imbalance in both domains, and, as a result, an individual faces the problems of work-family imbalance. On the other hand, balanced involvement in the work and family domains will reduce work to family conflict (Allen *et al.*, 2000). Work to family conflict arises when an individual allocates more time to work-related activities, which causes conflicts with family-related activities and demands. Therefore, when more time is given to work-related tasks, there will be a resultant imbalance between work and family (Madsen, 2011). Further, this situation can be very

demanding for an individual, rushing through urgent activities and realigning a schedule to handle the opposing demands of family-related activities (Ramya *et al.*, 2022). In this situation, an individual will likely find it challenging to establish a satisfying balance between work and family (Soomro *et al.*, 2018). Thus, the following hypothesis is advanced based on theoretical reasoning and empirical evidence:

H3: Work to family conflict impacts work-family balance.

Family to work conflict and work-family balance

When telecommuters perform their office-related work from home, time spent in the family role becomes insufficient due to increased work burdens (Greenhaus *et al.*, 2003). It has been mentioned that, when telecommuters work from home, they do not have any physical borders, and family members can enter the working place. Thus, there might be the possibility of creating a disturbance (Clark, 2000), and a negative situation may lead to work-family imbalance (Boyar *et al.*, 2005).

Previous studies have found that FWC (Family to Work Conflict) could create adverse outcomes in work-family domains and cause negative emotional health, lack of physical wellbeing, and unsatisfactory lifestyles (Boyar *et al.*, 2005). Accordingly, FWC can reduce the balance between work and family. For example, an individual's family-related issues spilling over into the work realm can cause that employee to waste time at work and reduce concentration on work-related activities (Hammer *et al.*, 2011). As a result, that individual must realign his/her schedule to meet the opposing demands arising from family-related activities (Bobbio *et al.*, 2022). Further, Bhende *et al.* (2020) found that, when family activities interfere with work, there is a disturbance in objectives, demands, and thoughts on work matters. This gives rise to consequent challenges for employees. Thus, the following hypothesis is advanced based on theoretical reasoning and empirical evidence:

H4: Family to work conflict impacts work-family balance.

The mediating impact of work to family conflict and family to work conflict

When telecommuters work from home, work and family obligations can interfere due to the lack of physical boundaries that telecommuting creates (Clark, 2000). Work-family conflict significantly impacts the development of an imbalance between the work and family domains, according to Frone *et al.* (1992). Since work and family objectives and cultures are unique (Clark, 2000), employees' personal lives may impact their work culture when they work from home. Similarly, the challenges experienced at work may affect family-related activities (Greenhaus *et al.*, 2003). Although working long hours helps complete work-related activities,

it decreases family time (Bobbio *et al.*, 2022). On the other hand, it has been found that working from home causes a balance between the work and family spheres while fulfilling family responsibilities (Dissanayake, 2017). Therefore, balancing family and work obligations while working from home has positive and negative implications. Thus, the following hypotheses are supported by both theoretical reasoning and empirical evidence:

H5:   WFC mediates the relationship between the extent of telecommuting and work-family balance.

H6:   FWC mediates the relationship between the extent of telecommuting and work-family balance.

The moderating impact of mindfulness on the relationships between work-family balance and conflicts from work to family and family to work

Generally, mindfulness is defined as being aware of and paying attention to whatever is occurring in the current moment (thoughts, bodily sensations, surroundings) without judging them (Brown & Ryan, 2003). Mindfulness enables individuals to perceive what is occurring within and around them in the present moment without attaching meaning to what is observed (Shapiro *et al.*, 2006). Nearly everyone has the potential to be aware of and pay attention to the present moment, which is a defining attribute of mindfulness (Brown & Ryan, 2003; Mesmer-magnus *et al.*, 2017). However, individuals differ in their overall propensity or willingness to be mindful; mindfulness is neither a transient nor an individual quality (Brown & Ryan, 2003; Mesmer-magnus *et al.*, 2017). The blending of work and personal life makes it increasingly challenging for many individuals to unplug and disconnect from their work (Toniolo-Barrios & Pitt, 2021). Therefore, individuals performing office work from home may need help to avoid thinking about work after hours and when engaged in family-related activities. Psychological detachment is the ability to disconnect from work-related concerns during family and family-related activities during office time (Firoozabadi *et al.*, 2018). The more a person can separate psychologically from work and family outside work hours, the better he or she will feel, leading to a work-family balance (Park & Nam, 2020). Therefore, employees derive more significant advantages from their family and work time if they can disengage from their office and family work. The following assumptions are therefore offered based on theoretical logic and empirical evidence:

H7:   Mindfulness moderates the relationship between work to family conflict and work-family balance.

H8:   Mindfulness moderates the relationship between family to work conflict and work-family balance.

Telecommuting and work-family balance

Telecommuting has several advantages (Irawanto *et al.*, 2021; Nakrosiene *et al.*, 2019), yet some researchers have highlighted that telecommuting can have detrimental effects on balancing work and family life as well (Novianti & Roz, 2020; Wessels *et al.*, 2019). According to Clark (2000), telecommuting has the potential to blur the boundaries between work and family, which could lead to an increase in issues at family and at work and an imbalance between work and family (Allen *et al.*, 2015; Gajendran & Harrison, 2007; Onyemaechi *et al.*, 2018). However, Auryn & Marion (2022) stated that several family-related problems are resolved due to the new telecommuting system, and several researchers have mentioned (Rau & Hyland, 2002; Sarbu, 2018; Tremblay, 2002) that telecommuting reduces the imbalance between work and family. Therefore, the current study suggests the following hypothesis based on the findings:

> H9: Telecommuting impacts work-family balance.

Work-Family Border Theory (WFBT)

Work-family border theory (WFBT) conceptualizes "Work" and "Family" as two distinct, interactive domains. Clark (2000) explains in the WFBT that there are boundaries between work and family, which must be appropriately managed to achieve a desirable balance. Physical, temporal, and psychological boundaries define the beginning and end of work and family. Psychological borders are rules individuals create to decide when specific thought patterns, behaviours, and emotions are appropriate for one domain but inappropriate for another, allowing them to concentrate on the current, more robust domain (Karassvidou & Glaveli, 2015). When employees work from home, there are no physical borders, and they must manage activities in two domains (Clark, 2000). However, this theory has not explained individual factors related to managing psychological borders, and this omission is a notable gap in this theory.

Conceptual Framework of the Study

Figure 1 depicts the conceptual framework of the study based on the presented theory and hypotheses.

Methodology

The current research is categorized as a single, cross-sectional study in which data is collected and analyzed at a specific point in time. A positivist perspective has been adopted in adhering to the research onion (Saunders *et al.*, 2020). Initially, the study followed a deductive method

to identify the gaps by analyzing current theories and concepts. Thereafter, using the survey method, a self-administered questionnaire was used to collect data from respondents. In performing the research, a sample of 350 women telecommuters in the IT industry in Sri Lanka was collected using a method of purposive sampling, and the data were analyzed using Structural Equation Modelling (SEM) and AMOS 23.0 software.
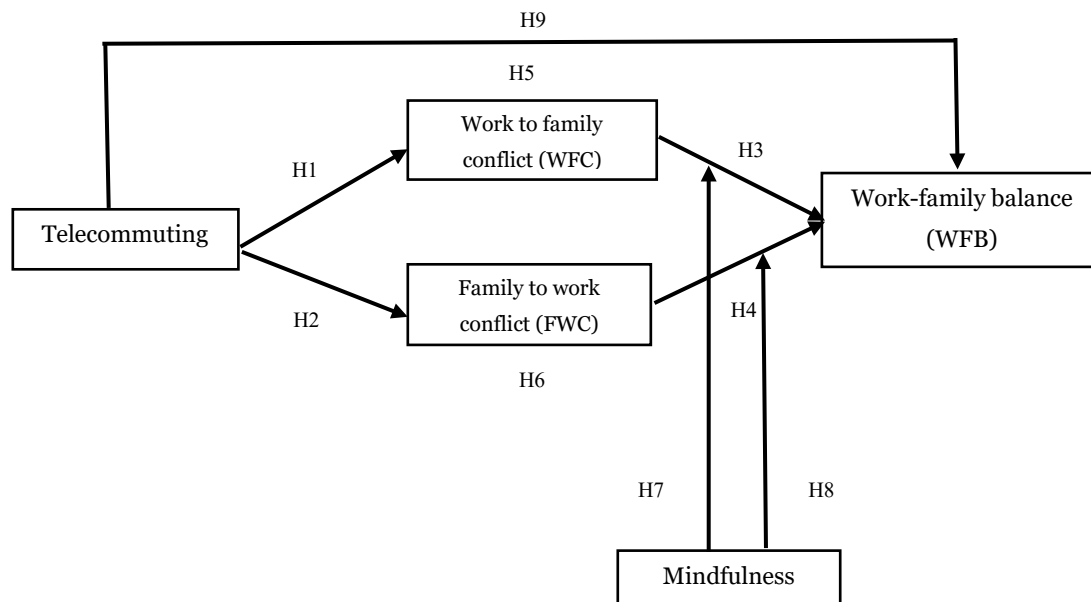
Figure 1. Conceptual framework of the study (Source: Author)

Study data overview

The study was conducted in information technology (IT), and women IT telecommuters were considered for this study, due to the performance gap observed for this study in the IT sector, where telecommuting is already in place. Therefore, the current study focused on women telecommuters in the IT industry. As a result, 380 respondents from the IT industry were selected, and 350 usable questionnaire responses were obtained, resulting in a 92% response rate. The sample comprises 35 (10%) managerial-level teleworkers, 186 (53.10%) non-managerial-level teleworkers, and 129 (36.7%) technical-level teleworkers. Therefore, the majority of the sample consists of non-management-level women teleworkers. Regarding the number of years teleworkers have been employed, 141 (40.3%) have 1-5 years of experience, 145 (41.4%) have 6-10 years of experience, and 64 (18.3%) have 11-15 years of experience.

Measurements

Work-Family Balance (WFB)

The construct of work-family balance was assessed using the most relevant and widely used scale in the literature, which was developed by Carlson *et al.* (2009). Six items were used to measure the construct, which was anchored on a seven-point Likert scale as in the original

scale. Sample items include: "I am able to negotiate and accomplish what is expected of me at work and in my family", "I do a good job of meeting the role expectations of critical people in my work and family life", and "People who are close to me would say that I do a good job of balancing work and family".

The extent of telecommuting

The extent of telecommuting was assessed using an item scale suggested by Vander Elst *et al.* (2017). It was measured using two items: "How many days a week do you, on average, work from home?" and "On a typical day, how many hours do you spend working from home?".

Work to Family Conflict (WFC)

The study used five items anchored on a five-point Likert scale adopted from Netemeyer *et al.* (1996) to measure the construct of work to family conflict. Sample items included: "The demands of my work interfere with my home and family life", "The amount of time my job takes up makes it difficult to fulfil family responsibilities", and "Things I want to do at home do not get done because of the demands my job puts on me".

Family to Work Conflict (FWC)

The construct of family to work was also measured using the scale adopted from Netemeyer *et al.* (1996). The study used five items anchored on a five-point Likert scale. Sample items included: "The demands of my family or spouse/partner interfere with work-related activities", "I have to put off doing things at work because of demands on my time at home", and "Things I want to do at work do not get done because of the demands of my family or spouse/partner".

Mindfulness

The construct of Mindfulness was assessed using the most relevant scale in the literature, which was developed by Brown and Ryan (2003). Fifteen items were used to measure the construct anchored on a seven-point Likert scale, as in the original scale. Sample items included: "I break or spill things because of carelessness, not paying attention, or thinking of something else", "I find it difficult to stay focused on what is happening in the present", and "I tend not to notice feelings of physical tension or discomfort until they grab my attention".

Presentation of data

First, Harman's single-factor test was conducted, and it was confirmed that no common method bias existed in the study. The first factor described by the analysis is 34.85%. Accordingly, the fact that the most significant factor explained less than 50% of the covariance reflected the reality that no single factor reported most of the covariance, and the absence of

common method bias in the current study was concluded. The multivariate assumptions were tested, and the appropriateness of the data for drawing valid conclusions was ensured. Cronbach's alpha was also calculated, and all the scales reported values above 0.8. According to the first-order measurement model, the data fit the model, as shown in Table 1.

Table 1. Indices of Goodness of Fit for the final model of measurement

Absolute fit					Incremental fit			Parsimony adjusted measures		
CMIN/DF	GFI	AGFI	RMR	RMSEA	IF	TLI	CFI	PRATIO	PNFI	PCFI
2.28	0.797	0.771	0.116	0.066	0.946	0.942	0.946	0.927	0.848	0.877

Source: Survey Data

Furthermore, the factor scores, average variance extracted (AVE), composite reliability (CR), and correlation versus square root of AVE were calculated and analyzed to establish the convergent and discriminant validities. The results of the descriptive statistics, reliability, and validity tests are given in Tables 2 and 3.

Table 2. Descriptive Statistics of the Variables of the Study

Variable	Mean	Standard Deviation	Cronbach's Alpha	CR	AVE
WFC	3.118	1.079	0.932	0.934	0.738
FWC	3.138	0.833	0.943	0.951	0.797
WFB	3.738	1.772	0.977	0.978	0.880
Mindfulness	3.715	1.908	0.991	0.991	0.881

Source: Survey Data

Table 3: Correlation Matrix along with evidence for discriminant validity

Variables	WFC	FWC	WFB	M
WFC	0.738			
FWC	0.558	0.797		
WFB	0.880	0.591	0.880	
Mindfulness	0.764	0.520	0.817	0.881

Source: Survey Data

According to Saunders *et al.* (2020), the AVE for all constructs should exceed the SMC (Simple Matching Coefficient) between the construct and any other recognized discriminant validity. As indicated in Table 2, this criterion was used to assess the discriminant validity of the measures in this study. These findings indicate that the data can be used to run a structural model.

Structural model for direct relationships

Five hypotheses reflect direct relationships: the extent of telecommuting on WFC (H1), the extent of telecommuting on FWC (H2), WFC on WFB (H3), FWC on WFB (H4), and the extent of telecommuting on WFB (H9).

Structural model used to test the direct hypotheses

A structural model, depicted in Figure 2, was created to investigate the direct relationships.
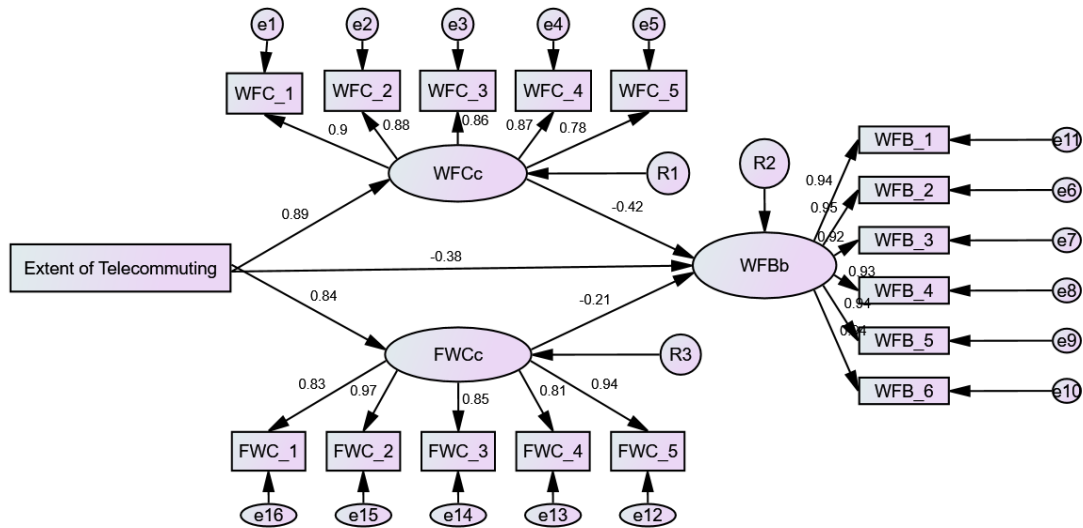
Figure 2. Structural Model for Direct Hypotheses (Source: Survey data)

The statistics associated with the five direct hypotheses of the study are shown in Table 4.

Table 4. Results of the five direct hypotheses

Path	Hypothesis	Beta value	P-value	Decision
Tele → WFB	H9: Telecommuting on work-family balance	-0.382	0.015	Supported
Tele → WFC	H1: Telecommuting on Work to family conflict	0.880	0.012	Supported
Tele → FWC	H2: Telecommuting on Family to work conflict	0.838	0.003	Supported
WFC → WFB	H3: Work to family conflict on work-family balance	-0.424	0.009	Supported
FWC → WFB	H4: Family to work conflict on work-family balance	-0.211	0.004	Supported

Source: Survey Data

The mediating effect of WFC

As shown in Figures 3 and 4, a structural model was developed to examine the mediating effect of WFC and FWC on the relationship between the extent of telecommuting and work-family balance.
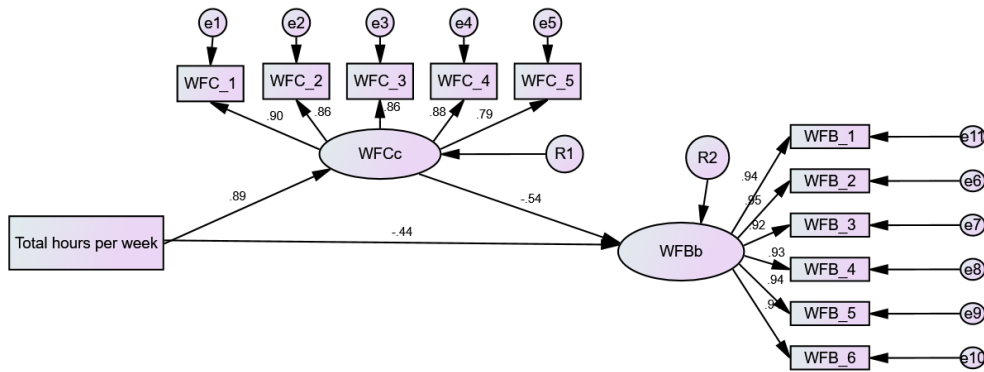
Figure 3. Mediation effect of WFC (Source: Survey data)

The mediating effect of FWC
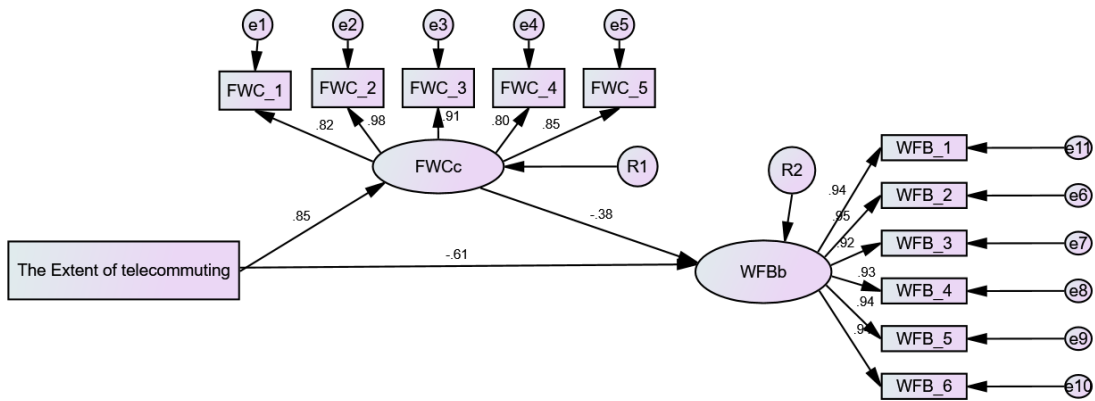
Figure 4. Mediation effect of FWC (Source: Survey data)

Table 5 represents the summarized results of the indirect and direct path analysis reflecting the mediation analysis of WFC and FWC on the relationship between the extent of telecommuting and work-family balance.

Table 5: Bootstrap test for WFC and FWC

Variable	Direct path	Indirect path	Decision	Total effect
WFC				
Beta value	-0.444	-0.483	Partial mediation	Direct effect + Indirect effect (-0.927)
P value	0.007	0.010		
Decision	Accepted (p<0.1)	Accepted (p<0.1)		
FWC				
Beta value	-0.606	-0.321	Partial mediation	Direct effect + Indirect effect (-0.927)
P value	0.013	0.008		
Decision	Accepted (p<0.1)	Accepted (p<0.1)		

Source: Survey Data.

Moderating impact of mindfulness

As shown in Figure 5, a structural model was developed to examine the moderating impact of mindfulness on the relationship between WFC and work-family balance.
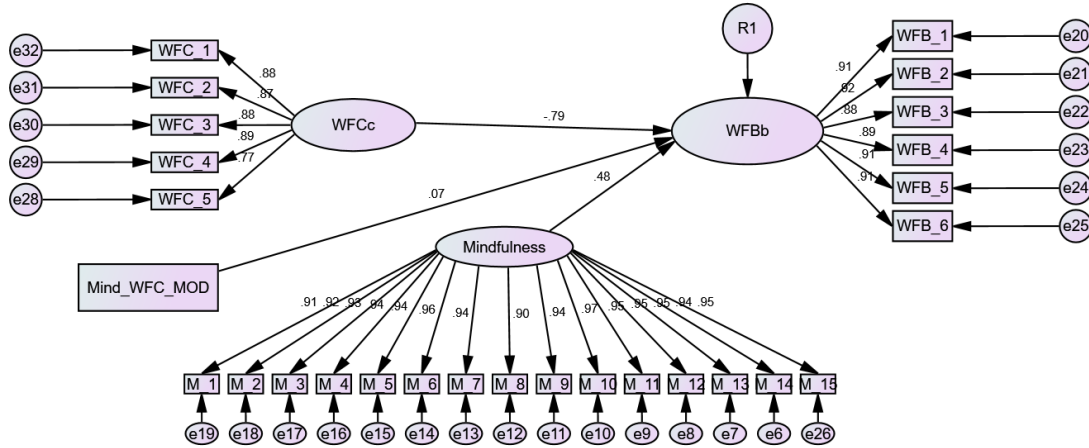
Figure 5. The moderating impact of Mindfulness on WFC and WFB (Source: Survey data)

As depicted in Figure 6, a structural model was developed to examine the moderating impact of mindfulness on the relationship between FWC and work-family balance
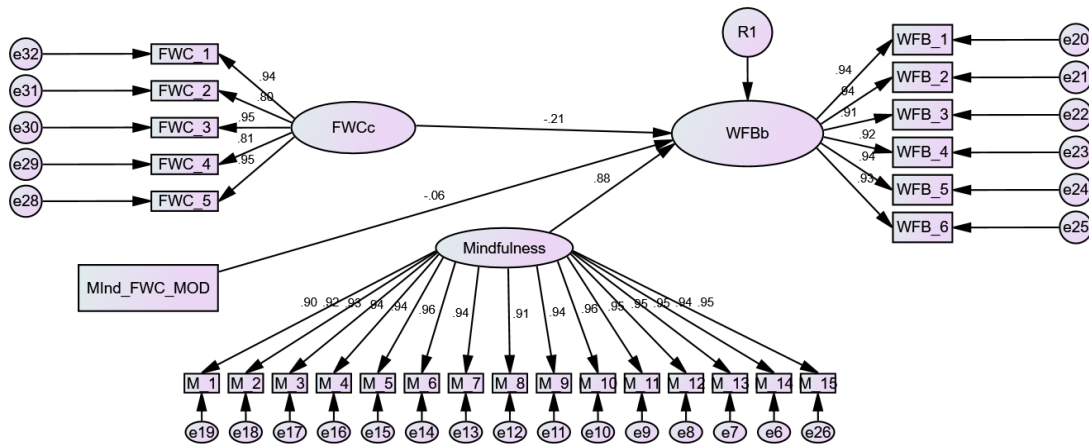
Figure 6: The moderating impact of Mindfulness on FWC and WFB (Source: Survey data)

The results of the bootstrap analysis for the trait of mindfulness with the work-family balance and conflicts from work to family and family to work are presented in Table 6.

Table 6. Summary of Bootstrap Test for Mindfulness

Path	Beta Value	P–value	Decision
Mindfulness moderates the relationship between WFC and WFB.	0.073	0.004	(P<0.1) Accepted
Mindfulness moderates the relationship between FWC and WFB	-0.064	0.010	(P<0.1) Accepted

Source: Survey Data.

Discussion

The findings of the current study reflect that, when working from home, there is an impact on women telecommuters' WFB. According to the WFBT, telecommuting creates WFC and FWC due to the absence of physical boundaries which separate the work and family domains (Voydanoff, 2005). Compared to men, women telecommuters confront difficulties balancing work and family responsibilities. Despite the fact that telecommuting is a beneficial concept (Rau & Hyland, 2002; Tremblay, 2002), it has been discovered that its lack of physical boundaries presents some disadvantages. However, a strong effect could be observed from mindfulness on the relationship between WFC and WFB. Also, it has been identified that mindfulness impacts the relationship between FWC and WFB. This implies that the impact of mindfulness on WFB could be explained by referring to both WFC and FWC and that there is a substantial impact of mindfulness on reducing the work-family imbalance of women telecommuters. This is consistent with previous claims (Toniolo-Barrios & Pitt, 2021) that mindfulness influences the balancing of work and family life during telecommuting. This is further confirmed by prior research indicating that mindful employees can effectively balance work and family domains (Allen & Kiburz, 2012; Toniolo-Barrios & Pitt, 2021) by mitigating conflicts between work and family (Voydanoff, 2005).

Theoretical implications

This study makes substantial theoretical contributions in several ways. First, the study identified the personal factors that affect the management of the psychological borders of telecommuters by examining the impact of mindfulness on WFB, which was identified as the gap in the WFBT (Clark, 2000). Accordingly, to fill in the gap, this study proposes mindfulness as a personal trait that facilitates work in the telecommuting field without harming the originality of the theory. This study contributed to the literature on telecommuting empirically by incorporating mindfulness as a moderating variable.

Consistent with the main theoretical contribution, the present study has determined that WFC and FWC mediate the relationship between telecommuting and WFB. The mediating effect contributes to the theory by validating the possibility of emerging WFCs when women are

engaged in working from home. However, available researches have been confined to examining the bi-directional nature of work-family conflict in relation to its impact on telecommuting, and this study has primarily focused on the unidirectional form of conflict (Golden *et al.* 2006; Landolfi & Lo, 2020). Since available literature examines the impact of telecommuting on work-life balance and WFB is rarely tested, this study focuses on work-family balance, one of the sub-categories of work-life balance.

Practical implications

Economic growth is based on technology, innovation and, more broadly, knowledge (Rosenberg, 2004). ICT is a key tool in promoting innovation activities, technology diffusion, and knowledge generation within societies. An estimated 4.1 billion people used the Internet in 2019 (N'guessan, 2020). Among them, 83.9% came from developed countries, while only 19.6% came from the least developed countries. When considering Latin America, although there is a sharp increase in usage of ICT, there is still much room for improvement (N'guessan, 2020). Africa also has the lowest Internet usage rate, and Internet penetration is slowly growing. Sri Lanka is firmly and rapidly establishing itself as a reliable ICT service provider (Saleh, 2023). Sri Lanka's ICT workforce is expanding, and the overall strength of the workforce has grown by 51% in the last five years (Sri Lanka Export Development Board, 2023), with an annual growth of 11%. The study's findings will enhance the IT industry, which has already adopted work-from-home or telecommuting.

Further, this study has several implications for stakeholders, including women telecommuters and organizations responsible for professional conduct and other professional organizations. According to the findings, mindfulness is identified as a possible individual factor that influences WFB. As this trait is not innate, but rather honed through training and development, professional organizations that implement telecommuting should recommend extensive personality development for women telecommuters. This requirement is unavoidable, as the number of women in the labour force is rapidly increasing, and this study proposes the significance of training and developing management-related traits in professional disciplines for telecommuters to develop a broader understanding of adapting to new working systems and balancing work and family through the avoidance of conflicts.

Moreover, work-family conflicts are inevitable with telecommuting. Therefore, organisations must establish new policies and procedures in relation to implementing new working systems, as existing policies were formulated decades ago based on the assumption that employees would have unified work schedules and be supervised face-to-face in their workplaces (Kossek *et al.*, 2006).

Limitations and further research avenue

Several limitations have been recognized, including referencing the current study to contextualize the findings. First, time and resource restrictions dictate the approach employed for determining the sample size. Second, the unit of analysis for the present study was women telecommuters. However, upon realizing that the challenge of telecommuting was not exclusive to women but also applicable to both men and women in the IT industry, the unit of analysis for the present study can be expanded to include both genders. Hence, future researchers could examine the impact of telecommuters on employees' work-family balance without considering gender, as opposed to considering women employees solely. Future research could explore the empirical validation of the proposed conceptual framework in various employment settings that exhibit either high femininity or high masculinity. By examining different contexts, researchers can gain a comprehensive understanding of how telecommuting challenges are influenced by gender dynamics and cultural norms.

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Conditions Affecting the Perspective Towards the "Work-From-Home" Setup

Women's Voices in the Philippine Business Process Outsourcing (BPO) Industry

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Abstract: Despite the economic downturn caused by the pandemic, Business Process Outsourcing (BPO) in the Philippine industry is striving to achieve greater gains because they are able to employ 70% of their staff to work from home. However, within this economy that has been helping the country, inequalities are still present, especially in the work from setup in the new normal. It unfortunately highlights the notion that women's contribution to domestic work is greater compared to men. From advancing this position, this study aims to describe the narratives of women BPO agents as they express the surrounding conditions that led to their gendered perceptions of the "work from home" (WFH) setup. The authors use qualitative descriptive design and purposive sampling of fourteen (14) women BPO agents working in Cebu as respondents. The paper uses thematic analysis and concludes that the following are the surrounding conditions affecting the views of women on the WFH setup: (a) The opportunity to do both productive and reproductive work; (b) the significance of the age of the children; (c) the impact of support systems; and the (d) consequences of gender stereotypes.

Keywords: Women, Gender, Perspectives, Work from home setup, BPO Industry

Introduction

Prior to the pandemic, the Philippines was one of the countries whose economies were developing. The "sick man of Asia" title was finally wearing off (Mendoza, 2021). However, when the COVID-19 pandemic hit the country, that was when its economy began to deteriorate. In fact, the month of April 2020 recorded the highest unemployment rate in the country at 17.6% ("Philippines: Workers", 2019). In the year leading up to January 2021, the pandemic wiped out 1.7 million paying jobs (Bird *et al.*, 2021). But despite the economic downturn caused by the pandemic, Business Process Outsourcing (BPO) in the Philippine industry continues to grow because, during tight quarantine periods, BPOs were able to carry on with their operations by employing 70% of their staff to work from home.

In the case of the workforce, there has been a 1.8% increase of Filipino workers in BPO companies from 2019 to 2020. And from these numbers, call centre operations have historically been dominated by women and are one of the only areas where Filipino LGBTQ+ employees may find safe employment. Women account for 71% of workers in the global call centre industry (Hultgren, 2018), which maintains what has been referred to as the "worldwide feminisation of the labour force and employment" (Pineda-Ofreneo, 2005, as cited in Dominggo-Cabarrubias, 2012).

However, within this economy that has been helping the country, inequalities are still present, especially in the work from home setup in the new normal. At home, different roles are assigned to each family member, particularly the mother and the father, and along with these are tasks that they are responsible for. At the height of the Covid-19 pandemic, people were restricted from going outside their houses and women had to be burdened with multiple, time-consuming responsibilities and obligations, especially when institutions like schools, child-care services, and so on have also closed down. For the longest period, women have had to bear a disproportionate share of the load of parenting and household work, which has consequently made gender inequalities surface at home and has widened the gender gap between men and women (Feng & Savani, 2020). Moreover, according to the Asian Development Bank (2013), there is a significant gender gap in domestic work, with women bearing a greater share of the burden of caregiving and home duties than men. In the Philippines, women take care of the children 84% of the time that is spent at home.

As for the case of the BPO industry, despite the fact that both men and women experience the same stressful demands and environment at work, both may not suffer the same consequences. The nature of work of the BPO industry, which includes demanding jobs and uncertain working schedules, certainly affects women's traditional duties as caregivers at home and division of labour in terms of gender in the household (Dominggo-Cabarrubias,

2012), as well as social responsibilities and expectations. Furthermore, because being in customer service requires interaction, it can be at times draining. In fact, despite whatever private matters they may hold, employees are expected to maintain a pleasant and enthusiastic demeanour when dealing with clients (Pico, 2006). As a result, these employees eventually become disconnected, sceptical, and their sense of accomplishment declines. These characteristics have an impact on the personal and family life of employed women. With women being expected to be loving and compassionate, burnout and stress from the workplace can alter that disposition. On the other hand, the work-from-home setup of BPO agents necessitates a stationary setup, which requires some mobility around the house. In this work setup, women have to juggle work and homemaking tasks, while casually and briefly leaving their work stations to respond to the demands of their homes.

Studies like Dominggo-Cabarrubias (2012) and Pico (2006) showed the nature of the BPO industry and discussed its effects on working married women and their domestic responsibilities, demonstrating that gender issues are also present in the BPO industry. Mudaliar (2018) further supported this idea by mentioning that married women suffer additional restrictions on work because of their home responsibilities, which married men can typically escape from and which allow men to leave at reasonable hours. Because they must meet the needs of their husbands or children during the day, which wears them out, women who work night shifts frequently complain of sleep issues. These studies, however, only touched on the surface of these issues and did not go into detail about the effects or gendered impact of call centre work on women and the consequences of such work on gender relations and gender division of labour, specifically in the domestic sphere; hence, a need for more in-depth research that incorporates the experiences of women in the work from home setup in relation to their call centre jobs. Knowledge of the perceptions of BPO agents, particularly women, on work-from-home (WFH) is significant in the development of WFH practices regarding gender roles and for inclusivity in the policy-making process. In order to mitigate the gender disparity issues faced in this setup, there is a need to find out the lived experiences of the target population. Thus, the researchers aimed to answer the question:

> *What were the expressed surrounding conditions that led to the perceptions of the women BPO agents on the "work-from-home" setup?*

Methodology

Research design

In seeking to describe the BPO agents' experiences with the work from home setup, this research utilised a qualitative descriptive design. In the social sciences, the qualitative research method was designed to allow researchers to explore social and cultural phenomena

by observing people's feelings, thoughts, behaviours, and beliefs (Myers, 1997). The research deals with human interaction and perspectives; hence, the use of qualitative methods is appropriate. Additionally, the purpose of qualitative descriptive studies is a full description, in daily language, of specific occurrences experienced by individuals or groups of individuals.

Research environment

This study was conducted in the Philippines wherein the BPO industry is one of the biggest contributors to its economy. It was conducted in the Visayas Region, specifically in Cebu. The BPO industry in Cebu is one of the key employment generators with the highest job openings in the region, with a 19% increase in hiring in 2019 ("Cebu BPO", 2019). Cebu City has a well-established IT-BPO foothold, with 24 PEZA-accredited IT Centres and four IT Parks (KMC Savills, 2019).

Figure 1. Map of the Philippines highlighting the Visayas Region

Research participants

The participants for this study were women BPO agents in the Philippines. In this study, the researchers used the purposive sampling method to select the participants. Purposive sampling is when the researchers choose people purposefully because they know the target participants have the attributes needed for the study (DeCarlo, 2018). The participants of this study were women BPO agents taking a lead in both work and household duties who were any of the following – mothers that may or may not be married in status; married but childless as they may also have duties to their husbands; solo parents responsible for their children; single women taking care of the whole immediate family; and

- has experienced working in an office setup before the pandemic for at least six months; and

- has experienced working from home setup during the pandemic for at least six months.

At this level, they were expected to have gained enough experiences to allow them to reflect easily on those experiences, particularly gender roles that are present in the household which may affect BPO agents' preference for their work setup.

In qualitative descriptive research, it is important to consider the sample size in order to acquire enough collected data to reach the objective of the study (Ritchie *et al.*, 2014). Instead of relying on data saturation in measuring the sample size appropriate for the research, it is preferable to focus on the concept of "information power" to determine the number of participants. Ritchie *et al.* (2014) recommend focusing on the amount of information in the data collected that are relevant to the study, rather than to the number of participants. The average range of sample size by different qualitative descriptive research is between 11-20 participants (Kim *et al.*, 2016). The first few participants recommended their co-workers to be invited as participants in the study, which helped the researchers reach the target number. Some of the individuals approached by the researchers declined to participate in the study due to schedule conflicts and unavailability. The final number of respondents is fourteen (14), which has given the research sufficient information and data to be analyzed.

Research instrument

This study used a semi-structured interview to gather data on the experiences of women BPO agents in the work from home setup. Interviews are also recognised as the most effective method for acquiring and exploring experiential narrative material that may be used to generate a better and deeper understanding of a human phenomenon. Moreover, semi-structured interview is a data collection method in which questions prepared by the researcher are open-ended and the interview flow is based on how the participant responds (DeCarlo, 2018). The questions consistently asked to the participants particularly seek their views and narrations on their experiences as BPO agents. The following are the research questions:

- Can you describe in detail your work/experience as a BPO agent in the WFH setup?
- How is working from home beneficial for you as a woman?
- What are the disadvantages of WFH for you?
- Do others have expectations from you as a woman or you yourself put on the pressure of being the breadwinner while fulfilling your role as a mother, wife, and/or daughter?
- What is your preferred setup? Work from home or work on site? Why?

Data gathering procedure

Mode of administration. Informed consent forms were provided for the respondents to read and attach their e-signatures. Upon gathering the desired number of respondents, the researchers and participants had an in-depth individual interview through Google Meet. In

this interview, the respondents were asked open-ended questions and further questions depending on the given answers.

Transcription. The interviews were recorded for the process of transcribing. However, visual information and utterances are not necessary for data interpretation. The interviews were encoded and analysed in the language spoken by the respondents so as to not lose their meaning. Parts of the interview to be quoted are translated to English, as it is the language of the study.

Data analysis

Since this study's goal is to comprehend and describe the phenomenon and lived experiences of BPO agents, the researchers used the thematic analysis method. Braun and Clarke (2006) describe thematic analysis as a tool for analysing qualitative data that involves looking through a collection of data to determine, examine, and document recurring patterns. This process as outlined by Braun and Clarke consists of six steps: first, is to familiarise oneself with the data gathered; second, generate initial codes; third, search for a common theme with those codes; fourth, review the formulated themes; fifth, define and name the themes; sixth, interpret the data and produce the final report (Braun & Clarke, 2006).
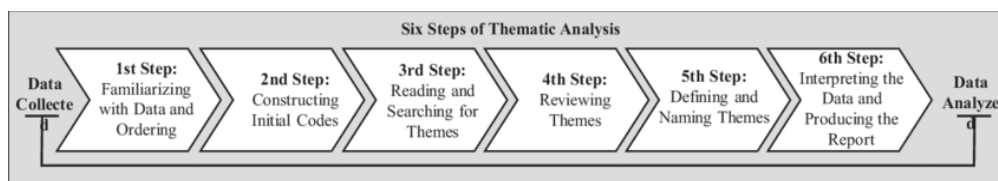
Figure 2. Thematic analysis processes (adapted from Braun & Clarke, 2006)

In the data analysis, researchers immersed themselves in the narratives given by the respondents in order to reach a comprehension of the data gathered.

1st step: The researchers did the transcription, converting audio to text. Consequently, the researchers read and re-read the data, while noting any initial analytic observations and impressions.

2nd step: The researchers began to systematically organise the data, followed by constructing initial codes. The coding process breaks down a large amount of data from the online interview into relevant data extracts. This was done by breaking down the data into discrete excerpts.

3rd step: The examined codes made into categories were then fitted together to make into a theme.

4th step: The researchers questioned whether the candidate themes suited the coded data and overall dataset. When the data did not sufficiently support the themes, the researchers modified and refined the names of the candidate themes.

5th step: The researchers conducted and wrote an in-depth analysis of each theme to determine its importance. This included defining each theme and discerning its connection to the full dataset.

6th step: The researchers compiled the analytic narrative and concise data extracts to provide the reader with a cohesive and engaging story about the data and to contextualise it in connection to existing studies.

The data analysis was done through the mentioned method. Also, experts validated the interview guide being utilised by the researchers. The data analysis was reviewed by the same set of experts for validity purposes.

Results and Discussions

The overview results are presented in this part of the chapter. To analyse the data acquired from the respondents, the researchers used the thematic analysis method. The researchers organised the emergent themes following the study's statement of the problem: Conditions Affecting the Views of Women on the WFH setup.

The codes, categories, and themes are listed in Table 1. The codes are derived from the respondents' significant statements that they answered during the online interview, while the categories were the common codes. Subsequently, the themes are then generated from the categories of the same essence.

Conditions affecting the views of women on the WFH setup

While the shift to work from home setup results in the diverse views of the women BPO agents, there are underlying conditions that affect such perceptions.

The emergent themes for this are as follows: (a) The opportunity to do both productive and reproductive work; (b) the significance of the age of the children; (c) the impact of support systems; and (d) the consequences of gender stereotypes.

Code	Category	Theme
It is the nature of women to not depend on their partners. Also, the present situation calls for both partners to work for one is not enough.	Women work because they believe that the income of their partner alone is not enough to sustain the family.	**The opportunity to do both productive work and reproductive work**
It is the nature of women to have the initiative to do household responsibilities-/unpaid work.	Women work because they believe that it is in their nature to provide for their child. So,	

Code	Category	Theme
It is the nature of a woman to take care of her child. It is the norm for mums to do everything for their child.	they chose to work and at the same time take care of their family.	
For the respondent, it is her utmost priority to provide for her child. Also, the insufficient income of her partner pushed her to work.		
For the respondent, practicality wise, the income of one of the partners is not enough. She also wants to be able to provide for her needs aside for her child.		
Preschooler (3-5 years old) tends to call the attention of their mothers even during work in the WFH setup.	The younger the child, the more time it needs tending. The older the child, the more it is able to understand their mother's situation.	**The significance of the age of their children**
Grade schooler (5-12 years old) understands the situation of mothers in the work from home setup and can be trusted by their mothers; and takes the role of looking out for their siblings.		
Lesser responsibilities at home and as a parent because the child is old enough to be assigned tasks and take care of himself.		
The respondent has her partner to do most of the household responsibilities.	Living with other family members, such as the partner or in-laws, reduces the mother's household responsibilities.	**Impact of support systems**
The respondent receives support from her partner in terms of taking care of their children.		
The respondent is living with in-laws, and her mother-in-law is doing most of the food preparation.		

Code	Category	Theme
Despite having nannies, mothers are still worried about their children's welfare. They think that they are the best person to take care of their own children.	Having also a nanny does not take away the mother's intuition or innate sense of their child's needs.	
Respondent has more tasks than her husband as it is typical in the family that the woman does more housework than the man.	Women accept and acknowledge the idea that they should have more household chores because it is the norm.	**Consequences of gender stereotypes**
Respondent is subjected to more duties as she is the mother.		
Respondent states that men are not domesticated.		

1. The Opportunity to Do Both Productive and Reproductive Work

The work from home setup allows women the opportunity to do both productive and reproductive work, which greatly affects their perception, especially with the rise in living conditions following the rise in inflation. This is the case of the Respondent KF when she revealed:

> "Nature na siguro na gyud nato mga babae na dili wala lang ta gasalig sa atong partner gali. Pwede man gyud no ang partner ra ang motrabaho… But sa panahon man gud karon lisod kaayo if kuan usa ra ang mag work." *(It is natural for women to not depend on their partner. It could be that only the partner works but in present times, it is difficult if only one is working.)*

During the interview, Respondent KF started the discussion by highlighting that there are no expectations on her coming from her family or partner; no one forced her to work, but it is her choice to provide for her family, especially since she believes that the income of her partner alone is not enough to sustain the family. She even admitted that she enjoys having this dual responsibility because it allows her to provide for her family. She further discussed that it is not only natural for a woman not to depend on her partner financially but also with regard to unpaid responsibility, as she added that:

> " … dili raman sad siguro about sa trabaho kanang about anang kanang mangita gyud ug trabaho bisan sa balay kuan na gyud siguro na sa babae nga kanang kusa na gani tang molihok dili na angay istoryaan" *(It may not only be about work but also about finding work to do even at home – we act on our own without being told to do so.)*

This is the same case of the Respondent EC when she answered:

> "Syempre ang kanang imohang role pagka mama, natural raman na siya. Normal rana nimo ba nga buhaton nimo tanan paras imo anak. Wala man sad ko ingon nga nagpabaya." *(Of course, your role as a mother is natural. It is normal for you to do everything for your child. I am also not neglectful.)*

Being a single mum, Respondent EC believes that it is her sole responsibility to provide for her child on top of her responsibility to also provide for her family. Consequently, she believes that it is expected of her to do everything for her child, including nursing and earning money for her child's needs. But despite this, she similarly revealed that she feels happy and satisfied instead of feeling burdened doing both unpaid work and paid work, when she said that:

> "wala raman ko naka feel ug burden. Kay syempre, main reason ngano nanarbaho ka is because of family. Happy ra pod ko nga makaprovide ko nila." *(I didn't feel a burden at all. Because of course, the main reason why you work is because of family. I'm just happy that I can provide for them.)*

Such is opposite to the study conducted by Farre *et al.* (2020) in Spain. The study found that childcare and housework was increased for both genders, but women, particularly mothers, experienced the increased burden. Similarly, Ramani *et al.* (2022) stressed that married working women have an additional burden because, while working remotely, they must simultaneously do family duties and be productive at work. With the difference between the study of Farre *et al.* (2020) and Ramani *et al.* (2022) and the researchers' findings in this study, it is important to take note that the former did not specifically study the BPO industry. What makes the BPO industry unique is that the work from home setup that it offers takes out a feeling of anxiety. Despite still having to face both productive and reproductive work at the same time, such a setup allows a worker to be in an environment wherein they are comfortable and at ease – i.e., being with their families or the reasons why they are working hard. In turn, this boosts their productivity.

Furthermore, even before the pandemic, unpaid work was perceived as a responsibility for women. Gender gaps in unpaid work are seen all around the world. As such, women spend, on average, two to ten times as much time as males doing unpaid chores (Ferrant *et al.*, 2014). This, however, did not change much with the pandemic and with the work from home setup. A paper by Andrew *et al.* (2020), as cited in Seedat & Rondon (2021), shows that gender inequalities in the pandemic have extended to childcare, with mothers providing a greater proportion and significantly more time to childcare and housework than their male partners. Thus, with unpaid responsibility, on top of the paid responsibility that women carry, the work from home setup eases their burden, as it allows them to work on both responsibilities at the same place (home), or, at times, even simultaneously.

Hence, the emergent theme, the opportunity to do both productive and reproductive work, implies that the work from home setup, particularly that of the BPO industry, allows a woman to generate income aside from her partner to provide for their child's needs, and, at the same time, be a mum and take care of the family.

2. The Significance of the Age of the Children

Generally, children are assumed to play a significant role in mother's experience in the work from home setup, but in this study, the age of children, in particular, emerged as a theme. Respondent DM illustrates the importance of age, particularly the age of the children in the situation of work from home mothers. She claimed:

> "There are numerous times when my youngest … she's still like 5 years old pajud sya ba, baby pajud sya, ing-ing kayo. So, while naa jud koy call, mag hilak hilak. Nya dili ka makatagad dayon kay you're in a call man. Nya madunggan pa jud usahay." *(There are numerous times when my youngest … she's still like 5 years old, she's still a baby, very whiny. So, while I have a call, she cries. You can't pay attention right away because you're on a call. The cries can sometimes be heard during the call.)*

Participant DM describes that preschoolers (3-5 years old) tend to call upon the attention of their mothers even during work in a work from home setup. Children at this age are oblivious in terms of work arrangements and they assume their mothers can cater to them all the time, since they see them at home, and not in the office. With her other child, who is 9 years old, Participant DM experienced a different situation:

> "Kay ang akoang eldest, makasabot raman sya nga dili jud ko samukon." *(Because my eldest, he understands that I should not be disturbed.)*

In this case, Participant DM illustrates that grade schoolers (5-12 years old) understand the situation of mothers in the work from home setup. This supports the idea that grade schoolers can be trusted by their mothers and take the role of looking out for their siblings when mothers are at work. In addition, Participant BG claims that her child is not an inconvenience because she is almost 18 years old. She revealed:

> "She's very old na. She's almost 18. So, she's not an inconvenience when I'm working from home. Actually, she sometimes helps me when I have to do bathroom breaks. She helps me checking my monitor if I have … someone is calling for me."

Also, Respondent HJ, a mother of a 13-year-old, explained that her son is able to do chores such as cooking rice and simple dishes, and sweeping the floor. She further claimed that her son is already big enough not to need much care. She answered:

> "Dili naman sya atimnanonon kay matured na sya mag hunahuna. Kanang wala ra, pasagdan raman na nako siya, dili nako mag sigeg kuan niya mandar man kay kaybaw naman sya unsay iyang buhatonon gani." *(He does not need much care and attention*

because he is mature. That's all, I'll just let him be, I don't always order him to do things because he already knows what he is assigned to do.)

With this, it is understood that the age of the child matters in seeing if a child is an inconvenience (i.e., an interruption in the work from home setup) or a help to a working mother in the work from home setup. Since the start of the coronavirus outbreak, parents who work remotely and have children under the age of 18 have reported experiencing difficulties finishing work without interruptions (Schaeffer, 2022). Igielnik (2021) reported similar findings in which it is said that responsibilities required for taking care of a child during working time vary depending on the age of the child taken care of at home. It found that working-from-home parents who have children whose age is around preschool or younger are more likely to report that they have childcare obligations while doing work, compared to those parents with school-aged children. Furthermore, the same study (Igielnik, 2021) found that mothers are about twice as likely as fathers to report they have a lot of these responsibilities. This shows that mothers take up more responsibility regarding childcare than fathers. In another study, it is revealed that in the work from home setup, those who have and infants at home were noted to be less productive, possibly as a result of the constant attention that infants need (cited in Awada *et al.*, 2021). On the other hand, having a teenager at home had no influence on the work of parents, as they are capable of helping with household chores and are more independent, and did not add to any potential work-life conflicts when working from home (cited in Awada *et al.*, 2021).

3. Impact of Support Systems

Working from home led women to have more close contact with the people they are living with at home. Different household setups were exhibited by the respective participants, wherein some of them are living with partners, have children and living with their partner/husband, with in-laws, or with hired nannies. This has a significant effect on the perspective of women in performing their roles and duties at home, for the reason that additional assistance and support, or even pressure, would be experienced.

Women who are living with partners feel the lessening of burden and responsibilities due to the initiative of their partners to do the chores. This is evident for Respondent ID who is living with a partner but does not have a child. She expressed how her partner takes care of cooking, and other chores as she pointed out that she does not have problems with her household responsibilities at home. She explained:

> "My partner does like almost everything sa household I don't even need to. Akong buhaton kay maligo mokaon. I don't have any problems with household responsibilities and such. Because I don't even do it anymore for myself." *(My partner does like almost everything in the household; I don't even need to. What I do is take a*

shower and eat. I don't have any problems with household responsibilities and such. Because I don't even do it anymore for myself.)

Participants who do not have children are more likely to have received support from their partners in terms of the household responsibilities. There are inclinations for them to continue taking care of their own needs or distributing the work evenly. The underlying implication is that women are expected to perform household duties at various periods in their narratives. Women are supposed to handle the housework, but males help out instead for a variety of reasons, including the fact that their work is different in extent. Women view this behaviour of men as a fortunate event that does not frequently happen.

For women who have children, receiving support from their partner also reduces their burdens. For the case of Respondent GC, whenever her children need something while she's at work, her husband is there to assist the children. She narrated:

> "It doesn't mean na ako ra jd sa balay, naa man ilang papa pud for example managayo silag unsa or na unsa ba dira akong anak – gigutom, kailangan mag luto. So okay rako kay naa man ilahang papa." *(It doesn't mean that I'm the only one at home, their father is also there; for example they ask for something or if there's something that happened to my child - he's hungry, cooking is needed. So, it's okay because their father is there.)*

The assistance or support women receive from men is considered as an unexpected, fortunate situation, instead of looking at it as the natural arrangement it should be. As shown from the experience of Respondent GC, men take over taking care of the children when she goes to work.

Participant DM is living with her husband and in-laws. This setup caused pressure towards the participant. Mothers worry about what their in-laws would say if they do not perform their expected roles, since they are present in the house. She said:

> "We are living dependently with our parents, particularly with my in-laws … kay di baya tanan pareha ug kaagi so there's the pressure… but ikaw man gud ang nakipuyo, so dijud na nato makalikayan nga ah unsa gahay ikaingon sa parents sakong partner." *(We are living dependently with our parents, particularly with my in-laws … because not everyone is going through the same thing so there's the pressure… but since you are the one who is living with others, we couldn't avoid thinking about what my partner's parents would say.)*

However, the participant later on clarified that this pressure is not imposed directly by her in-laws but because of the uneasiness that she feels and self-consciousness towards her in-laws. She expressed that her in-laws take care of a lot of household chores at home and that they understand her situation.

The same is the case for Participant BG, who is also living dependently with in-laws, allowing the mother to have a breather and lesser responsibilities from their work and household duties. The in-law took the role of preparing meals. This instance is manifested from her statement:

> "That's the advantage of living with parents, kay ahong mother-in-law, iya tanan sa kitchen." *(That's the advantage of living with parents, because my mother-in-law does all the kitchen work.)*

Although the pressure does not come directly from the in-laws they are living with, women feel this judgment due to the accustomed role of being the household's responsibility as the mother and wife. When these activities are not fully achieved, these women are considered liable.

Respondent AA's case is different from the previous cases. She is living with her husband, who is also working, and they have a 2-year-old baby. They have hired a nanny to assist them with their child's needs. However, despite having a nanny the mother still prefers to give more attention to her child.

> "Akoa mas ma monitor nako ang bata gud. Let's say kung naay nannies, matan aw gyud nako kung okay ba ang bata, if nakakaon ug sakto, gitarong bag pagbantay. Mao ni ang pinakaimportante nako mao nindot sad gyud ang work from home." *(I can monitor the child better. Let's say if there are nannies, I can really see if the child is okay, if he has eaten properly, if he is taken care of properly. This is the most important thing to me, it's really nice to work from home.)*

The participants are living under different types of households that serve as their support system. They also had differing experiences such as living with a responsible partner, or felt pressure around their in-laws, but also had fewer household chores due to the help of their in-laws or partner; or, even for mothers who have decided to hire nannies, they have shown worries about their roles as mothers.

Despite being at home and being able to do their responsibilities as a woman or as a mother, the members of their household serve as their support system. They provide support by doing some of the chores in the household and taking care of the children. Similarly, Ramani *et al.* (2022) stressed that, for working women, physical and emotional support from family members, particularly from their spouses, are important in the remote setup. The study concluded that receiving emotional support from family members as well as physical support, such as sharing in household chores and childcare, motivates them to continue working remotely. Furthermore, it is found that working mothers believed that having supportive family members and employers would help them manage the problems of the work from home setup; otherwise, it would be a double task, especially for those with children under the age of

five (cited in Ramani *et al.*, 2022). However, from the findings of the study, the presence of their support systems does not eliminate their own pressure and expectation to do their duties as a mother, such as taking care of their children. This corresponds to the study of Schulze (2004) that discussed Filipino culture of being family-oriented and that it is in the nature of mothers or women members of the family to take the responsibility of caring for their children. Women, especially wives and mothers, are the ones expected to do this duty, and the support or help that is offered by their family members, in-laws, or nannies are just supplementary in case that they have to work; but it did give significant help to women and made the work from home less of a burden.

4. Consequences of Gender Stereotypes

When the participants were asked about who was more burdened with unpaid work, most of the participants narrated their viewpoints as being affected by the gender stereotypes that they are experiencing as mothers and wives and how these affect their responsibilities in their households.

Respondent BG expressed that, in terms of household duties, men expect and are expected to be less involved. She claimed:

> "Ang mga lalaki man gud, they're not really domesticated." *(Men are really, they're not really domesticated.)*

This implies that the patriarchal system still prevails in our society, with the conception that women are bound to be homemakers. This is in relation to our findings on the support system, that women are expected to do various unpaid work more than men. Similarly, Respondent CF agreed in terms of how women are expected to do more of the household responsibilities, and that mothers would just accept their traditional roles at home. Women accept and acknowledge the idea that they should have more household chores because it is what is typical in the family. She claimed:

> "Mas daghan kog tasks compared to my husband, but typical in a family, na ang laki na dili man gyud sila mag hinlo-hinlo or arrange-arrange. Usually, babae man gud lage magwork sa balay pod." *(I have more tasks compared to my husband, but [it is] typical in a family that the man won't clean or arrange. Usually, women do household work.)*

Most of the participants were being constricted by gender stereotypes. Burdened with paid work responsibilities, they needed to carry the load of unpaid work as well. While men are generally accepted to be less domesticated, the participants' family members and companies expect them to be confined within societal perceptions of being a woman, a mother, and a wife. According to a study by Fisher & Ryan (2021), gender disparities were more apparent during the COVID-19 pandemic, especially with the shift to remote work, and gender role

expectations have not changed, with women still expected to do the majority of domestic and caring responsibilities while also being productive at work. Traditional feminine gender roles dictate that women are social, exhibiting qualities like warmth and compassion, occupying lower status roles in society and acting as caregivers in the household; while men should exhibit strength and dominance, act as the provider outside of the home and assume higher status in society (cited in Fisher & Ryan, 2021).

Unfortunately, most of them became conformist of these notions and will continue to live day by day dictated by these expectations. The conformity is due to the fear of what society will say about how they choose to work instead of fulfilling their responsibilities as women. Men do not receive the same kind of pressure.

Summary of findings

The study of Farre *et al.* (2020) revealed to us that women, particularly mothers, experienced an increase in the amount of both childcare and housework during the pandemic, which led them to feel more burdened. This is in contrast to the data gathered in this study, wherein women expressed that they felt less burdened due to a few conditions that affected their experience in the work from home setup.

Firstly, the opportunity to do both productive work and reproductive work, wherein they can financially provide for their family and take care of their household responsibilities at the same time, makes them happy rather than feeling burdened. Secondly, even though women are expected to do childcare, those who have children who can already comprehend the situation do not feel inconvenienced, since their children can already understand that they are working despite being at home and already know how to do some of the chores. Those who have young children who are unable to comprehend at their young age, on the other hand, may find their work setup disrupted.

Furthermore, the presence of support systems such as partners, in-laws, and nannies ease the challenges of the work from home setup. Finally, there is women's conformity to gender stereotypes, in which they believe that caring for their children and doing household chores are responsibilities that they should fulfill and are not a burden. If they do not work from home, they would still have these household and childcare responsibilities but would be burdened by other factors.

Conclusions

The narratives of women BPO agents in the study express the surrounding conditions that led to their gendered perceptions of the "work-from-home" setup. Furthermore, it is important to note that women prefer the work from home setup because, though women are aware of the

disproportionate share of household responsibilities, they tend to ignore this because they see it as the norm. Most importantly, despite the dual responsibility on top of the challenges women face when working from home, they still perceive the work from home as the best setup, because they feel satisfied and accomplished being able to do both productive and reproductive work.

Recommendations

The following are recommendations for policy and research.

Firstly, the Local Government Unit of Cebu City should pass a resolution for the institutionalization into law of the adoption of adding an option to choose what work setup employees prefer, whether from home, on-site, or hybrid. This is done so that the company will be obligated to give alternatives for their employees.

Secondly, by investigating the experiences of the work-from-home setup, Multinational Corporations (MNCs) and Business Process Outsourcing (BPO) Industries should provide permanent remote job opportunities, incentivise remote workers, and address their needs to boost work performance and maintain business productivity.

Lastly, with the study on the perspectives of women BPO agents on the work-from-home setup being limited in scope, future researchers can pursue the same topic in the manner of:

a. Exploring industries similar to telecommunications that adopt the work-from-home setup to learn the perspectives of women in that industry;
b. Investigating women's perspectives in the BPO industry in cities other than Cebu in the Philippines; and
c. Analysing the case of WFH BPO agents who are single mothers, being part of the disadvantaged sector, to propose solutions that are specially tailored to their needs.

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Financial Literacy, Digital Financial Literacy and Women's Economic Empowerment

Study in West Sumatera, Indonesia

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Abstract: There have many been studies on women's economic empowerment (WEE), most related to financial literacy (FL). However, in this digital era marked by the emergence of Fintech, FL needs to be expanded into digital financial literacy (DFL), in making good financial decisions, especially regarding Fintech products. Hence, the study aims to investigate the influence of DFL and FL on WEE. In this study, 259 female respondents participated. Using the PLS Structural Equation Modelling, the study found that both DFL and FL had a positive and significant effect on WEE. However, further analysis found that DFL affects all 5 dimensions of WEE. Meanwhile, FL only affects 3 components of WEE. In addition, the results also show that DFL has a much greater influence on WEE compared to FL. These results prove that, in this digital era, FL is not sufficient for making good financial decisions, but more understanding is needed, especially related to digital literacy. These results are expected to provide a new understanding of the importance of the DFL variable in the study of WEE, as well as input for the Indonesian government to give more consideration to DFL in making policies related to WEE.

Keywords: Digital Financial Literacy, Financial Literacy, Women's Economic Empowerment, Financial Wellbeing, Developing Countries

Introduction

Issues and discussions about women have always been the focus of attention in many countries. This is due to the significant contribution of the female population to the world population, which are 49.7% of the total (World Bank, 2021). Based on data from the World Bank, there has been an increase in the number of working women in many countries. In the USA, it is recorded that the number of working women has reached 50% of the workers (Ul-Hameed *et al.*, 2018). Meanwhile, in Indonesia, according to Central Statistics Agency (BPS, 2020) data in 2020, the number of women has reached 133.54 million people or 49.42% of the total population, and the number of working women has reached figure 46.1% of total workers.

Attention to women is not only because of their numbers, but also because of the amount of contribution they make to the country's economy. According to Peterson (2019), the contribution of working women is estimated as US$5.87 trillion of global market capitalization. Similarly, in Indonesia, the International Finance Corporation (2016) stated that the contribution of working women to the Gross Domestic Product (GDP) reached 9.1% of total GDP. This value is expected to be even greater if women are given equal opportunities to participate in economics. It was mentioned by Indonesian Finance Minister, Sri Mulyani, that women's contribution to the world's GDP could reach 26% of the world's GDP if they had the same opportunity to participate in the economy (Putri, 2021).

Based on this condition, it is not surprising that in 2016 the World Bank established women's empowerment as one of the basic principles of sustainable development. Various efforts are made by the governments in many countries in the context of empowering women, especially empowerment in the economic sector, as it is a major component of women's empowerment (Kumari *et al.*, 2020).

It cannot be denied that there have many been studies conducted related to the factors influencing women's economic empowerment (see Batra, 2013; Beckmann, 2013; Bhushan, & Medury, 2013; Arrondel & Savignac, 2013; Maheswari & Revathy, 2016; Roy & Jain, 2018; Kumari *et al.*, 2020). Among those studies, the majority of them found financial literacy (FL) as a determinant factor of women's economic empowerment (WEE). According to Golla *et al.* (2011), women are considered to be economically empowered if they have abilities to succeed and advance economically, and have the power to make the right economic decisions. It is mentioned in the literature that, to be economically empowered, of course, they must have adequate knowledge about financial planning and management, known as FL. FL is defined as a person's ability to understand, analyze, manage and communicate personal financial problems (Prasad *et al.*, 2018). FL can also include an individual's understanding of financial products and services in the context of making financial decisions. Therefore, many studies

often link FL and WEE (Haque & Zulfiqar, 2016; Kumari *et al.*, 2020; Lyons, Kass-Hanna *et al.*, 2019; Postmus *et al.*, 2013, Arora, 2016; Batra, 2013; Dash *et al.*, 2016; Deka, 2015; Kabeer, 2012; Siddik, 2017). Postmus *et al.* (2013) examined the relationship between FL and the economic empowerment of women victims of violence, with a sample of 120 victim women. The study found that there is a positive and significant relationship between the level of FL and WEE. In line with this, Haque & Zulfiqar, (2016) also found that FL has a significant influence on the economic empowerment of 300 female workers in Pakistan. Likewise, Kumari *et al.* (2020) also found that the level of FL is the dominant factor in WEE, especially for poor women in Sri Lanka. This is also supported by other studies such as Arora (2016), Batra (2013), Dash *et al.* (2016), Deka (2015), and Siddik (2017).

From the explanation above, it can be seen that the literature agrees that FL is one of the main antecedents of WEE. However, according to Rahayu, Ali *et al.* (2022), Setiawan *et al.* (2020), Morgan *et al.* (2019) and Rahaya, Juita *et al.* (2022), the emergence and development of Fintech (financial technology) has changed the way and behaviour of individuals in making financial decisions. As we know, Fintech has revolutionized the financial services sector substantially (Frost *et al.*, 2019). Fintech does not only offer advantages, such as process speed, cost savings and convenience (Frame *et al.*, 2019), but it also has negative effects by triggering impulsive consumer behaviour and consumerism (Panos & Wilson, 2020). In addition to this, another risk associated with this digital financial product is the risk of fraud, loss of money, scams, and data theft. Hence, to be able to make appropriate financial planning and decisions, a higher level of financial sophistication is required to effectively utilize fintech products and services, and avoid costly fraud and errors (Morgan *et al.*, 2019). This condition shows that, in this digital era, customers need to be accompanied by adequate knowledge and understanding of this digital finance, which is known as digital financial literacy (DFL) (Panos & Wilson, 2020). So, when we discuss women's economic empowerment in this digitalization era, of course, FL is no longer adequate. It is also necessary to consider DFL in this study. Accordingly, in this study, both DFL and FL are considered as antecedent variables of WEE.

Currently, there are still limited studies on DFL. Some of the recent studies that focus on DFL are as follows: Prasad *et al.* (2018); Tony & Desai (2020); Setiawan *et al.* (2020); Rahayu, Ali *et al.* (2022); and Rahaya, Juita *et al.* (2022). Of these studies, two were conducted in India, namely Prasad *et al.* (2018) and Tony & Desai (2020), while the research of Setiawan *et al.* (2020); Rahayu, Ali *et al.* (2022); and Rahaya, Juita *et al.* (2022) was carried out in Indonesia. Research conducted by Prasad *et al.* (2018) focuses more on mapping DFL in households in India. Meanwhile, Tony & Desai (2020) aims to see the relationship between DFL and financial inclusion in general; they found that DFL has an effect on financial inclusion. Meanwhile, Setiawan *et al.* (2020)and Rahayu, Ali *et al.* (2022) examined the relationship

between DFL and people's saving and shopping behaviour in Indonesia, and they found that DFL has influenced saving and shopping behaviour of the millennial generation. Then, Rahaya, Juita et al. (2022) tried to investigate the relationship between DFL and financial behaviour and financial wellbeing, and found there was a relationship between them. Based on these studies, it can be seen that, recently, DFL has been recognized as an important factor in the study of financial behaviour. A good level of DFL can lead an individual to make good financial decisions through avoiding costly risks and errors, and this is certainly an effect that contributes to increasing economic empowerment, especially for women. Due to limited studies related to DFL, especially in a WEE study, this is certainly proposed as a novelty of this research.

Furthermore, based on the report submitted by the United Nations Development Program (UNDP) in 2019, summarized by Xiao (2021), Indonesia's financial literacy level score is still low compared to the average literacy rate of Southeast Asian countries, such as Malaysia, Singapore, and Myanmar. For the DFL score, it is estimated that Indonesia's position is also not much different from the level of FL, which is still below the average. This condition certainly needs more attention from various parties, including academics, especially to study what factors affect the level of DFL and also to measure the level of DFL in Indonesia, especially Indonesian women. Some studies have found that socio-demographic factors, such as age, educational level, marital status, income, and job status, have an important role in affecting FL and DFL (Setiawan et al., 2020; Rahayu, Ali et al., 2022; Nanziri & Olcker, 2019; Wangmo, 2018), Thus, in addition to looking at the influence of FL and DFL on WEE in Indonesia, this study will also examine the effect of socio-demographic factors on FL and DFL of women in Indonesia.

Theoretical Framework

Women's empowerment is mentioned by Kasturirangan (2008) as the process by which a person gains control or power of their own life. This empowerment can include many things from an individual's life, including control or power related to financial or economic problems. So, in this regard, women's economic empowerment (WEE) refers to individual abilities and skills, as well as individual confidence in overcoming problems of their own financial wellbeing (Postmus et al., 2013). Moreover, Kumari et al. (2020) defined WEE as the ability of women to decide for themselves how to spend their resources, and it promotes the prosperity of families and communities. Kumari et al. (2020) also mentioned that WEE has 5 dimensions, namely, the ability to make economic *decisions (*economic decision-making power)*;* control over the use of income and expenditures; leadership in society; control over time allocation; and financial wellbeing. These five dimensions will later be used in this study to measure WEE.

Meanwhile, the majority of earlier researches described the definition of FL from various angles. Prasad *et al.* (2018) revealed FL as a person's ability to understand, analyze, manage and communicate personal financial problems. Then, the Organization for Economic Co-operation and Development (OECD) in Mourougane (2012) defined FL as the ability to make sound financial decisions, improve the financial circumstances of individuals and communities, and engage in the economy. It includes having knowledge of financial concepts and risks as well as the skills, motivation, and confidence to put that knowledge and understanding to use. Additionally, Bhushan & Meduri (2013) explored the possibility of moving towards a formal financial system by empowering people to make decisions through FL. Then, Bonga & Mlambo (2016) argue that a person who is financially literate may manage the nation's formal financial system and significantly boost their community's economy. In this regard, a good level of FL will guide individuals or communities in making financial planning and making good and effective financial decisions, and this will later have an impact on improving the welfare of individuals or communities (OJK, 2017). Therefore, the discussion of WEE has always been associated with discussions about FL (Batra, 2013; Beckmann, 2013; Bhushan & Medury, 2013; Arrondel & Savignac, 2013; Maheswari & Revathy, 2016; Roy & Jain, 2018; Lyons, Grable *et al.*, 2019; Kumari *et al.*, 2020).

With the emergence of Fintech, higher levels of understanding of digital finance are required to improve access to financial services through Fintech, so an individual can effectively use the Fintech product to avoid behavioural problems such as mis-selling, or scams such as phishing, hacking, data leaks, discriminatory treatment and over-borrowing (Morgan *et al.*, 2019). This is well known as DFL. Morgan *et al.* (2019) revealed that DFL consists of 4 dimensions, which are understanding of digital financial products and services, awareness of the risks of digital financial products and services, knowledge of digital financial risk control, and knowledge of consumer rights and redress procedures.

Recent studies conducted by Aggarwal *et al.* (2019) found that digital payments caused overspending behaviour in India. Then, Moenjak *et al.* (2020) also mentioned that Fintech has an impact on financial behaviour/attitude and also financial knowledge. As Fintech offers more sophisticated products to meet needs, so customers need to adjust their knowledge to greater sophistication by experimentation, or learning by doing. In addition, Panos & Wilson (2020) said that the development of Fintech can also damage financial wellbeing by triggering impulsive/spontaneous consumer behaviour when interacting with technology and digital financial platforms. Then, Zheng *et al.* (2019) also provide evidence that mobile users are more likely to engage in impulsive buying behaviour and also associate with the use of payday loans (Garrett *et al.*, 2014). Moreover, Panos and Karkkainen (2019) also found that FL is negatively related to cryptocurrency ownership. The study mentioned that consumers with FL still do not

have an adequate understanding that, in fact, the risks they will receive are greater than the benefits they will get. The dominance of the market by investors who largely lack digital literacy is what is suspected to be the driving factor for the volatility of cryptocurrency. Therefore, in this digital era, DFL is something that is very important to consider. Since DFL has significant influence on financial behaviour (Rahayu, Ali *et al.*, 2022; Setiawan *et al.*, 2020) and financial wellbeing (Rahayu, Juita *et al.*, 2022), in this study DFL is also included as a factor affecting WEE.

Therefore, based on the above explanation, it can be hypothesized that:

Hypothesis 1: the financial literacy of women in Indonesia has a significant influence on women's economic empowerment.

Hypothesis 2: the digital financial literacy of women in Indonesia has a significant influence on women's economic empowerment.

As previously described, in this study the variable of women's economic empowerment consists of 5 dimensions; hence, these hypotheses will be broken down into:

Hypothesis 1a: the financial literacy of women in Indonesia has a significant influence on the ability to make economic decisions.

Hypothesis 1b: the financial literacy of women in Indonesia has a significant influence on the control of the use of income and expenditure.

Hypothesis 1c: the financial literacy of women in Indonesia has a significant influence on leadership in society.

Hypothesis 1d: the financial literacy of women in Indonesia has a significant influence on the control over time allocation.

Hypothesis 1e: the financial literacy of women in Indonesia has a significant influence on financial wellbeing.

Hypothesis 2a: the level of digital financial literacy of women in Indonesia has a significant influence on the ability to make economic decisions.

Hypothesis 2b: the level of digital financial literacy of women in Indonesia has a significant influence on the control of the use of income and expenditure.

Hypothesis 2c: the level of digital financial literacy of women in Indonesia has a significant influence on leadership in society.

Hypothesis 2d: the level of digital financial literacy of women in Indonesia has a significant influence on the control over time allocation.

Hypothesis 2e: the level of digital financial literacy of women in Indonesia has a significant influence on financial wellbeing.

Methodology

This study was conducted in Indonesia region West Sumatera. Currently, based on data from the Indonesian Central Statistics Agency (BPS, 2020), the female population in 2022 has reached 136 million people, including infants, children and the elderly. Since the focus of this study is women's economic empowerment, the targeted respondent is, of course, an adult woman of productive age. For productive age, it is estimated that the number is 50% of the total female population, so the total population in this study is approximately 68 million people. Because of the very large population spread over a very wide area, this study will be limited to women in West Sumatera. This region was chosen because, based on the BPS data, the number of women in this region is quite large, so they are expected to reflect women in Indonesia. In addition to this, West Sumatera is one of the regions in Indonesia that adheres to matrilineal society, which is a society that adheres to a kinship system in which ancestral descent is traced through maternal instead of paternal lines. In this society, women have an important role in making decisions on society. This condition is certainly interesting to be studied.

In this study, the data were gathered by using an online structured questionnaire. Due to the large numbers of population, the snowball sample technique was applied. According to Neuman (2003), this technique is appropriate for a study that has a very large population and also does not have definite figures. In this technique, questionnaires were sent to several women's groups in West Sumatera through social media, and then members of these groups would be asked to distribute the questionnaire to other women's groups they knew. In this way, it is expected that the response rate will be increased. The data were collected from October to December 2022, and, during that time, 334 questionnaires were returned. However, due to incompleteness of data, 75 questionnaires were declined. Hence, in this study there are 259 data points available for further processing.

Then, the data were analyzed with Structural Equation Model (SEM). There are 3 latent variables tested in this study, which are FL, DFL, and WEE. In this regard, FL was measured by 9 indicators, with true and false answers that was adopted from Wise (2013). Then, DFL was measured by 17 indicators, using 5-point Likert scales, starting from 1 (poor/very low) to 5 (excellent/very high). These indicators are used to assess 4 elements, which are understanding of Fintech products, awareness of the risks of Fintech products, knowledge of digital financial risk control, and knowledge of consumer rights and compensation procedures. This instrument is also used by other studies, such as the research of Setiawan *et al.* (2020) and Prasad *et al.* (2018). Meanwhile, in this study, WEE consists of 5 dimensions, which are ability to make economic decisions, control to use income and expenditure,

leadership in society, control to allocate time, and financial wellbeing (Kumari *et al.*, 2020). These 5 dimensions are later to be outlined in 26 questions developed by previous research, such as Postmus *et al.* (2013) and Kumari *et al.* (2020).

Results and Findings

Characteristics of respondents

This study uses 259 samples from West Sumatera. These numbers have met an adequate sample size as suggested by Tabachnick & Fidell (2013), in which "50+8m" (m refers to the number of independent variables) is an adequate sample size. Since the number of independent variables is two, the minimum sample should be 66 samples. Thus, the 259 samples are considered to have met the minimum sample requirements. The respondents participating in this study varied in age, starting from age 15 until 60 years old. These respondents are then classified based on their generation. In this regard, 118 of Z generation, who were born in 1997 to 2012, participated; and they were followed by 78 respondents from generation Y, who were born in 1981–1996; and 63 respondents from generation X, who were born in 1965–1980. Table 1 represents the profile in terms of their generation, marital status, job status, educational level, residential location and income.

Table 1. Respondents' Profiles

Generation	Total	Residential Locations	Total
Generation Z	118	in a Remote Village	8
Generation Y	78	in the Village	40
Generation X	63	in the District Capital	54
Total	259	in the Provincial Capital	157
Job Status		Total	259
Student	105	**Income**	
Not Working	33	Below IDR* 2,000,000	124
Working	121	IDR 2,000,000 to 4,000,000	43
Total	259	IDR 4,000,001 to 6,000,000	28
Education Level		IDR 6,000,001 to 8,000,000	15
Junior High School	9	IDR 8,000,001 to 10,000,000	12
Senior High School	92	More than IDR 10.000.000	37
Diploma I, II, III	6	Total	259
Bachelor/Diploma IV	71	**Marital Status**	
Masters Degree	67	Unmarried	137
Doctoral Degree	14	Married	111
Total	259	Divorced	11

*IDR 14.500 = 1 USD

From all these tables, it can be seen that the respondents who participated in this study varied in terms of their generation, level of education, marital status, employment status, location of residence, and income.

The level of Digital Financial Literacy and Financial Literacy

In order to see the level of DFL and FL of women in Indonesia, the following table presents the average score for DFL and FL.

Table 2. The level of Digital Financial Literacy and Financial Literacy

No.	Description	N	Minimum	Maximum	Mean	Std Deviation
1	DFL Score	259	1.00	5.00	3.83	.672
2	FL Score	259	1.00	9.00	7.15	1.34

Table 2 shows that the average score of DFL of women in West Sumatera is 3.83. Since the average number is in the range 3.40–4.19 (see Alkharusi *et al.*, 2012), it is considered that, on average, the DFL level of the women in West Sumatera is quite good. Meanwhile, the average score of FL for women in West Sumatera is 7.15. It means that, among nine questions related to FL, the women in West Sumatera can answer 7 questions correctly. This figure is, of course, quite satisfying, because the women have been able to answer 77% of the FL questions correctly.

Further, in order to investigate whether the demographic factors such as age, marital status, job status, educational level, residential locations and income have an effect on the FL score and the DFL score, this study calculated the FL and the DFL scores of each group, as presented in Table 3.

Table 3. The Average Score of The DFL and FL

	Average Score				Average Score	
	DFL	**FL**	**Occupation**	**DFL**	**FL**	
Generation			Student	3.92	7.09	
Generation x	3.6	7.22	Not Working	3.47	6.75	
Generation y	3.84	7.18	Working	3.85	7.29	
Generation z	3.95	7.08	**Residential Location**			
Marital Status			In a remote Village	2.60	5.63	
Married	3.64	7.21	In the Village	3.66	6.6	
Unmarried	4.00	7.08	In the District Capital	3.74	6.91	
Divorced	3.57	7.18	In Provincial capitals	3.96	7.45	
Educational level			**Income**			
Junior High School	2.95	5.88	Below IDR. 2,000,000	3.72	6.83	
Senior High School	3.73	6.65	IDR 2,000,000–4,000,000	3.97	7.16	
Diploma I, II, III	3.96	6.5	IDR 4,000,001–6,000,000	4	7.79	
Bachelor/Diploma IV	3.95	7.57	IDR 6,000,001–8,000,000	3.95	7.33	
Masters Degree	3.93	7.58	IDR 8,000,001–10,000,000	3.85	7.33	
Doctoral Degree	3.91	7.58	More than IDR 10.000.000	3.86	7.57	

Table 3 shows that the women in the Z generation tend to report a higher score than the older generation. This contrasts with the FL score, in which the FL scores tend to increase with increasing age. This condition can be explained reasonably. As the DFL reflects a person's ability related to digital products, and the Z generation, who were born in the digital era, of

course have a high ability to adapt to the information technology innovation, so they can easily understand everything related to these digital products. In contrast, FL reflects a person's ability to use their financial skills and knowledge to manage financial resources effectively (Bahonar & Sadrabadi, 2014), and this ability will usually be experienced with age. Therefore, this study shows that the older generation reported a higher score of FL than the younger generation.

In regard to marital status, the data shows that unmarried women tend to report higher scores of DFL than other groups. Divorced women show the lowest result of DFL score. However, for the FL score, the data shows that unmarried women even reported the lowest score of FL compared to married women and divorced women. This condition can be explained in similar way with the previous one. In this study, the unmarried women are dominated mainly by the younger generation (Z generation), which is well known as the digital generation; hence, they tend to have higher capability to deal with digital innovation compared to the older generation. Therefore, it is not surprising that this generation reported the highest score of DFL. In contrast, since the younger generation has limited experience in making financial decisions compared to the older generation, they also have limited knowledge and understanding of FL. So, in this study we found that unmarried and young women reported the lower score of FL than others.

Next, Table 3 also shows that both the DFL and FL scores appear to rise as education levels increase. In this case, the lower levels of education tend to report the lower scores of DFL and FL. This is common, since the education level is strongly related to individual capability and understanding, including literacy.

Furthermore, in association with the job status, this study found that women studying reported a higher score on the DFL score compared with the group of working women and non-working women. However, for the FL score, it is seen that working women have a higher score of FL than other groups. Then, based on residential location, it can be seen in the table that the women who live in an urban area reported the higher level of DFL and FL than the women who live in rural areas. This finding is reasonable, since the women who live in rural areas have limited access to information sources and technology. Thus, they certainly tend to have limited knowledge and understanding of DFL and FL.

In addition, this study found increasing income up to a certain level causes the DFL and FL scores to rise. This condition might happen because those who are at a certain income level tend to feel comfortable with their current position, so that they are no longer trying hard to improve their knowledge and understanding of FL and DFL.

Data analysis

In order to investigate the relationship between the DFL and FL on women's economic empowerment, the Structural Equation Model (SEM) Partial Least Square (PLS) method was applied. As described earlier, there are two main hypotheses, which are to investigate the influence of te DFL on WEE (H1), and the influence of FL on WEE (H2). In order to test the main hypotheses, all of the constructs of DFL and FL were calculated to see the direct effect of both variables on WEE. Table 4 shows the result.

Table 4. Significance of the Direct Relationship between the DFL, FL and WEE Path

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistic (|O/STDEV|)	P Value
Total FL -> Total WEE	0.119	0.116	0.059	2.023	0.044
Total DFL -> Total WEE	0.485	0.482	0.061	8.014	0.000

Based on the data analysis, it is found that the R squared value in this model is 0.285 or 28.5%. As stated by Cohen (1988), with R squared above 26%, the ability to explain exogenous variables to endogenous variables can be classified as a substantial influence; thus, it is indicated that there is substantial influence of DFL and FL on WEE. Furthermore, the result also demonstrated that 11.9% of WEE is represented by FL among women in West Sumatera; and 48.5% of WEE is also represented by DFL among women in West Sumatera. The p value and t statistic also reflect that there are positive and significance influence between DFL and WEE; and between FL and WEE. The table also shows that, among the two variables, FL and DFL, DFL was noticed as the more influential variable on WEE. Therefore, in this study, Hypothesis 1 and Hypothesis 2 were empirically supported by the data.

Further, in this study, several sub-hypotheses were developed with the purpose of determining the most significant dimension of WEE influenced by DFL and FL. Even though DFL consists of 4 dimensions, in order to see the effect of DFL on another variable, in this regard WEE, DFL is considered as one variable and it is not separated based on the dimensions that form it (see Setiawan *et al.*, 2021 and Rahayu. Ali *et al.*, 2022).

Hence, in this study, the influence of DFL and FL on the WEE dimensions are investigated through several steps, which are evaluation of the measurement model, evaluation of the structural model and hypothesis testing. The first step is evaluation of the measurement model, which aimed to test whether the question indicators used to measure variables in this study are valid and reliable. According to Hair *et al.* (2017), factor loading (> 0.4), composite reliability, Cronbach Alpha (>0.6), Average Variance Extracted (>0.5), and Fornell Larcker can be used to indicate whether the measures are valid and reliable. Table 5 shows the result of factor loading, composite reliability, Cronbach Alpha, and Average Variance Extracted after removing 6 indicators that have loading factor below 0.4.

Table 5. Factor Loading, Composite Reliability, Cronbach Alpha and AVE

Variable	Dimension	Indicator	Factor loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
DFL		LKD10	0.647	0.940	0.95	0.51
		LKD11	0.723			
		LKD12	0.774			
		LKD13	0.817			
		LKD14	0.817			
		LKD15	0.716			
		LKD16	0.623			
		LKD17	0.710			
		LKD1	0.700			
		LKD2	0.728			
		LKD3	0.501			
		LKD4	0.473			
		LKD5	0.755			
		LKD6	0.752			
		LKD7	0.767			
		LKD8	0.777			
		LKD9	0.798			
FL		TLK	1.000	1.000	1.00	1.00
Women's Economic Empowerment	Economic decision-making power (WEE1)	YA1	0.824	0.904	0.924	0.637
		YA2	0.876			
		YA3	0.802			
		YA4	0.824			
		YA5	0.784			
		YA6	0.776			
		YA7	0.688			
	Control over the use of income and expenditures (WEE2)	YB1	0.738	0.859	0.892	0.580
		YB3	0.697			
		YB4	0.747			
		YB5	0.819			
		YB6	0.787			
		YB7	0.774			
	Leadership in society (WEE3)	YC1	0.724	0.852	0.893	0.626
		YC2	0.800			
		YC3	0.767			
		YC4	0.806			
		YC5	0.853			
	Control over time allocation (WEE4)	YD1	0.624	0.794	0.842	0.574
		YD2	0.754			
		YD3	0.799			
		YD4	0.837			
	Financial Wellbeing (WEE5)	KK10	0.671	0.848	0.889	0.574
		KK11	0.782			
		KK2	0.766			
		KK4	0.635			
		KK8	0.852			
		KK9	0.816			

From Table 5, it can be seen that all of the indicators used in this study have meet validity and reliability requirements. Therefore, the next step, which is evaluation of the structural model, is processed further. In this stage, PLS bootstrapping is performed. The result can be seen in Table 6.

Table 6. Path Coefficient

	Control over time allocation	Leadership in society	Financial Wellbeing	Control over the use of income and expenditures	Economic decision-making power
FL	0.141	0.029	0.099	0.147	0.145
DFL	0.296	0.286	0.404	0.465	0.279

This path coefficient shows the magnitude of the influence between exogenous variables and endogenous variables. From the table, it can be seen that FL only influences the three dimensions of women's economic empowerment at most of 0.147 or 14.7%. Meanwhile, DFL can influence all of the dimensions between 27% and 46.5%. This condition shows that DFL has a greater influence on women's economic empowerment than FL. From the table, it can also be seen that the influence of each exogenous variable on the endogenous variable is positive. This indicates that any increase in exogenous variables will have an impact on the increase in endogenous variables. Then, in order to evaluate whether the model of this study is fit or not, the goodness of fit test was performed. In this regard, R squared can be used as an indicator. Table 7 shows the R squared values for this research model.

Table 7. R Squared

	R Squared	R Squared Adjusted
Control over time allocation	0.134	0.127
Leadership in society	0.088	0.081
Control over time allocation	0.198	0.192
Control over the use of income and expenditures	0.282	0.276
Economic decision-making power	0.125	0.118

From Table 7, it can be seen that both DFL and FL have the ability to explain change in the dimension of women's economic empowerment variable, varying from the lowest 8.8% (for *leadership in society*) to 28.2% (*for control over the use of income and expenditures*). Therefore, it can be seen that, both DFL and FL have substantial influence on *control over the use of income and expenditures,* and they have moderate influence on *control over time allocation, control over time allocation, economic decision-making power*. However, for *leadership in society*, both variables only have weak influence.

The next step is hypothesis testing result, as presented in Table 8.

Table 8. Hypothesis Testing Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistic (|O/STDEV|)	P Value
FL -> Control over time allocation	0.141	0.144	0.069	2.050	0.041*
FL -> Leadership in society	0.029	0.033	0.065	0.438	0.662
FL-> Financial Wellbeing	0.099	0.100	0.063	1.563	0.119
FL-> Control over the use of income and expenditures	0.147	0.146	0.052	2.804	0.005*
FL-> Economic decision-making power	0.145	0.145	0.062	2.324	0.021*
DFL -> Control over time allocation	0.296	0.310	0.089	3.313	0.001*
DFL-> Leadership in society	0.286	0.296	0.073	3.943	0.000*
DFL-> Financial Wellbeing	0.404	0.413	0.068	5.967	0.000*
DFL-> Control over the use of income and expenditures	0.465	0.467	0.059	7.891	0.000*
DFL-> Economic decision-making power	0.279	0.293	0.082	3.402	0.001*

According to Hair *et al.* (2017), the p value below 0.5 and t statistic above 1.96 indicate that an hypothesis is supported, and vice versa. From Table 8, it can be seen that FL has only positive and significance influence on three dimensions of WEE, which are control over time allocation (O=0.141; t=2.050; p=0.041), control over the use of income (O=0.147; t=2.804; p=0.005) and expenditures and economic decision-making power (O=0.145; t=2.804; p=0.021). Therefore, in this study, the hypotheses H1a, H1d and H1e are supported. On the other side, it can be seen in Table 8 that DFL has positive and significance influence on all WEE dimensions, which are control over time allocation (O=0.296; t=3.313; p=0.001); leadership in society (O=0.286; t=3.943 ; p=0.000); financial wellbeing (O=0.404; t=5.967; p=0.000); control over the use of income and expenditures (O=0.465; t=7.891; p=0.000); and economic decision-making power (O=0.279; t=3.402; p=0.001). It indicates that the hypotheses H2a, H2b, H2c, H2d and H2e are supported.

Analysis and Discussion

The effect of Financial Literacy on Women's Economic Empowerment

This study found that, among the 5 dimensions of WEE, only 3 dimensions were significantly influenced by FL: *control over time allocation*, *control over the use of income and expenditure*, and *economic decision-making power*. Then, among these three dimensions, *control over the use of income and expenditures* is the most influenced by FL, with the highest t value (t value = 2.804) among the others; while *control over time allocation* is found as the least influential dimension of WEE as this dimension has the lowest t value (t value = 2.050). The result implies that FL is an important factor for women in managing their personal finance and also directs them in making decisions especially related to financial decision.

As the p-value is below 0.05 and t statistic below 1.96, this study found that *leadership in society* and *financial wellbeing* are not affected by FL. It appears that, although FL has an important influence on financial management, this research shows that FL does not have a significant influence on leadership in society and financial wellbeing. This could be because, in this digital era, an individual, especially a woman, is not only faced with how to use their abilities and financial understanding in managing their financial resources, but currently they are also faced with various uncertainties that occur due to the impact of the development of digital technology products. Therefore, in the digital era, FL itself is not sufficient without being accompanied by digital skills. This is certainly contrary to the previous research, such as Kumari *et al.* (2020) and Postmus *et al.* (2013), which found that leadership in society and financial wellbeing were influenced by FL.

Despite this study finding that FL influenced only 3 out 5 dimensions of WEE, overall, this study found that FL has a significant relationship with WEE (as presented in Table 4). In this study, it was found that FL has contributed to the change of the whole dimensions of WEE of 11.9%. This finding is certainly in line with previous studies, such as Kumari *et al.* (2020), Singh & Kumar (2017) Arora (2016), Bannier & Schwarz (2018), Haque & Zulfiqar (2016), Lyons, Grable et al. (2019), Postmus *et al.* (2013), Batra (2013), Dash *et al.* (2016), Deka (2015), Kabeer (2015) and Siddik (2017). Most of the previous studies found that FL has a positive influence on women's economic empowerment.

The effect of DFL on Women's Economic Empowerment

Based on the data analysis, this study found that DFL has a positive and significant influence on all of the dimensions of WEE, which are control over time allocation, leadership in society, financial wellbeing, control over the use of income and expenditures, and economic decision-making power. Among the 5 dimensions, *control over the use of income and expenditures* was recognized as the most influential dimension of WEE affected by DFL. It can be seen from the high t value score, which is 7.891, and also the high O value (0.465). It reflects that, for every unit increase in DFL, it is expected that there will be 0.465 increase in *control over the use of income and expenditures*, holding all other variables constant. On the other side, the *control over time allocation* was found as the least influential dimension of WEE, as the respective path coefficient has the lowest t value, which is 3.313. Therefore, it is not surprising that this study found that DFL has positive and significant influence on the overall WEE. This result is in line with previous studies, such as Rahayu, Ali *et al.* (2022) and Setiawan *et al.* (2020), that found that DFL has a positive and significant influence on financial behaviour and financial wellbeing.

Digital FL is a combination of FL and digital literacy. A person with a good level of DFL will certainly have a good understanding of financial planning and management and also have a good understanding and ability related to digital technology. Of course, women with an adequate level of understanding and ability in the field of finance and digital technology will be able to analyze the available financial information so that they can make better economic decisions. As a result, this will also have an impact on improving financial wellbeing. In addition, with a good level of DFL, a woman will have a good level of self-confidence to lead activities in society. In addition, women with a good level of DFL will also often be asked for opinions related to various activities in society. So, it is not surprising that it was found in this study that the level of DFL of women in West Sumatera has a positive and significant influence on women's abilities in making economic decisions, leadership in society, and financial wellbeing.

Furthermore, good DFL will also be able to direct individuals regarding their financial behaviour in spending money, managing individual and family finances, and allocating time. So, it is not surprising that in this study it was found that the level of DFL of women in West Sumatera has a significant influence on the control in the use of income and spending and control over the allocation of time.

Conclusion and Implications

This study specifically confirms that, apart from FL, it turns out that DFL is also a significant factor affecting WEE. Furthermore, it also found that the effect of DFL on WEE outweighs that of FL. These findings indicate that the advancement of digital technology has had an influence not only on the way we undertake activities but also on changing our viewpoint and the way we cope with difficulties, especially related to economic and financial activities. As a result, to live and carry out their tasks in this digital era, individuals must be financially literate and update their abilities and skills in the digital field, known as digital literacy. In this case, FL itself is no longer sufficient to guide individuals in making decisions, especially related to digital finance. Hence, in this era, DFL is something that is important for individuals, including women, to be attained.

This research provides new insights for future researchers in regard to the WEE study. In the digital era, the study of WEE should not only focus on FL, but instead needs to emphasize the importance of DFL. This study also contributes by adding to the number of studies related to DFL. As previously mentioned, there are still limited studies about DFL. The limited number of studies related to DFL will certainly have an impact on the limited amount of our understanding about DFL; although, as was previously explained, in this digital era DFL has become a necessity that must be owned by an individual in order to be able to adapt to this very fast and massive technological change. Thus, the issue of DFL is very relevant and really needs to be discussed and researched further.

In addition, this study also provides insight about the determinant factors of DFL and FL. In this study, it was found that demographic factors, such as age, education level, marital status, job status, residential location, and income, are factors that influence DFL and FL. This finding is expected to be useful in providing input to the government in making policies related to increasing DFL and FL, especially for women in West Sumatera, Indonesia.

Moreover, this study proposes to be an input for the Indonesian government in making policies to strengthen women's economic empowerment. In order to encourage women's economic empowerment, the government needs to pay attention to the level of FL and DFL of women in Indonesia. Although digital financial literacy in this study has been shown to have a greater impact on women's empowerment, on the other hand, the level of digital financial

literacy is lower than financial literacy. This finding should have further implications at the application level for curriculum development and lifelong learning programs starting from the basic level. It is necessary to consider including a discussion of FL, especially DFL, in the curriculum, so that the level of understanding of the women in the millennial generation on this matter can be increased. Aside from designing educational programs and curricula, the government must also create comprehensive policies to increase public literacy awareness, both FL and DFL.

Although this study has contributed to the literature, it cannot be denied that this study has several limitations. First, the respondents in this study come from West Sumatera, an Indonesian region with a matrilineal society. As a result, these findings may solely characterize the situation in this community, so future studies may be conducted with diverse groups of people. In addition, the limited number of participants in this study could affect the generalizability of research results. Therefore, it is hoped that future research should consider a larger area and a larger number of participants.

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Non-Obvious Connections Between Information Literacy and Online Payments

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Abstract: The importance of information literacy in today's digital world is increasingly emphasized. This is particularly evident in the context of using digital financial services. This article aims to investigate whether there is a relationship between information literacy and online payment preferences among a student population and whether there are gender differences in online payment habits. An online survey was conducted among students in Osijek examining information literacy and the types of goods they purchase and pay for through online financial services. Of the 408 respondents, the majority were female (86.27%), who were more likely to buy and pay for clothing, while men were most likely to make payments for particular features of video games. Differences were also found in the tendency to make online payments. Because no obvious linear relationships were found between reported information literacy and other variables, a neural network model with a multilayer perceptron (NN) architecture was developed to classify participants according to their reported information literacy level. The best overall classification accuracy of the NN was 73.17%. The NN and its sensitivity analysis revealed some hidden patterns that can help educational institutions develop information literacy and digital financial literacy programs for their students.

Keywords: information literacy, online shopping, online payments, gender, digital financial literacy

Introduction

The relationship between different types of literacy skills and online purchase intentions and digital payment preferences has been an important topic for some time. Werts ([2008](#)) highlighted information, visual, digital, and media literacy as key 21st century skills. These

skills are considered necessary to prepare the young population for the digital world (Fraillon *et al.*, 2020). Information literacy is important because it is the ability to distinguish relevant from irrelevant information and data (Head & Eisenberg, 2011) in the digital environment, which includes extensive online financial activities and is necessary in daily life. Consequently, it has a positive impact on overall job performance (Al-Azri *et al.*, 2023; Bruce, 1999). Computer literacy or digital literacy is also highlighted in this context and often analysed in combination with information literacy (López *et al.*, 2022). Eurostat, through the Digital Skills Indicator 2.0 (DSI), reports general digital skills composed of "information and data literacy skills, communication and collaboration skills, digital content creation skills, safety skills and problem-solving skills" (Eurostat, 2022, n.p.), which are highest in Iceland, Norway, and Switzerland; and lowest in Romania, Bulgaria, and Poland. Furthermore, Bannier *et al.* (2019) are exploring bitcoin literacy in terms of gender differences, finding women's literacy weaker than in the case of men. Therefore, further research on information literacy and its connection to various digital services is considered useful.

Although it appears that many young people are using digital technologies for their daily activities, including online shopping and digital payments, Beheshti (2012) emphasizes the need to develop their basic information literacy skills. This includes the issue of safety and risks that young people face in digital business activities. Unfortunately, the number of studies addressing the issue of linking information literacy and online activities with financial implications, such as online shopping, online payments, and various financial transactions, is limited. This shortage becomes even more emphasized if gender differences are considered. *The 2018 International Computer and Information Literacy Study* reports gender differences, with female students having higher scores in computer and information literacy than male students, while male students tend to have higher scores in computational thinking (Fraillon *et al.*, 2020). Similarly, numerous studies report gender differences in online purchases and payments (Kanwal *et al.*, 2022; Khaleeli, 2020; Lin & Wang, 2020; Lin *et al.*, 2019; Zhang, 2017; Lin *et al.*, 2017; Nadeem *et al.*, 2015; Gayathiri *et al.*, 2014; Ruane & Wallace, 2013; Chai *et al.*, 2011).

We argue that financial knowledge is not sufficient to enable young people to make decisions about online purchases and online payments in a safe manner, but that a broader level of information literacy is needed in today's digital environment. The literature review found that there is relatively little published research on the relationship between information literacy and women's online shopping and online payments. This problem exists even when gender differences are ignored, as many of the relevant papers were published nearly a decade ago while changes in digital environment are frequent. The importance of this issue is also underscored by the projections that digital payments and eCommerce will continue to grow

(from 2020, as a base year, to 2025, it is expected that digital commerce will grow in Europe by 16.3%, in the US by 15.20%, and in China 11.2% (Zavialova, 2021) and eCommerce from 2022, as a base year, to 2027 in Europe by 15.8%, in the US by 18.3%, and in China by 5.8% (Zavialova, 2022)).

To contribute to this field, we wanted to investigate whether there is a relationship between young people's level of information literacy and the types of goods they tend to buy and pay for online. We also wanted to compare these results with previous findings by other authors and verify whether neural networks can successfully classify individuals with high levels of self-assessed information literacy. Thus, the main goals of this work are:

- to determine respondents' self-assessed information literacy and their frequency of using online payments for various goods and services;
- to investigate whether there is a statistically significant relationship between information literacy and variables related to online payments;
- to attempt to develop a successful neural network model that classifies respondents according to their information literacy, based on general data and online payments.

For that purpose, we developed an MLP (multilayer perceptron) neural network using the hidden activation function tangent hyperbolic, sum of squares error, and Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm. We also analysed the differences in the tendencies of the female and male student populations with respect to the different types of goods they purchased and paid for through online applications. The research was conducted at two Croatian social science faculties at the University of Josip Juraj Strossmayer in Osijek in the academic year 2021/2022. The sample consisted of 408 students, of which 86.27% were female respondents.

The rest of the paper is organised as follows. The literature review chapter introduces the publications relevant to the topic that address gender differences in online shopping behaviour and payment transactions, as well as the relationship between information literacy and shopping behaviour and payment transactions. The following chapters present the research methodology, research findings, and developed MLP neural network results. The last chapter contains a discussion and conclusion on the research results.

Literature Review

The literature review was conducted at two levels: 1) gender differences in online purchases and payments; 2) information literacy related to online purchases and payments.

Gender differences in online shopping and payments

For the purpose of literature search and analysis, the search query included WoS and Scopus and, at the following level, Google Scopus. At the first level, the keywords "gender", "female", and "women" were searched for in combination with the keywords "online payments" and "online shopping preferences". At this level, as noted above, numerous works were found, most of which are emphasizing existence of gender differences in online purchases and payments. Kanwal *et al.* (2022) claim that women are less positive about online purchases and payments than men. Women's decisions about online purchases and payments are also more influenced by privacy concerns and social influences (Kanwal *et al.*, 2022). This is consistent with the findings of Chai *et al.* (2011), who found that women have more privacy concerns than men, which may affect their propensity to share information on social networks or make online purchases and payments from online retailers. According to Zhang *et al.* (2017), women are more likely to shop at a wider range of retailers. However, this changes with household size. On the other hand, households with more working members are more likely to shop online, but from fewer retailers. Awan & Ho (2018) found a relationship between gender and online payments and online shopping intentions in an analysis of Chinese consumers, with women having lower online shopping intentions and being more aware of the risks of online payments and online purchases. This finding is consistent with Ravikumar & Prakash's (2022) conclusions that women have less confidence in online payment services and tend to accept innovations gradually. Recent professional reports are also confirming that there are gender differences. Statista (2022) reports gender differences in online impulse purchases worldwide, with women most likely to buy clothing and footwear (57% of women vs 38% of men) and personal care products (29% of women vs 18% of men). On the other hand, men are most likely to impulsively buy electronics (49% vs 27% of women) and toys, games or books (44% vs 38% of women) online.

In contrast to previous findings, Nadeem *et al.* (2015) believe that gender differences are decreasing, as the authors found no significant difference in the intensity of e-trust, e-attitude, and e-loyalty between genders, although women's attitudes toward online retailers are more influenced by online peer recommendations in social networks (Nadeem *et al.*, 2015). These findings are consistent with those of Sahu & Singh (2017), who found that gender did not influence the relationship between various constructs (facilitating conditions, hedonic motivation, value for money, and habit) and purchase and payment intention via a mobile platform for booking tickets in India. Raj & Singh (2016) developed a decision tree model with the objective of finding out how demographic characteristics (including gender, age, annual income, occupation, spending, etc.) influence the frequency of online purchases and developed a model with 66.45% accuracy. They found that of all the variables analysed, including gender

as an influencing factor, spending was the most important in predicting online purchase frequency.

Information literacy in connection to online shopping and payments

The literature search on information literacy in relation to online purchases and payments was also conducted on two levels by evaluating the Scopus and Web of Science databases with a combination of the keywords "information literacy" and "online payments" in the first search round. After filtering by relevant subject areas (excluding medicine, physics, and astronomy), the following results were found: Scopus 15 articles; and 11 in Web of Science. In WoS and Scopus, only one paper by Seldal & Nyhus (2022) was filtered out that contained keywords in combination with "women" or "gender" or "female" in this field of research. Because a detailed analysis of the search results revealed that the filtered results did not fully match the topic of this study, we set out to find articles that were closer to the topic of the relationship between information literacy and women's online shopping and payment preferences in the Google Scholar database. Searching for the same keywords yielded approximately 17,700 results for articles published in the last 5 years (as of 2018), but, again, relevance was limited. Nevertheless, we have singled out and analysed the works that are thematically most similar to our research area.

Head & Eisenberg (2011) conducted a survey of 8,353 students from 25 US colleges (with more than 70% of respondents being female). Although most students searched the Internet for news and information about shopping, health, and wellness, they were found to have difficulty finding and filtering relevant from non-relevant information. Mahmood *et al.* (2022) analysed the current digital information literacy (DIL) of 269 female online shoppers in Pakistan and found that information literacy has a strong influence on women's online shopping behaviour. Although their digital information literacy is at a good to moderate level, they rarely use advanced search techniques, are reluctant to use online payments, and generally infrequently use online purchasing (Mahmood *et al.*, 2022).

Shang *et al.* (2013) studied the problem of information and alternative overload on online shopping websites and how it affects customers' purchasing decisions. It seems that too many products offered in online stores reduce consumers' subjective status regarding their purchase decision. Moreover, a longer time spent on online websites is not necessarily a positive thing, but a sign of the buyer's indecision and a bad feeling about their choice. Therefore, they conclude that "information literacy will be essential for people in the information age" (Shang *et al.*, 2013, p. 641). The level of information literacy, according to Shirzadi *et al.* (2022) in their research conducted in Iran, does not influence customers' decisions about the brand and

the time they spend in the online shop, but the size of the purchase (the number of garments purchased), the place of purchase, and the payment method do.

Leung (2009) analysed various aspects of information literacy: tool literacy, resource literacy, social structure literacy, research literacy and publishing literacy, new technologies, and critical literacy. The author found that Publishing Literates (people who are able to format and publish research and ideas in text and multimedia formats) are more likely to be female and tend to be very active users of various Internet applications, such as online shopping and online payments. Stephen (2022) studied financial literacy among a group of librarians and information scientists in northeast India and defined it as "a set of abilities and information that enables a person to make informed and effective financial decisions" (Stephen, 2022, p. 2), although it seems that the author placed financial literacy under the umbrella of information literacy as a broader field. At the same time, the author defined digital financial literacy as a combination of financial literacy and digital literacy that enables users to understand and use digital financial services. Ravikumar & Prakash (2022) studied the factors affecting the adoption of digital payment services among small bricks-and-mortar retailers in Bangalore, where digital literacy was also referred to as information literacy in the study. Perceived risk and digital illiteracy were found to be strongly related.

Considering all of the above, it is understandable why most researchers of online purchases and online payments narrow their scope of research and focus on financial literacy or digital literacy rather than the broader more comprehensive concept of information literacy.

Research Results

The study was conducted in the academic year 2021/2022. A total of 408 students from the Faculty of Education and the Faculty of Economics responded to the call for participation in this study. All participants gave their informed consent to participate in this study before accessing the study and completing the online questionnaire, which recorded participants' general data (5 variables), self-rated information literacy (1 variable), and frequency of using online payments for various purposes (12 variables).

The majority of participants were female (86.27%), slightly less than three-fifths (59.56%) of them were from the Faculty of Economics, less than half of them (47.79%) were between 18 and 21 years old, three-eighths of them (37.50%) were in their second year of study, and the same number of them lived in a rented private apartment or room. Most participants (84.60%) had made online payments for purchased goods and services in the 12 months prior to the survey. According to the survey, there was a lower level of receptivity to digital payments among women compared to men. Almost a quarter of the women (24.44%) who were asked about their likelihood of using online payments for purchases did not give a positive response,

whereas an overwhelming majority of men (94.6%) showed a positive inclination towards this option.

More than half of the participants (52.45%) self-rated their information literacy as very good, slightly more than one-ninth (11.27%) as excellent, and less than one-third (31.86%) as good. Only 3.92% reported having adequate information literacy and 0.49% reported having inadequate information literacy.

When it comes to using online payments for various purposes, as seen in Figure 1, between two-fifths and seven-ninths (depending on the online payment purpose) said they mostly do not use them at all, with the exception of ordering clothes. Just over one-seventh (14.46%) of them do not use online payment when ordering clothes and 7.35% almost never use it.
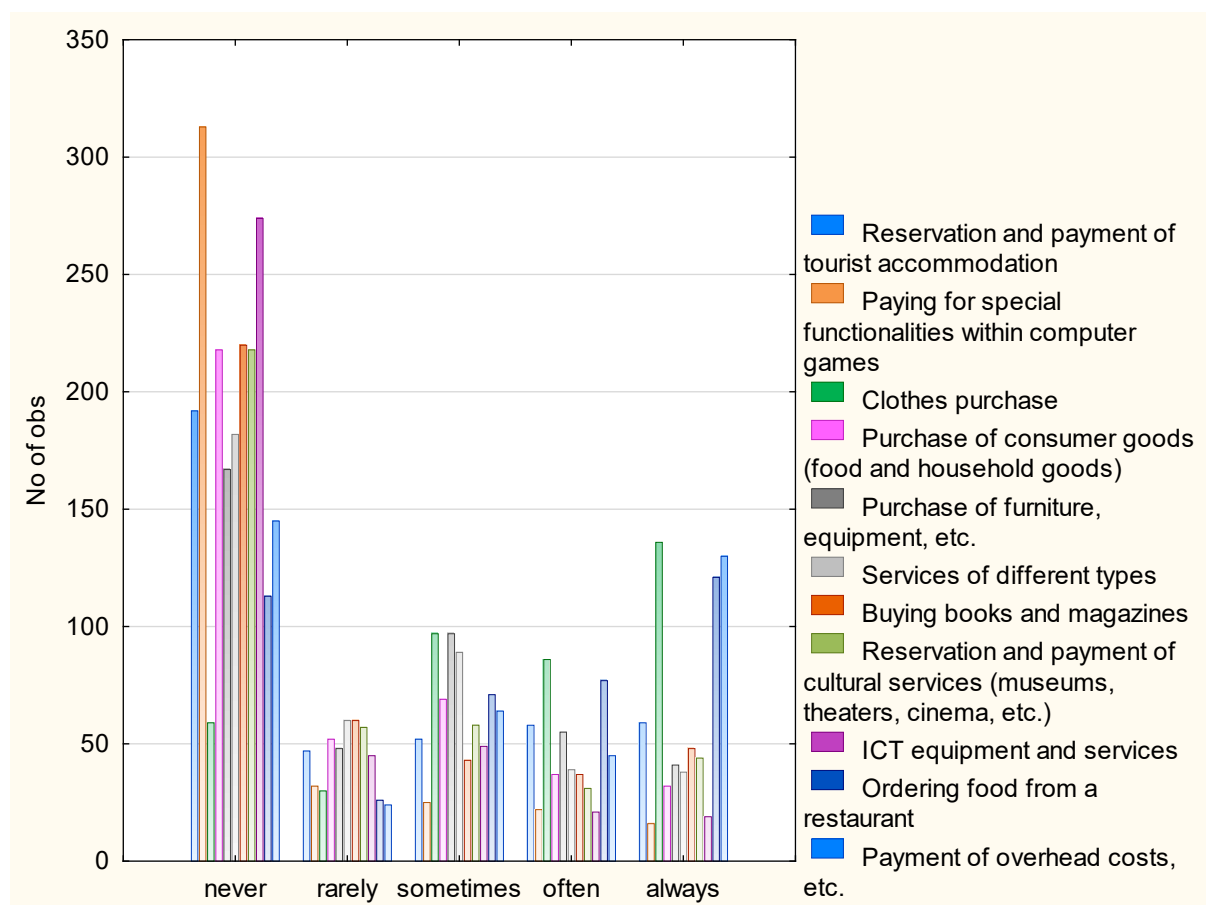
Figure 1. Frequency of online payment use for various purposes

To determine whether there was a relationship between reported information literacy and other variables, the chi-square test (χ^2 test) was used. At a significance level of 0.05%, no statistically significant relationships were found between variables.

Since no obvious linear relationships were found, a neural network model was created to classify participants according to their reported information literacy level. For this purpose, participants were divided into two categories. Those who indicated a high level of information

literacy (excellent or very good) were placed in category 1 (63.81%) and the others in category 2 (36.19%). The total sample was then divided into a training (70%), a testing (20%), and a validation (10%) subsample. A multilayer perceptron (MLP) neural network architecture was used, and 200 different models were trained, tested, and validated, modifying various architectural elements. The best overall classification accuracy of 73.17% on the validation subsample was obtained with the MLP neural network that used the hidden activation function hyperbolic tangent, the sum of squares as error function, and the Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm. This model had higher accuracy in identifying students with higher information literacy (80.77%) than the other category (60%).

When analysing which variables had the greatest impact on this model, sensitivity analysis revealed that the descriptive variables used had the greatest impact — accommodation while studying (1.89), gender (1.45), year of study (1.32), and age (1.25) — while among the variables for the purpose of online payment, payment for specific functionalities within video games (1.17) had the greatest impact.

Because neural networks were used as a nonlinear method to classify participants and the questionnaire was used solely for data collection, no internal consistency was calculated.

Conclusions and Recommendations

Based on a literature review, it was found that there is a gap in research on interconnection of information literacy and the use of online financial services by the young population. This becomes even more evident when the gender perspective is taken into account. On the other hand, it was found that the development of information literacy is particularly important in many areas of life and especially in the use of digital financial services. According to the results of this study, most of young people used online payments in the past 12 months (84.6%) and most often for buying and paying for clothes, which is particularly pronounced in the female group, and for buying and paying for special features in video games, which is most common in the male student group. Most participants do not use online payments for other various purposes. In addition, females are less likely to make online payments, which is consistent with Kanwal *et al.* (2022), Chai *et al.* (2011), Awan & Ho (2018), and Ravikumar & Prakash (2022).

We found no obvious linear associations among reported information literacy and other analysed variables, but the neural network model managed to find some data patterns from which it was possible to successfully classify students with an overall classification accuracy of 73.17%. According to the results, accommodation, gender, year of study, and age had the greatest influence on the model.

These results may be useful for online sellers to identify their potential customer group. On the other hand, educational institutions can use the results of this study to understand the relationship between self-assessed information literacy and the use of digital financial services. This is because, despite the high self-assessment of respondents in terms of information literacy, there is clearly still a need for action in this area by expanding the content of study programs, as almost a quarter of respondents are not ready to use online payments, which can now be considered a basic financial service and convenience. Therefore, educational institutions should evaluate the level of information literacy among students and develop programs to improve it, focusing on its application in the digital environment. In this endeavour, educational institutions could develop targeted educational programs that address students' specific information and digital literacy needs, based on the hidden patterns revealed by the neural network model. There is also an opportunity to develop digital finance programs aimed at developing digital financial literacy, such as lifelong learning programs targeting student groups. One of the goals of these activities could be to address the gender gap in adoption of new types of digital financial services. By developing such programs based on neural network results, higher education institutions could improve student readiness for the digital age, and this is an area where their potential is of great importance.

There are a few limitations of this study which should be considered in interpretation of the results. The sample size was relatively limited and focused on a female population. To improve the generalizability of the results for both genders, a survey with a more balanced male-to-female ratio should be conducted in the future. Furthermore, the study relied on self-reported information literacy levels and online payment preferences from participants, which may introduce some bias in the results. As well, the limitations of the study are the geographical coverage and the number of variables related to the objective assessment of information literacy and online payments, since the self-assessment method was used in this research. It is important to acknowledge these limitations when interpreting the research results and to interpret the findings with caution.

In relation to the above, future research should increase the sample with more balanced male-to-female ratio, improve geographic coverage of the study, include a larger number of variables related to a more objective assessment of information literacy as well as the use of online payment services. As well, it would be useful to analyse whether there are differences that could be used to examine the existence of a relationship between general information literacy and digital information literacy on users' attitudes toward online payments. As well, in future research, researchers could use some of the already developed instruments for measuring information literacy, as well as other more objective measures for determining the use of online payments.

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Exploring the Role of Cultural Capital, ICT Skills, and Entrepreneurial Self-efficacy in Shaping Entrepreneurial Intention among Women

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Abstract: The present study aimed to examine the impact of cultural capital on the entrepreneurial intention of female college students in India, with the mediating role of entrepreneurial self-efficacy and the moderating influence of ICT skills. Structural equation modelling (SEM) was employed to analyze the data collected from a sample of female college students using AMOS and SPSS version 23. The results indicated a positive relationship between cultural capital and entrepreneurial intention, with entrepreneurial self-efficacy as a mediator. Additionally, the study found that ICT skills positively influenced cultural capital and entrepreneurial intention via the mediation of entrepreneurial self-efficacy. The findings of this study have practical implications for policymakers, educators, and practitioners in promoting entrepreneurship among female students. Furthermore, the study has theoretical implications in extending our understanding of the role of cultural capital, entrepreneurial self-efficacy, and ICT skills in shaping entrepreneurial intention among women.

Keywords: Cultural Capital, Entrepreneurial Self-efficacy, ICT Skills, Entrepreneurial Intention, Women

Introduction

Women's entrepreneurship has been a subject of significant research since the 1980s, which has linked it to various topics, including empowerment, work-life balance, leadership, the glass ceiling, and economic contributions (Ferguson & Durup, 1997; Baral *et al.*, 2023). Studies have explored the features of male and female businesspersons and discovered that women and men share similar traits in terms of their risk-taking ability, vision, purpose orientation, inventiveness, and governance skills (Buttner, 1993; Pal & Mishra, 2021; Carlsrud & Olm, 1986).

The intention to become a businessperson varies, and understanding these intentions is crucial in directing students toward self-employment (Acs *et al.*, 2009; Pita, Costa & Moreira, 2021). The success of entrepreneurship is influenced by the accessibility of cultural, economic, social, and symbolic resources (Shaw *et al.*, 2008, 2009, 2013). Cultural capital significantly impacts school success and personal performance (Holt, 1998; Fernandes, 2001; Santos *et al.*, 2018). Cultural factors shape an individual's personality development and motivation for recognizing entrepreneurial opportunities and starting a firm (Liñán & Chen, 2009; Shardha *et al.*, 2005: Sharma & Sah, 2022).

In the Indian context, sociocultural variables, such as upbringing, religious beliefs, race, family background, and social environment, are critical for starting a company (Timmons, Spinelli, & Tan, 2004; Qazi *et al.*, 2020); Gartner, 1988; Dodd *et al.*, 2021). Even though studies have focused on the Theory of Planned Behaviour (Ajzen, 1991) and Social Cognitive Theory (Bandura, 1986) to explain the influence of cultural capital on women's decisions to pursue self-employment, studies on this phenomenon are still rare in the Indian context.

The development of information and communication technology (ICT) in India has profoundly impacted both personal and professional lives. In recent years, there has been a mounting interest in the relationship between cultural capital, technology, and entrepreneurship. Maitland & Obeysekare (2015) link cultural capital to competence and skills, including ICT skills, which can become embodied capital (Ragnedda *et al.*, 2022). Similarly, Hatlevik, Guðmundsdóttir & Loi (2015) emphasize that social background and cultural capital predict secondary school students' digital competencies. Concepts such as techno-capital (Rojas *et al.*, 2004; Straubhaar *et al.*, 2012), information capital (Hamelink, 2000), information habitus (Robinson, 2009), and informational capital (Prieur & Savage, 2013) have also been used to describe the technological component of already existing social or cultural capital. However, these approaches neglect one constitutive component of capitals: their convertibility. This means that what is interpreted as an outcome of cultural capital might result from investing part of this capital to be converted into another form of capital, the digital one. Some approaches have moved some steps in this direction. Selwyn (2004), for example, argues that 'technological capital' is intertwined with three different capitals: economic, social, and cultural. These three capitals are necessary to develop a positive attitude and the right abilities to use technologies for business establishment.

It is crucial in this environment to explore the effects of ICT on cultural capital and entrepreneurial intentions among female students in the Indian context, based on the Theory of Cultural Capital and Theory of Planned Behaviour, and it is crucial to understand the driving elements responsible for starting a business in the digital age. The increasing use of ICTs in our daily lives raises questions about how individuals' access to ICTs and their competence in

using them may influence their cultural capital and intention to become an entrepreneur. While some research has suggested that cultural capital plays a significant role in forming entrepreneurial intentions, little is known about how ICT usage can affect the relationship between cultural capital and entrepreneurial intentions.

Literature Review & Hypothesis Development

ICT and women's entrepreneurship

Entrepreneurial and digital management skills are in demand in the digital age. According to Prüfer & Prüfer (2020), entrepreneurial skills are more valued than digital skills. Entrepreneurial intention is gradually becoming more important in the social realm of venture creation (Tran & Von Korflesch, 2016).

ICT's effect on entrepreneurship and women's entrepreneurship have been extensively studied recently (Asongu & Nwachukwu, 2018). ICT reduces information asymmetry, provides timely information, and helps women feel more confident and respect themselves (Díaz-Chao *et al.*, 2015; Chen, 1998; Yen & Lin, 2022).

Studies show that ICT and innovation are essential components of entrepreneurship and interact beneficially (Yunis *et al.*, 2018). ICT can aid entrepreneurs in accessing markets and funding data (Malhotra *et al.*, 2012; Hinson, 2011). Due to the integration of ICT into India's economic and social fabric, many Internet applications have emerged, including social networking, e-commerce, mobile commerce, and the Internet of Things (IoT) (Statista, 2020).

ICT also affects women's social and cultural norms. Fitzallen & Brown (2006) noted that lifestyle is a major factor in ICT adoption and that rural women can benefit greatly. According to a 2009 World Bank report, effective communication and information dissemination can increase engagement and help rural women access income-boosting information (Narula & Arora, 2010). Technology may help women feel comfortable, while giving women entrepreneurs opportunities within culture and society (Sassen, 2002). Three key categories of skills are integral for engaging in ICT: (1) operational skills, which encompass the requisite proficiencies for effectively utilizing system and network hardware and software; (2) informational skills entail comprehending and manipulating the structured aspects of computers and networks; and (3) creative skills, which encompass the requisite proficiencies for effectively utilizing system and network hardware and software.

Gender inequality in ICT and digital skills gaps keep many, especially women, out of the digital market economy (Kamberidou & Pascall, 2019). Despite the numerous benefits of ICT, there is little evidence on the relationship between ICT and women's micro-businesses, especially in

rural areas (Asongu & Nwachukwu, 2018). Studies that look at the effects of ICT on women entrepreneurs in rural regions and the issues that need to be resolved are thus necessary.

Entrepreneurial self-efficacy

Self-efficacy—the belief in one's ability to overcome challenges and achieve goals—is crucial to personal and career development (Scholz *et al.*, 2002; Judge & Bono, 2001). This concept is specific to certain domains, such as occupational and entrepreneurial self-efficacy (ESE) (Bandura, 1997). ESE, in particular, refers to a person's confidence in their business results and influences their interest in entrepreneurship (Chen *et al.*, 1998; Newman *et al.*, 2019).

ESE has consistently been linked to entrepreneurial intention, the desire to start a business (Ajzen, 1991). ESE's effects on aspiring entrepreneurs have been studied using Ajzen's theory of planned behaviour (Kickul *et al.*, 2008; Sanchez, 2013). ESE reflects a person's expectations and ability to handle different situations, according to this theory (perceived behavioural control). ESE is positively associated with entrepreneurial intention in secondary school students (Wilson *et al.*, 2003; Silveyra *et al.*, 2021), undergraduate students (Austin & Nauta, 2016; Hockerts, 2017), postgraduate students (Bacq *et al.*, 2017; Prabhu *et al.*, 2012), and postgraduate students (Zhang & Cain, 2017).

The present study defines ESE as an individual's confidence in their ability to successfully perform entrepreneurial tasks, such as creating new products or market opportunities, developing a creative environment, forming investor partnerships, identifying the core business goal, overcoming unforeseen obstacles, etc. This literature review examines ESE's effect on women's IT entrepreneurship. ICT can boost innovation and productivity, helping businesses and economies grow. The evaluation will examine several studies on how ICT tools, including social media, improve business owners' productivity and growth.

Solow (1987) believed the computer age could boost productivity, which is crucial for achieving goals and reaping benefits (Sardar *et al.*, 2021). According to Hollenstein (2004), ICT boosts productivity and innovation (Sardar *et al.*, 2021) and can easily satisfy people's knowledge-sharing needs (Rauniar *et al.*, 2013).

According to the literature, ICT tools improve ESE and empower micro-entrepreneurs in developing nations (Bidwell *et al.*, 2014; Javed *et al.*, 2020; Bvuma & Marnewick, 2020).

ESE, ICT skills, and women's entrepreneurship are crucial to understanding barriers and opportunities for women and women entrepreneurs.

Cultural capital

Modern cultural capital research has focused on women and ICTs. Pierre Bourdieu's concept of cultural capital—embodied, objectified, and institutionalized knowledge, education, and experiences—helps people advance in society (Bourdieu, 1986).

Family, peers, and cultural elites shape an individual's cultural awareness and abilities (Holt, 1998; Atwal *et al.*, 2022). Tangible cultural capital includes works of art, while intangible cultural capital includes a culture's ideas, practices, beliefs, and values (Throsby, 1999; Zelekha & Dana, 2019).

Cultural capital has been extensively studied in entrepreneurship and business, with mixed results; where some have shown positive relations (Cooper, Gimeno-Gascon & Woo, 1994; Azubayeva, 2021), others have not (Stuart & Abetti, 1990; Dunkelberg *et al.*, 1987; Wdowiak, *et al.*, 2012). In a meta-analysis, Kennedy & Drennan (2001) found conflicting results, emphasizing the need to study cultural capital and entrepreneurship.

Educational, professional, and cultural factors affect women's ICT engagement and proficiency. Higher-educated and experienced women are better at ICT (Wdowiak *et al.*, 2012). However, the relationship between cultural capital and women's engagement with ICTs remains understudied, requiring further exploration.

Institutionalized cultural capital

Pierre Bourdieu defined cultural capital as non-financial resources institutionalized in individuals that can be converted into economic capital. Education, industry experience, and social norms are examples.

Education is one of the most significant forms of institutionalized cultural capital. Bourdieu (1986) found that better-educated entrepreneurs succeed. Education confers cultural power. Education boosts cognition and demonstrates competence (Weiss, 1995; Suleman, 2021). The Global Entrepreneurship Monitor (GEM) Report (Bosma & Harding, 2007) shows that past-junior-grade schooling increases entrepreneurship awareness and responsiveness. Entrepreneurship education boosts self-efficacy, research shows. Extended entrepreneurship education correlates better with these (Bux & Van Vuuren, 2019). Research shows that entrepreneurship courses increase students' entrepreneurial intention and that university knowledge and education are beneficial (Zanabazar & Jigjiddorj, 2020).

Social norms play a critical role in shaping entrepreneurial opportunity recognition. Capital acquisition, exchange, and negotiation can be aided or hindered by social norms of responsibility and mutuality (Lareau & Shumar, 1996; Carmona, 2019). Social norms affect

labour market participation and ethnic business enclave consolidation (Portes, 1993: Lintner, 2019). Professional success requires technical, cognitive, and social skills (Santos *et al.*, 2018).

Incorporated cultural capital

According to Pierre Bourdieu, cultural capital is knowledge, skills, education, and values that help people succeed. People internalize culture through embodied cultural capital. It reflects society's values and personal growth. Early socialization creates essential embodied cultural capital, according to Bourdieu (1986).

The entrepreneurial skills of individuals are closely related to embodied cultural capital. Entrepreneurial skills refer to identifying and exploiting business opportunities, developing effective strategies, and allocating resources efficiently, according to Bourdieu (1986). Startups must spot and seize opportunities (Timmons, 2002). According to Chandler & Hanks (1994, 1998), entrepreneurs who recognize and seize opportunities outperform their peers. Entrepreneurship skills are needed to handle uncertainty and disequilibrium (Orazem & Vodopivec, 1997; Nguyen, Nguyen-Quoc & Dung, 2022).

Individualism of cultural capital affects entrepreneurship. Individuals with a high degree of individualism are likelier to pursue entrepreneurship and achieve better outcomes (Morris & Schindehutte, 2005; Donaldson, 2021). Individualism is associated with creativity, competition, self-governance, social recognition, and imagination (Tiessen, 1997).

Finally, entrepreneurial learning increases embodied cultural capital and opportunities. Entrepreneurship classes and programs have grown recently (Walter & Block, 2016). These programs foster entrepreneurship, innovation, and business creation (Duval-Couetil, 2013). According to research, entrepreneurship learning increases entrepreneurial intent (Wu & Wu, 2008; Rafiei *et al.*, 2021). Henry *et al.* (2004) found that entrepreneurial development students had higher entrepreneurial intent (Fayolle & Degeorge, 2006).

Thus, individuals' entrepreneurial skills, values, and learning experiences shape their embodied cultural capital and ability to identify and exploit business opportunities.

The complex relationship between ICT skills, embodied cultural capital, institutionalized cultural capital, entrepreneurial self-efficacy, and entrepreneurial intention of women can affect their success in entrepreneurship. These factors interact and can be used to promote gender equality in entrepreneurship.
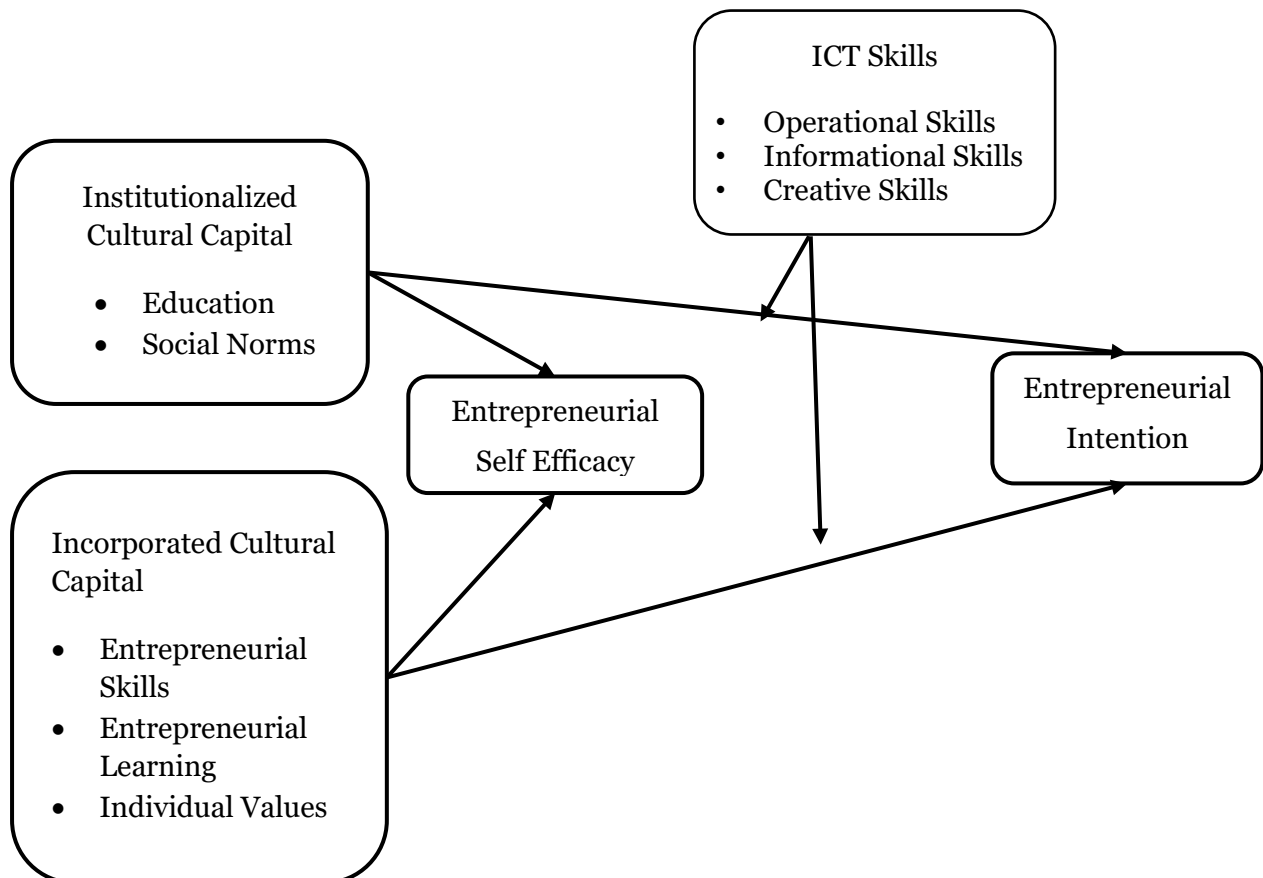
Figure 1. Proposed relationship between the variables

The following hypotheses are formed:

H1: Entrepreneurial self-efficacy impacts entrepreneurial intention among female college students.

H2: The relationship between institutional, cultural capital, and entrepreneurial intention among female college students is positively influenced by entrepreneurial self-efficacy.

H3: The relationship between incorporated cultural capital and entrepreneurial intention among female college students is positively influenced by entrepreneurial self-efficacy.

H4: Entrepreneurial education among female college students positively influences entrepreneurial intention.

H5: Entrepreneurial skills positively affect entrepreneurial intention among female college students.

H6: Individual values positively affect entrepreneurial intention among female college students.

H7: Social norms positively impact entrepreneurial intention among female college students.

H8: Entrepreneurial learning positively influences entrepreneurial intention among female college students.

H9: ICT skills moderate the relationship between institutional, cultural capital, and entrepreneurial intention among female college students via the mediation of entrepreneurial self-efficacy.

H10: ICT skills moderate the relationship between incorporated cultural capital and entrepreneurial intention among female college students via the mediation of entrepreneurial self-efficacy.

Research Methodology

The study examined the relationship between cultural capital and intention toward entrepreneurship among female/women university students aged 18-25 and the mediating effect of ESE and the moderating effect of ICT skills. The sample for the study was collected through snowball sampling. Due to the inaccessibility to students in a controlled setting, such as a classroom or college, it was challenging for the researchers to identify and recruit potential participants. Therefore, they had to rely on the method of snowball sampling, and the inclusion criteria for the study were female students who were currently enrolled in a college or university in Kerala and had undergone any kind of entrepreneurial education. The researchers identified a small number of participants who met the inclusion criteria and asked them to refer other potential participants (Ramadani *et al.*, 2022; Reagan *et al.*, 2019; Parker, Scott & Geddes, 2019; Naderifar, Goli & Ghaljaie, 2017; Marcus *et al.*, 2017). The sample consisted of 304 valid responses after eliminating duplicate responses using complete case deletion and based on the recommendation of advanced rules-of-thumb (Boomsma, 1982, 1985; Nunnally, 1967).

The questionnaire consisted of questions about the respondents' demographics and other elements adapted from different sources measuring cultural capital, entrepreneurial self-efficacy, ICT, and entrepreneurial intent (Table 1 and Appendix 1). The data were analyzed using AMOS and IBM SPSS, with the structures and objects being modified based on the literature to ensure content reliability.

Data analysis

Based on examining the link between the indicators and constructs, the measurement model of the questionnaire was evaluated and validated. To create the measuring model, internal consistency, convergent validity, and discriminant validity were tested (Table 1).

Internal consistency was evaluated with Cronbach's alpha and composite reliability, and both measurements suggested that internal consistency was strong. Specifically, Cronbach's alpha values were above the required threshold of 0.7, as proposed by Hair *et al.* (2012), and composite reliability values fell within the recommended range of 0.7 to 0.9 (Hair *et al.*, 2012).

Convergent validity was determined by analyzing the outer loadings, extracted average variance (AVE), MSV, and ASV.

Table 1. Construct validity and reliability

	CR	AVE	MSV	ASV
Entrepreneurial Learning	0.954	0.807	0.449	0.230
Entrepreneurial Self-Efficacy	0.948	0.751	0.555	0.348
Entrepreneurial Skill	0.929	0.767	0.543	0.357
Entrepreneurial Education	0.935	0.828	0.449	0.169
Individual Values	0.896	0.742	0.473	0.282
Social Norms	0.903	0.700	0.555	0.327
Entrepreneurial Intention	0.959	0.798	0.466	0.283

Cross-loadings and the Fornell-Larcker criteria were examined to establish discriminant validity (Fornell & Larcker, 1981). Cross-loading was not a problem because the factor loadings were higher on their parent construct than on other constructs (Hair *et al.*, 2012). In addition, the AVE values were greater than the squared correlation values with other variables, and ASV and MSV values were within limits, confirming the measuring model's reliability and validity (Hair *et al.*, 2012; Fornell & Larcker, 1981).

After reviewing the model of measurement based on construct reliability, validity, and model fitness, researchers evaluated the fitness of the model of measurement using several fit indices. The fitness indices conform to Hair's (2014) recommendations and are within their respective limits for the structural model, as shown in Table 2.

Table 2. Goodness of Fit measures

Fit indices	Threshold Limit	Value
Chi-square (χ^2)	Low value	955.540 (p=0.00)
Ratio of χ^2 to DF	≤3	2.182
Root Mean Square Error of Approximation (RMSEA)	≤0.08	0.062
Comparative Fit Index (CFI)	≥0.90	0.950
Tucker-Lewis Index (TLI)	≥0.90	0.943
Normed Fit Index (NFI)	≥0.90	0.912
Incremental Fit Index (IFI)	≥0.90	0.950

The present study utilized structural equation modelling (SEM) to examine the interrelationships between numerous characteristics and their influence on entrepreneurial

self-efficacy and intention (Appendix 2). According to the path analysis, institutional and cultural capital models, education, and entrepreneurship exposure did not substantially impact entrepreneurial self-efficacy or intention. Conversely, it was shown that cultural capital components, such as learning, individual values, skills, experience, and social norms, strongly affected entrepreneurial self-efficacy. Entrepreneurial Education, Individual values, and societal norms were the only factors that did not significantly influence entrepreneurial intent. Table 3 displays the specific findings of this investigation.

Table 3. Hypothesis testing

Hypothesis	β	SE	CR	P value	Decision
Entrepreneurial Skill→ Self-efficacy	0.354	0.066	5.339	0.000	Supported
Education→ Self-efficacy	-0.023	0.051	-0.443	0.658	Rejected
Individual value→ Self-efficacy	0.179	0.067	2.679	0.007	Supported
Social norms→ Self-efficacy	0.471	0.083	5.646	0.000	Supported
Entrepreneurial Learning→ Self-efficacy	0.097	0.052	1.860	0.046	Supported
Entrepreneurial Skill→ Intention	0.445	0.103	4.334	0.000	Supported
Entrepreneurial Education→ Intention	0.040	0.075	0.539	0.590	Rejected
Individual value→ Intention	0.150	0.097	1.545	0.122	Rejected
Social norms→ Intention	-0.101	0.127	-0.794	0.427	Rejected
Entrepreneurial Learning→ Intention	0.156	0.076	2.060	0.039	Supported
Entrepreneurial Self-efficacy→ Intention	0.396	0.105	3.780	0.000	Supported

Table 4. Mediation analysis

Path	Direct Effect	Indirect Effect	Mediation Result
Institutional capital→ Entrepreneurial Self-efficacy→ Entrepreneurial Intention	0.0040 (0.1059) [-0.2044, 0.2124]	0.1214 (0.0450) [0.0392, 0.2170]	Full mediation
Incorporated capital→ Entrepreneurial Self-efficacy→ Entrepreneurial Intention	0.6474 (0.1116) [0.4277, 0.5670]	0.2893 (0.0874) [0.1361, 0.4785]	Partial Mediation
Institutional Capital→ Incorporated capital→ Self-efficacy→ Entrepreneurial Intention (Serial Mediation)	0.0040 (0.1059) [-0.2044, 0.2124]	0.8770 (0.1152) [0.6579, 1.1090]	Full Mediation

Three hypotheses (H1, H2, and H3) were examined using a model in which entrepreneurial self-efficacy acted as a mediator to evaluate the possible influence of cultural capital on entrepreneurial ambitions. The results indicated that entrepreneurial self-efficacy mediates the relationships between institutionalized cultural capital, integrated cultural capital, and entrepreneurial intention. The results suggested that institutionalized cultural capital, directly and indirectly, affected entrepreneurial intention, with the indirect effect entirely mediated by entrepreneurial self-efficacy. Similarly, the cultural capital construct with incorporation

showed a strong indirect influence on entrepreneurial intention, partially mediated by entrepreneurial self-efficacy. Table 4 presents the specific outcomes of this serial mediator model, which examined three indirect effects.

The influence of the third variable on the connection between the first two variables is referred to as moderation. This study tried to analyze the impacts of ICT skills (operational, informational, and creative abilities) on the link between cultural capital and intention. The study aimed to investigate the moderating effects using IBM SPSS V23. Full evidence supported hypotheses H9 and H10, which asserted that entrepreneurial self-efficacy mediated the effect of cultural capital on entrepreneurial desire. The results are shown in Table 5.

Table 5. Moderation analysis

Moderation	Operational Skills (R^2)	Informational Skills (R^2)	Creative Skills (R^2)	Moderation Result
ICT skills moderate the relationship between institutional cultural capital, via the mediation of ESE	.40	.8	.432	Positive (H9 Accepted)
ICT skills moderate the relationship between incorporated cultural capital and entrepreneurial intention via the mediation of ESE	.484	.895	.465	Positive (H10 Accepted)

Discussion

Entrepreneurs are crucial to economic revitalization and crucial to comprehend which interventions can enhance the formation of new enterprises. The notion that entrepreneurs were "born" has long enjoyed widespread acceptance. During the 1990s, various research has investigated the influence of other factors incorporated into purpose models, considering factors such as personal and contextual expectations (Ajzen, 1991; Shapero & Sokol, 1982). Researchers have attempted to explore the effects of institutionalized cultural capital (education, experience, and social norms), incorporated cultural capital (entrepreneurial skills, entrepreneurial learning, and individual values), and entrepreneurial self-efficacy in predicting entrepreneurial intention (EI) among students in the context of India. The study has validated that all precursors have shown a statistically significant favourable association with EI. Nevertheless, with the mediating effect, entrepreneurial self-efficacy (ESE) was considered to be the greatest predictor of EI.

The present study focuses on the role of cultural capital in creating entrepreneurial intention. Cultural capital primarily consists of institutionalized and incorporated cultural capital (Bourdieu, 1986). Starting from institutionalized cultural capital elements, the coefficient of the path from entrepreneurship intent to educational level is negative, contrary to

expectations, and hence H4 is rejected. Reports on the effects of entrepreneurship education and intention have remained inconsistent in the literature, and our findings from Hypothesis H4 align with the findings of Oosterbeek, Praag & Ijsselstein (2010) and Carpenter & Wilson (2022). The negative association between the level of education and intention could result from labour market characteristics to some extent, as salary-based employment is desirable among Indian graduates as a career option. As expected in the models that are in line with the findings of Iakovleva & Kolvereid (2009), the coefficient of the path from industrial experience to entrepreneurial intention displays a substantially positive impact, emphasizing that previous know-how affects the propensity of an individual to perform in a particular way (Iakovleva & Kolvereid, 2009). In addition, literature has explored exogenous or contextual variables on the probability of creating an entrepreneurial goal, such as past entrepreneurial exposure or entrepreneurial learning, covered through Hypothesis H9. The path coefficient from learning to entrepreneurial intention displays a positive effect, as expected in the model, and is congruent with the studies of Zhang, Duysters & Cloodt (2014).

According to our research, self-efficacy is a predictor that positively influences entrepreneurial intention. We examined the direct effect of ESE on entrepreneurial intention (H1), the mediating effect of self-efficacy between institutionalized cultural capital and entrepreneurial intention (H2), and the intervening effect of entrepreneurial self-efficacy between incorporated cultural capital and entrepreneurial intention (H3). The path coefficients of H1, H2 & H3 to entrepreneurial intention show a positive effect, as anticipated in the measurement models, and are in line with the findings of Saeed *et al.* (2015) and Thomas, Passaro & Scandurra (2014).

Intention models have often included social norms, which we have explored through H8, when they relate to certain stresses or help that people perceive from the environment, and our findings are in line with Thomas, Passaro & Scandurra (2014) and Trivedi (2016). Some experiments also examine their direct effects in this regard, finding inconsistent results or indicating indirect effects (Tsai, Chang & Peng, 2016).

In addition, the study examines the moderating influence of ICT skills on the impact of cultural capital on entrepreneurial intention, as mediated by entrepreneurial self-efficacy. Agnihotri *et al.* (2012) argued that organizations have responded to the ICT "gold rush" by embracing new tools that enable salespeople to leverage their social networks more effectively. Victoria Crittenden and colleagues (Crittenden *et al.*, 2019) found that access to ICT can enhance entrepreneurial self-efficacy (ESE) and social capital, leading to greater empowerment for women in developing countries. The authors highlight the need for tailored interventions that account for female entrepreneurs' unique challenges in emerging economies, including limited access to resources and social support networks. Bidwell *et al.* (2014) investigated the impact

of ICT on micro-entrepreneurs in rural South Africa. Furthermore, access to ICT tools, including social media, can improve entrepreneurial self-efficacy and enhance micro-entrepreneurs' ability to network and share information (Beninger, 2016). These studies give full evidence in support of hypotheses H10 and H11, which asserted that entrepreneurial self-efficacy mediated the effect of cultural capital on entrepreneurial desire.

Theoretically, this research topic contributes to the growing body of literature on the importance of cultural capital and self-efficacy in entrepreneurial intentions. The study provides valuable insight into how ICT can be used as a moderating variable to enhance the relationship between cultural capital, self-efficacy, and entrepreneurial intentions among female students. The study also sheds light on the importance of gender in entrepreneurship and how female students can be empowered to develop entrepreneurial skills and intentions through the use of ICT.

This study has significant implications for educators, policymakers, and entrepreneurs. First, it is essential to provide entrepreneurial training programs like MIT Venture Mentoring Service, Youth Entrepreneurship Support (Romania-Hungary), Stanford Ignite, and Berkeley Method of Entrepreneurship (Buckley, 2015) that foster entrepreneurial learning and improve female students' entrepreneurial self-efficacy. Such programs should emphasize developing entrepreneurial skills, expertise, and self-assurance. This may be accomplished through collaborations with business incubators, accelerators, and industry associations. Second, institutional and incorporated cultural capital should be utilized to encourage female college students' entrepreneurial desires. Institutions may foster an entrepreneurial atmosphere by giving access to resources, networks, and mentorship opportunities. Incorporating cultural capital might entail enabling female students to establish their entrepreneurial identity by drawing on their cultural history, values, and beliefs. Thirdly, the study reveals that entrepreneurial skills, personal values, and societal norms are significant factors that positively affect entrepreneurial intention among female college students in India. Programs similar to the Indigenous Women in Community Leadership (Donnelly, n.d.) and Intercultural Innovation Award (2023) can achieve this.

Consequently, boosting these qualities through focused interventions, such as mentoring, networking events, and community participation, can assist in fostering an entrepreneurial mentality and culture among female students. Furthermore, the study emphasizes the significance of ICT skills as a moderating variable in the association between cultural capital and entrepreneurial intention among college-aged women in India. This indicates the need for measures that increase the ICT abilities of female students and stimulate their entrepreneurship. Partnerships with IT companies, government initiatives, and training programs similar to *Girls Who Code* (Sherman, 2018) can accomplish this. The findings of this

study may be utilized to build educational programs for female students that emphasize the development of cultural capital, self-efficacy, and IT competence. Politicians may utilize the findings to establish policies similar to Women Entrepreneurship Strategy (Cukier & Hassannezhad Chavoushi, 2020) and Women Entrepreneurship Platform (NITI Aayog, 2021) that promote gender equality in entrepreneurship and encourage the development of entrepreneurial skills among female students. Using the study findings, entrepreneurs may discover possibilities to develop goods and services to meet the requirements of female entrepreneurs and students.

Limitations and Future Directions

While the present research offers valuable perceptions into the significance of cultural capital, ICT skills, and ESE in shaping entrepreneurial intention, several limitations must be considered. First, we utilized a non-probabilistic convenience sample, which may restrict the generalizability of our findings. Future studies should look at using a larger sample size to ensure that the findings are applicable to a broader population. Second, the study extended the concept of cultural capital to a wide range of students, but it was challenging to include the objectified status of cultural capital, such as statuaries, drawings, and manuscripts. Potential areas of attention for future research include occupations and the use of those cultural capital expressions to improve the measurement of cultural capital.

To further extend the current study, future research may expand the context of the analysis beyond the present limitations. For instance, the research could investigate "if" and "how" students benefit from their cultural resources, which include their digital capital. This would provide a more nuanced understanding of the role of cultural capital in developing entrepreneurial intention. Moreover, future research could examine whether the association between cultural capital and entrepreneurial intention differs across genders or ethnic groups. Such a study would be valuable in identifying potential barriers or facilitators to entrepreneurship for specific groups.

Conclusion

The research highlights the significance of cultural capital in shaping the intent to start a business. The findings indicate that entrepreneurial learning, industry experience, and abilities positively impact entrepreneurial intention. Additionally, individual values, social norms, and education play a crucial role in shaping the entrepreneurial mindset through their effect on self-efficacy. This study provides a comprehensive understanding of the role of cultural capital and its impact on human behaviour, which serves as a valuable contribution to the field of entrepreneurship.

Moreover, the results suggest that women's entrepreneurship intention can be fostered through skill development, particularly in the area of ICT. The research paper provides specific research implications with practical examples from developing and developed countries that India can adopt to promote entrepreneurship through entrepreneurial programs and policies. Despite India's numerous initiatives to promote women's entrepreneurship, the category remains underrepresented owing to a lack of awareness and the necessary skills. In light of these findings, it is advised that public and private institutions in India incorporate diverse courses in skill development and stimulate entrepreneurial activity on campus. This will provide students with an opportunity to develop an entrepreneurial attitude and mindset from an early stage in their professional lives.

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Appendix 1

Factor	Item	Source (adapted from)
Entrepreneurial skills	1: Influence and lead people	Chandler & Hanks (1998); Wdowiak *et al.* (2012)
	2: Seize high-quality business opportunities	
	3: Achieve results by organizing resources and motivating people	
	4: Delegate effectively	
Entrepreneurial Education	1: Knowledge about entrepreneurship	Asimakopoulos, Hernández & Peña Miguel, (2019)
	2: Better perception of entrepreneurs	
	3: Skills needed to be an entrepreneur	
Individual value	1: Hedonism (enjoyment in life and pleasure-seeking)	Schwartz (1992); Wdowiak *et al.* (2012)
	2: Stimulation (daring, exciting, and very challenging life)	
	3: Self-direction (creativity, independence, and choosing own goals)	
Entrepreneurial Learning	1: Increase your understanding of the attitudes, values and motivation of entrepreneurs	Souitaris, Zerbinati & Al-Laham (2007); Asimakopoulos, Hernández & Peña Miguel, (2019)
	2: Increase your understanding of the actions someone has to take in order to start a business	
	3: Enhance your practical management skills in order to start a business	
	4: Enhance your ability to develop networks (i.e., who do I need to know)	
	5: Enhance your ability to identify an opportunity	
Social Norms	1: My family would agree with my decision to start a business on my own	Asimakopoulos, Hernández & Peña Miguel, (2019)
	2: My friends would agree with my decision to start a business on my own	
	3: My colleagues would agree with my decision to start a business on my own	
	4: I care about and I am influenced by the opinion of my circle of close people	
Operational Skills	1: I am able to operate the Google search engine using different menu bars (e.g., image, map and Google Scholar)	Parvin *et al.* (2019); Shukla *et al.* (2021)
	2: I have the skills to operate various common file formats (e.g., PDF, Word and SWF)	
	3: I have skills on how to use social media campaign (e.g., Facebook Ad, Google Ad Word, Twitter Ad etc.) to promote my product or business online	
	4: I have the skills to create my own website. (This can be from free websites or using your own coding)	
	5: I have skills to use tools on the Internet such as Google Analytics and Search Engine Optimization tools to improve my product or business online	

Factor	Item	Source (adapted from)
Informational Skills	1: I am able to recognize hyperlinks in different website lay-outs	Parvin *et al.* (2019); Shukla *et al.* (2021)
	2: I am able to evaluate information on different websites	
	3: I am skilful in seeking information on appropriate websites	
	4: I have skills to use certain free tools on the Internet to minimize cost (e.g., blogger and downloadable materials)	
Creative Skills	1: I know how to create something new from existing online images, music or video	Onwu & Abah (2019); Shukla *et al.* (2021)
	2: I would feel confident putting video content I have created online	
	3: I know which apps/software are safe to download	
	4: I am confident about writing a comment on a blog, website or forum	
Entrepreneurial Self-Efficacy	1: I can work productively under continuous stress, pressure and conflict	De Noble, Jung & Ehrlich, (1999); Fu *et al.* (2022)
	2: I can originate new ideas and products	
	3: I can develop and maintain favourable relationships with potential investors	
	4: I can see new market opportunities for new products and services	
	5: I can recruit and train key employees	
	6: I can develop a working environment that encourages people to try out something new	
Entrepreneurial Intention	1: I am ready to do anything to be an entrepreneur	Liñán & Chen (2009)
	2: My professional goal is to become an entrepreneur	
	3: I will make every effort to start and run my own firm	
	4: I am determined to create a firm in the future	
	5: I have very seriously thought of starting a firm	
	6: I have the firm intention to start a firm someday	

Appendix 2. SEM Diagram
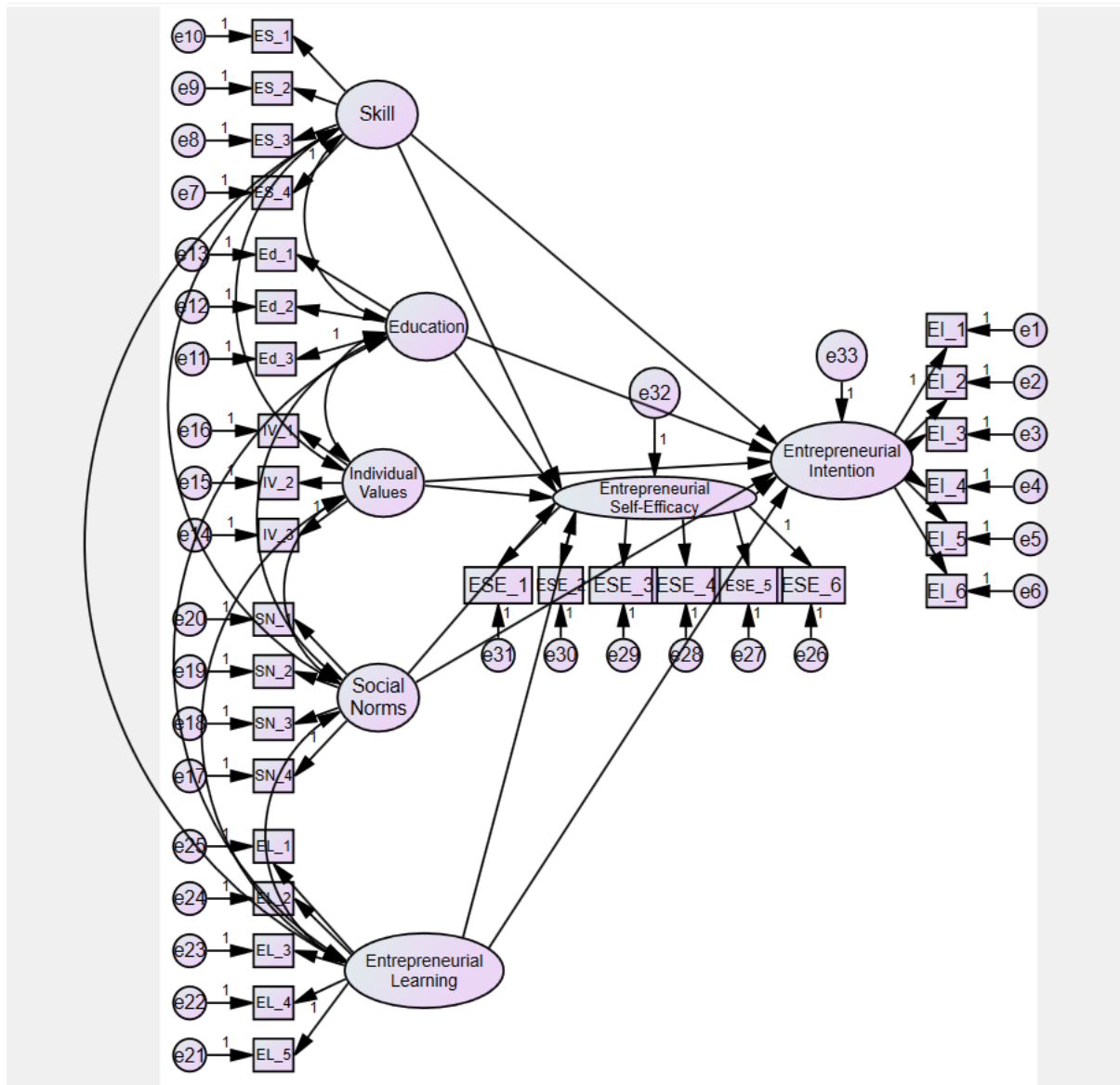
Appendix 3. Standardized Regression Weights

			Estimate
SelfEfcacy	<---	Skill	.345
SelfEfcacy	<---	Education	-.024
SelfEfcacy	<---	IndValue	.170
SelfEfcacy	<---	SoclNorms	.365
SelfEfcacy	<---	Learning	.107
Intention	<---	Skill	.342
Intention	<---	Education	.033
Intention	<---	IndValue	.113
Intention	<---	SoclNorms	-.061
Intention	<---	Learning	.136
Intention	<---	SelfEfcacy	.311
EI_1	<---	Intention	.847
EI_2	<---	Intention	.869
EI_3	<---	Intention	.910
EI_4	<---	Intention	.904
EI_5	<---	Intention	.921
EI_6	<---	Intention	.906
ES_4	<---	Skill	.845
ES_3	<---	Skill	.877
ES_2	<---	Skill	.909
ES_1	<---	Skill	.870
Ed_3	<---	Education	.859
Ed_2	<---	Education	.962
Ed_1	<---	Education	.905
IV_3	<---	IndValue	.850
IV_2	<---	IndValue	.893
IV_1	<---	IndValue	.840
SN_4	<---	SoclNorms	.784
SN_3	<---	SoclNorms	.880
SN_2	<---	SoclNorms	.868
SN_1	<---	SoclNorms	.812
EL_5	<---	Learning	.902
EL_4	<---	Learning	.906
EL_3	<---	Learning	.916
EL_2	<---	Learning	.889
EL_1	<---	Learning	.869
ESE_6	<---	SelfEfcacy	.877
ESE_5	<---	SelfEfcacy	.888
ESE_4	<---	SelfEfcacy	.905
ESE_3	<---	SelfEfcacy	.869
ESE_2	<---	SelfEfcacy	.888
ESE_1	<---	SelfEfcacy	.766

Evaluating the Important Role of Women in Maintaining the Sustainability of SMEs

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Abstract: Small and Medium Enterprises (SMEs) play a significant role in driving economic growth; hence, research on the sustainability of SMEs is currently under discussion. Previous research found evidence that women's role in the development of SMEs is still limited because most entrepreneurs are men. This is due to gender stereotypes, in which men tend to be more rational while women are more careful. Based on these problems, this research specifically tests the impact of digitalisation, business strategy, and competitive advantage on the sustainability of women-owned businesses. It also evaluated the digitalisation effect, business strategy, and competitive advantage on the sustainability of SMEs. It consisted of 150 female respondents who use e-commerce in Indonesia, and the focus was solely on women entrepreneurs, which has not been done in previous investigations. Furthermore, this study uses purposive sampling with specific criteria and hypothesis testing using SmartPLS. The results showed that digitalisation and business strategy affect competitive advantage, which also increases the sustainability of SMEs. This research is anticipated to assist SME owners, particularly women, in mastering technology to gain a competitive advantage and maintain sustainability.

Keywords: Business strategy, Competitive advantage, Digitalisation, Sustainability.

Introduction

There is a general consensus that Small and Medium Enterprises (SMEs) make a substantial contribution, are more adaptable than large companies, and account for the vast majority of businesses (Distanont & Khongmalai, 2020; Budiarto *et al.*, 2022; Alam *et al.*, 2022). Even though the economy has started to improve after Covid-19, many SMEs are experiencing problems maintaining sustainability (Yanto *et al.*, 2022; Purwadi *et al.*, 2022). Therefore, to

deal with environmental uncertainty, SME owners should have good managerial skills to implement the best survival plan (García-Cornejo *et al.*, 2020). Some previous research explained that the most appropriate strategy to deal with uncertainty is innovation, which involves implementing digitalization (Pangboonyanon & Kalasin, 2018; Distanont & Khongmalai, 2020; Chinakidzwa & Phiri, 2020; Yousaf *et al.*, 2021).

This research aimed to examine the role of women as SME owners in carrying out business strategies toward sustainability. Much research has been conducted on competitive advantage and sustainability (Jayeola *et al.*, 2020; Ferreira *et al.*, 2020; Obal, Morgan & Joseph, 2020). However, those that examined the involvement of women in developing digitalisation in SMEs are still interesting because: 1) gender stereotypes explain that women have feminine characteristics and hence they are not risk-takers (Manolova *et al.*, 2020; Chan, 2022); 2) The use of technology will bring the risk of failure (Games & Rendi, 2019; Nawrocki & Jonek-Kowalska, 2022); 3) There are opportunities and challenges when digitalisation creates gender inequality between men and women SME owners (Alam *et al.*, 2022); 4) Women believe that technology is only suitable for men (Shishko, 2022); 5) Despite the large population, the involvement of women in SME ownership is still limited to less than 30% (Pergelova *et al.*, 2018; Quaye & Mensah, 2019; Srikalimah *et al.*, 2020; Isa *et al.*, 2021; Budiarto *et al.*, 2022; Widjaja & Sugiarto, 2022); 6) Research on a single object will be more homogeneous, and the effects between variables are easier to isolate (Herrero, 2017).

In order to gain competitive advantages, SME owners need sufficient managerial knowledge and the ability to process information, as well as make optimal use of organizational resources (Mata *et al.*, 2021). Companies require a competitive advantage to maintain their position or defeat potential competitors. They also develop various strategies and determine the most efficient method to achieve competitive advantage (Setyaningrum & Muafi, 2022). Furthermore, a competitive advantage can be achieved when resources and technology are utilised, as well as when correctly implementing strategies (Jayeola *et al.*, 2020). SMEs should be prepared for technological developments and digitalisation in order to create product innovations and quickly adapt to market needs (Yousaf *et al.*, 2021). According to Alam *et al.* (2022), rapid environmental changes, such as the Covid-19 pandemic, have compelled the owners to accept the challenge of digitalisation. Consequently, companies' processes run efficiently and effectively, reducing the risk of losing market share. Digital technology has significantly changed owners' perspective regarding the need to adjust strategies, business processes, and service quality, resulting in better performance (Seclen-Luna *et al.*, 2022).

In addition to digitalisation, implementing the right strategy will increase the companies' ability to deal with very fast environmental changes and customers' demands (Dhameria *et*

al., 2021). Selecting a short-term and long-term strategy will push companies in the right direction towards excellence, because competitive advantage is the main key to success in the future (Wang *et al.,* 2021). Based on the perspective of Resource-Based View (RBV) theory, companies must respond quickly when the strategies used are inadequate and immediately utilize existing resources to implement new strategies to ensure competitiveness. Companies only enjoy the same return without a competitive advantage, but others tends to enjoy greater profits with the same risk (Farida & Setiawan, 2022).

SMEs have many problems compared to large companies, such as limited resources, poor management practices, and bureaucratic constraints, which cause difficulty in maintaining sustainability (Pangboonyanon & Kalasin, 2018; Quaye & Mensah, 2019). The life cycle of SMEs is short, and many fail (Engidaw, 2021). SMEs usually carry out activities side by side with the community, which necessitates the achievement of financial benefits and sustainability (Van Binh *et al.,* 2022). Based on some previous results showing that women's involvement in managing SMEs is still limited, this study will specifically examine their role in implementing digitalization and business strategies to increase competitive advantage and achieve sustainability. The results of this study can provide significant implications for SMEs, especially women entrepreneurs, to undertake risks and increase their competitiveness. This research consists of four parts, namely, introduction, literature review and hypothesis development, method, and results and discussion. This is followed by conclusions, limitations, and suggestions for future research.

Literature Review and Hypotheses Development

The RBV theory is the basis used because it explains the dependence of a company's performance on the ability to manage its resources. Furthermore, limited resources force companies to work efficiently in order to achieve a competitive advantage (Chinakidzwa & Phiri, 2020). The theory explains that companies should combine assets and human resources with strategy, as well as reduce costs to achieve a competitive advantage (Jayeola *et al.,* 2020; Mata *et al.,* 2021). According to Isa *et al.* (2021), women need to apply the right business strategy, since developing countries demonstrate significant empowerment and entrepreneurial development.

In addition to making a profit, maintaining a competitive advantage is an important goal for SME owners. Extremely rapid environmental changes and severe commercial competition compel them to select the best strategy, ensuring that companies maintain their competitive advantage (Jayeola *et al.,* 2020; Jin, Navare & Lynch, 2019). Previous research in Indonesia found evidence that digitalisation has no effect on competitive advantage (Setyaningrum & Muafi, 2022). However, several others found different results, such as research in Zimbabwe,

which showed that digitalisation in SMEs is important to ensure updated information, thereby ensuring awareness of existing trends and avoiding missed opportunities (Chinakidzwa & Phiri, 2020). Research in Malaysia explained that using digital technology can promote SMEs to become more competitive, efficient, low-cost, and able to increase market segments (Jayeola et al., 2020). Furthermore, digitalisation plays an important role for SME because it can help to reduce costs, improve quality of life, and maintain long-term advantages (Yousaf et al., 2021). It also facilitates the management of relationships with suppliers and customers, resulting in more flexible companies (Purwadi et al., 2022). Previous research explained that environmental uncertainty, such as the Covid-19 pandemic, gave rise to gender inequality in terms of digitalisation, negatively affecting SMEs led by women (Manolova et al., 2020; Jiménez-Zarco et al., 2021). However, other results in Australia explained that an individual's ability to master digital technology can narrow gender inequality (Alam et al., 2022). Furthermore, research in Peru showed that SMEs using social media, the Internet, social networks, and online sales can increase productivity. This is consistent with research in Bulgaria, which proved that women SME owners selected digitalisation because of the need for access, ease of customers' interaction, and knowledge of international markets (Pergelova et al., 2018). There is also a significant relationship between productivity and technology implementation in women's creative industries (Seclen-Luna et al., 2022). Based on the above literature review, this study will test the impact of digitalization on the competitive advantage of women-owned SMEs.

Research conducted in Malaysia showed that the government has a significant role in developing entrepreneurship for women by providing various facilities, specifically through increasing their competence in implementing business strategies (Isa et al., 2021). Similarly, research in Thailand showed that implementing the right strategy will push SME toward competitive advantage; hence, the support of the government is required. The right strategy is the main driver for companies to maintain a competitive advantage (Distanont & Khongmalai, 2020). Another research in America explained that, due to the Covid-19 pandemic, women entrepreneurs are trying to improve the ability to manage resources and use strategies in order to seize various opportunities (Manolova et al., 2020). According to Jiménez-Zarco et al. (2021), to achieve short-term profits, many SME owners change business strategy to meet customers' needs (Jiménez-Zarco et al., 2021). Results in China showed that companies can select an aggressive or conservative strategy according to the risks they will face. An increasingly competitive market environment forces companies to use various strategies to determine the path and direction of long-term goals to achieve advantages (Wang et al., 2021). Furthermore, they need good human resources, the right technology, and an efficient production process to produce quality products or services with positive consequences,

thereby increasing advantages (Farida & Setiawan, 2022). Based on several previous results, this study will test the impact of business strategy on the competitive advantage of women-owned SMEs.

The competitive advantage of an entity will start with efficiency by maximizing the use of resources and accelerating technology transfer (Lestari *et al.*, 2020). Therefore, the owners should realize that they need to explore strategies to remain competitive in a rapidly changing environment (Quaye & Mensah, 2019). Previous research in Indonesia explained that competitive advantage drives businesses to be more successful and superior in the future. The company's ability to achieve an advantage can be demonstrated by sales performance and improved service quality to customers. Companies should also be able to develop strategies to make production highly competitive in the market (Dhameria *et al.*, 2021).

Several results proved that the right business strategy significantly impacts competitive advantage (Lestari *et al.*, 2020). Similarly, women as entrepreneurs dare to make decisions to participate in business development and develop strategies to maintain business progress (Isa *et al.*, 2021). Research in Australia illustrated that managerial capabilities help to select the right strategy and create business opportunities to make competitive and sustainable advantages (Alam *et al.*, 2022). In line with some previous investigations, this study will test the impact of competitive advantage on the sustainability of women-owned SMEs.
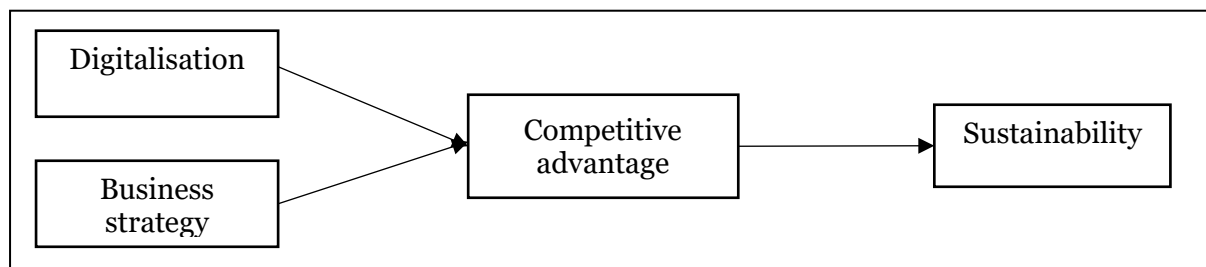

Figure 1. Research Model

Data and Methodology

This research started by selecting the method, searching various literature to determine suitable variables, then compiling indicators and distributing questionnaires. This study uses primary data by distributing questionnaires to the SME owners, using Google Forms through various WhatsApp groups, and a total of 158 questionnaires were completed. After analysis, only 150 questionnaires were used, since 8 were incomplete. This study uses validity and reliability tests to ensure data quality. Hypotheses were analyzed using SmartPLS with bootstrapping techniques. PLS analysis used 2 approaches: model measurement and structural measurement (Hair *et al.*, 2019). The model measurement used a validity test on the AVE (Average Variance Extracted) value with a cut-off of 0.5 and outer and cross-loading with a cut-off of 0.7. The model was also measured using Cronbach alpha values and composite

reliability with a cut-off of 0.7. The next step is structural testing using the adjusted R squared and VIF (Variance Inflation Factor) value.

Women who are SME owners and use digital technology, including social media and e-commerce, were selected as the respondents. Previous research focused on only one region, including Makassar (Lestari *et al.*, 2020), Central Java (Yanto *et al.*, 2022), West Sumatera (Games & Rendi, 2019), Special Region of Jogjakarta, and West Java (Dhameria *et al.*, 2021; Setyaningrum & Muafi, 2022). However, this research object expands more widely in Indonesia to obtain better generalization. The criteria for SMEs refer to Law No. 20 of 2008, which limits the annual turnover to less than 10 billion rupiahs, with 1-99 employees. Furthermore, it was not limited to the types of SMEs that use digital platforms, social media, or e-commerce.

A questionnaire with several question items was used to obtain data from respondents. Before the questionnaire was distributed, all questions were tested on research students and SME owners to ensure they were well understood. Based on the trial, several modifications were made according to the needs, such that the owners could answer all questions. Furthermore, digitalization is the digital orientation possessed by women related to the use of tools or systems for communication, including the Internet and social media. In this study, digitalization is defined by 4 questions that were used as a digital orientation by and Yousaf *et al.* (2021); while business strategy consisted of 7 question items adopted from Lestari *et al.* (2020). The competitive advantage and sustainability variables consisted of 9 and 10 questions, respectively, adopted from Lestari *et al.* (2020) and Jin *et al.* (2019). The questionnaire results were then analyzed on SmartPLS using the outer loading value. The results consist of 2 questions on the business strategy, 4 on the competitive advantage, and 2 on the sustainability variable. However, the questions with a cross-loading value of less than 0.7 were excluded from the model. This study aims to refine previous results by expanding the object to enable easy and accurate generalization. Questionnaires were distributed to SME owners in Indonesia, specifically women, during 4 months, from September to December 2022. The major limitation was the area of Indonesia, which reaches 1.9 million km² with 38 provinces; hence, the questionnaire was distributed using Google Forms.

Results & Discussion

The analysis of the respondents' profiles showed that 56% are undergraduates and 80 businesses are in the culinary field. The largest number of respondents was from Yogyakarta, namely 24%, followed by 12% Jakarta, 18% East Java, 9% West Java, and 2% from other provinces, such as Bali, East Nusa Tenggara, South Sulawesi, North Sulawesi, South Sumatra, Central Java, and Banten. Furthermore, 61% have just opened a business less than 3 years ago,

with the use of e-commerce for less than 3 years at 95% (Table 1). This is interesting, because the Covid-19 pandemic, which threatens sustainability, is the main driver for SMEs to open the type of business that is most needed by the community, namely culinary. As a result of the pandemic, women entrepreneurs are either prepared or unprepared to implement strategies and utilize digital media to keep the business running.

Table 1. Demographics of Respondents

		Yogyakarta	Jakarta	East Java	West Java	Other Provinces	Total
Level of Education	Bachelor	17	17	13	8	29	84
	Others	20	11	6	6	23	66
Type of Business	Culinary	31	23	15	9	42	120
	Agriculture	1	4	2	3	3	13
	Fashion	0	1	1	0	1	3
	Art	2	0	0	2	1	5
	Others	3	0	1	0	5	9
Running of Business	<3 year	19	12	14	12	35	92
	3-5 year	11	13	4	2	13	43
	>5 year	7	3	1	0	4	15
Use of e-commerce	≤ 3 year	36	27	18	13	49	143
	3-5 year	0	1	1	0	3	5
	>5 year	1	0	1	0	0	2

The analysis in Table 2 shows that the outer loading value on the target variable is greater than other variables in the model. The Cronbach alpha values were all greater than 0.7, with 0.74, 0.82, 0.88, and 0.94 for digitalization, business strategy, competitive advantage, and sustainability, respectively. In addition, the AVE values show 0.55, 0.58, 0.66, and 0.68 for the digitalization, business strategy, competitive advantage, and sustainability variables, respectively. Structural measurement testing shows an adjusted R squared of 0.28 for the competitive advantage equation and 0.05 for the sustainability equation. In addition, the VIF value for the competitive advantage equation is 3.09 and 1.00 for the sustainability equation. Due to the very low value of the adjusted R squared and the VIF value being close to 3, future studies may face challenges in conducting a more in-depth analysis.

The test results in Table 3 show that digitalisation and business strategy have a significant relationship to competitive advantage, and competitive advantage has a significant effect on sustainability. The results further supported the RBV theory, which explains that companies' ability to manage internal resources will increase their value. In practice, the ability to digitise experiences problems when owners do not attempt to understand the technology, but are effective when they possess new skills and knowledge (Chinakidzwa & Phiri, 2020; Jayeola *et al.*, 2020). The use of digital technology is an opportunity for SMEs, specifically for new players who are familiar with information technology. Consequently, they will easily enter the market and compete with older players (Games & Rendi, 2019). Social media has revolutionised traditional marketing techniques; hence, both large companies and small

businesses can increase brand awareness and sales of the products (Jiménez-Zarco *et al.*, 2021).

Table 2. Outer Loadings

	Indicator	Outer Loading
1.	We are committed to using digital technology as a solution to develop new products (to manage social, business, and ecological problems)	0.75
2.	The problems I face can be solved with the support of digital technology	0.72
3.	New digital technology is readily accepted and used in our business	0.72
4.	We always use technology to see opportunities and innovate	0.79
1.	Ability to establish good communication with customers	0.73
2.	Ability to achieve specified targets	0.78
3.	Compatibility between the products offered and the products provided to customers	0.82
4.	Utilization of technology to facilitate customers in the process of ordering and paying for goods purchased	0.74
5.	Excellent service, friendly, and responsive to every customer complaint	0.72
1.	I can bring high-quality products at affordable prices	0.73
2.	The products I market have excellent durability	0.81
3.	We provide fast and precise service as well as easy communication for customers	0.88
4.	Our business operations are digitally based, thereby facilitating customers to search, pay, and track every transaction	0.89
5.	We provide e-commerce accounts to give customers confidence in the transaction	0.81
1.	Environmental sustainability	0.85
2.	Social sustainability	0.83
3.	Sustainability criteria for new product development	0.82
4.	Measuring new product progress on sustainability	0.80
5.	The future importance of sustainability	0.80
6.	Developing sustainability policies	0.82
7.	Using the Triple Bottom Line for product planning	0.88
8.	Including sustainability in the product development budget	0.82

According to Alam *et al.* (2022), digitalisation is a solution to the challenge of determining new market segments and fast changes in customers' tastes. Even though digitisation requires the application of complex technology, it still has to be carried out to obtain feedback as inspiration to improve products or services to customers (Nawrocki & Jonek-Kowalska, 2022). Digitalisation significantly affects women entrepreneurs because it reduces barriers when entering new markets, makes it easier to find information, saves resources, and achieves work-life balance. This result is consistent with the previous reports that women entrepreneurs have been involved in business activities, even though many are carried out at home through digital technology (Pergelova *et al.*, 2018; Isa *et al.*, 2021).

Table 3. Test Result

	Beta	Mean	SD	T Statistic	P Value
Digitalisation→ Competitive advantage	0.30	0.30	0.13	2.26	0.024**
Business Strategy → Competitive advantage	0.27	0.27	0.14	1.96	0.050*
Competitive Advantage → Sustainability	0.27	0.30	0.13	3.39	0.001**

*Sig < 10%, ** Sig < 5%

Strategies to integrate products, processes and services indicate significant changes in companies (Seclen-Luna *et al.*, 2022). In line with previous results, the right strategy will promote women entrepreneurs to utilize financial and non-financial resources efficiently to achieve a competitive advantage (Wang *et al.*, 2021). They should also take advantage of existing resources and read opportunities that exist in the external environment (Farida & Setiawan, 2022). Due to uncertain environments, including the Covid-19 pandemic, swift movement using various strategies is required to seize business opportunities (Manolova *et al.*, 2020). Therefore, many women entrepreneurs have realised the need for their involvement in improving family welfare by investing using personal finances without realising the associated risks (Isa *et al.*, 2021). As owners, women entrepreneurs should think "out of the box" and develop different strategies, because they are in a rapidly changing environment (Quaye & Mensah, 2019).

Competitive advantage is created by maintaining good relationships with suppliers, which creates a healthy business, because SMEs will obtain information on new products and trends in the market (Lestari *et al.*, 2020). This can be achieved by removing barriers to market entry as well as increasing supplier strength and accuracy in decision-making (Lestari *et al.*, 2020). Jayeola *et al.* (2020) stated that SMEs with a competitive advantage will run faster than their competitors, becoming market leaders (Jayeola *et al.*, 2020). In line with the RBV theory, companies' managerial capabilities in building and integrating digital technology impact the advantages and create long-term sustainability (Alam *et al.*, 2022). Owners must improve their resource capabilities and help achieve companies' goals (Setyaningrum & Muafi, 2022). SMEs can utilise resources efficiently; hence, the income will be more significant. Furthermore, competitive advantage is easily achieved when the costs of managing internal and external resources are smaller than income (Mata *et al.*, 2021). These results are consistent with previous reports, which explained the strategies carried out by companies. In addition to increasing competitive advantage, strategies support social sustainability, such as producing quality products integrated with people's food security and making the SME owners agents of change, connecting the local and national economies (García-Cornejo *et al.*, 2020).

Conclusions/Recommendations

These research findings support the previous result that digitalization and business strategy affect competitive advantage (Wang *et al.*, 2021; Farida & Setiawan, 2022). In addition, this study also supports previous findings, which prove that competitive advantage affects sustainability (Srikalimah *et al.*, 2020). Furthermore, SME owners have a big challenge to take advantage of technology in order to expand their network and market share (Engidaw, 2021). The implementation of technology has become mandatory for owners, specifically women, due

to the rapid changes in customers' demands (Quaye & Mensah, 2019). In the process of implementing technology, SMEs are at a higher risk level due to limited resources. Therefore, owners should be careful and use their skills and experience optimally (Nawrocki & Jonek-Kowalska, 2022).

The results also showed that business sustainability is easily achieved in competitive companies. Competitive advantage will also grow in companies when customers obtain product value or benefits. This study has two implications. The first is that women need to have the courage to take risks in implementing technology and different business strategies to give companies advantage and achieve sustainability. Second, the government needs to create many opportunities for women to open businesses by providing various training and financial assistance, in order for SMEs to compete globally.

The research limitation is that it did not analyze the ability of SME owners based on educational background. To further examine the implementation of digitization, future studies should test whether its success is related to the owner's ability (Chinakidzwa & Phiri, 2020). The second limitation is that no test was carried out to determine whether SMEs use diversification strategies. Future studies are recommended to analyze digitalization and business strategy based on diversification, because previous results have explained that strategy diversification is one factor in determining success (García-Cornejo *et al.*, 2020; Budiarto *et al.*, 2022; Pangboonyanon & Kalasin, 2018). The third limitation is that this study is not separated by type of business, whether affected by the pandemic or not. Therefore, further studies can examine results based on the type of business, because some are negatively affected, such as restaurants, hotels, and fashion. Other businesses that have a positive impact include agriculture, pharmaceuticals, and herbal products (Manolova *et al.*, 2020; Purwadi *et al.*, 2022). The fourth limitation is that this study does not distinguish between the marital status of SME owners. Based on this, future studies should further test the owner's marital status, because married women tend to have different commitments and work time (Pergelova *et al.*, 2018). The fifth limitation is that this study does not distinguish between the strategies used by companies. Therefore, future studies are expected to examine this more deeply, because implementing strategies, such as defenders, analyzers, and prospectors, have different risks (Wang *et al.*, 2021; Farida & Setiawan, 2022). Furthermore, this finding would be more interesting when analysed in more depth because SMEs that receive government financial support may have a better level of excellence (Mata *et al.*, 2021).

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E-wallet and Women in India

Drivers of Post-Adoption Intention

and the Divide Across Age

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Abstract: The post-pandemic era witnessed an upsurge in digital wallet usage. The purpose of this cross-sectional study is to empirically examine the factors influencing the post-adoption intention of e-wallet users among Indian women and the digital divide across age groups. Validated questionnaires were used to collect data from female respondents across India. Path analysis using structural equation modelling was used to examine the driver of continuous intention for e-wallets, and the study demonstrates that user satisfaction and the perceived security and usefulness of e-wallets had a significant impact on post-adoption behaviour among women. Perceived confirmation, usefulness, and trust influence user satisfaction among women. However, contrary to expectations, the study found no significant difference in the continuous adoption behaviour of different age groups of urban women, indicating a lack of digital divide among urban women across age.

Keywords: E-wallet usage, Confirmation, Perceived Security, Perceived Usefulness, Trust

Introduction

Digital wallets have revolutionised modern life by gaining credence among people the world over. They have diminished the need to carry physical cards while shopping or travelling. Digital wallets permit consumers and businesses to accept payments, receive funds, or send and receive remittance funds without having a bank account in a physical branch but in online

accounts, thereby making financial inclusion possible in unbanked and under-banked communities. The growing popularity of e-wallets has transformed the way organisations do business and led to the emergence of many fintech companies globally. Thus, e-wallets are making a tangible social impact. The new-generation e-wallets have seamless integration with the world's leading payment systems, thereby giving consumers a better user experience, greater interoperability, scalability, and security. It also covers the needs of physically impaired audiences, paving the way for social inclusivity. The *Hindustan Times* on January 20, 2023, reports that India's digital payments transactions for 2022 exceeded the combined digital payments of four big economies: the US, UK, Germany, and France (HT News Desk, 2023). The Indian statistics show that women accounted for 51.8 percent of all workers employed in management, professional, and related occupations in 2020; hence, this study is highly relevant in the post-pandemic era.

This research aims to explore the factors prompting Indian women to pursue the continuous usage of e-wallets and to investigate if a digital divide exists among Indian women that determines their perception and behaviour regarding the usage of e-wallets. This study is therefore a cross-sectional one among Indian women.

Status of E-wallets among Women in India

The survey conducted by YouGov (2021) a British international Internet-based market research organization, in 2021 shows that the spread of the pandemic has accelerated the adoption of e-wallets, and currently two-thirds of urban Indian women use digital modes of payment on a general basis. The survey also shows that women predominantly use e-wallets for mobile recharges, payment of utility bills and transactions related to delivery services. The other areas where women in India use digital wallets are for shopping bills, fund transfers, travel and leisure bookings and toll-road charges. Further, the survey shows that Google Pay emerged as the top choice of e-wallets among females in India followed by Paytm. Other apps, like PhonePe, Amazon Pay, and BHIM, were far behind in terms of their popularity among Indian women. Thus, digital wallets have begun to outpace the use of debit cards and credit cards. Digital wallets have opened venues for buy now, pay later (BNPL), crypto currency, and cross-border payments.

Reaching financial equality through digital wallets

The demographic profile of the Global Findex 2021 survey highlights that the average female digital payment app user in India is young; the majority of women fall in the age bracket of 30-39 years, married & residing in tier-1 cities (World Bank Group, 2021). These women in the age group of 30-39 years are found to be more prudent with finance as compared to the

previous generation and they search for profitable ways to invest their money, but their willingness to take risks with money is found to be slightly lower compared to their predecessors. However, in rural areas, the majority of women have no bank accounts as compared to their male counterparts. India had over 63 million micro-, small and medium enterprises in 2020, the majority of which are in rural areas and the mass of which are owned by women. Thus, women, both in rural & urban India, have immense potential to generate, save, and spend their own money. They can not only profit for themselves but also contribute to the community they are a part of. In certain rural areas, women hand over their daily wages completely to their husbands or father and they have no say in how the money is spent or saved. Digital literacy and digital payment training can be used to empower these women with digital accounts and this can not only be life-changing for women but can also be economically beneficial to them.

Gender gaps in mobile ownership also have to be addressed while transitioning to digital payments. However, the availability of low-priced smart phones in Indian markets and fair tariff prices have added momentum to the use of digital wallets. The availability of user-friendly mobiles is enabling even non-tech-savvy women to use e-wallets. Digital wallets can transform the lives of two million women members who work in the informal sector. Financial inclusion of women can enhance their social status, gain greater control over their life and make their own decisions. Thus, the use of digital wallets among women acts as a driver of women's economic empowerment, and deeper financial inclusion; and provides greater bargaining power.

Literature Review

As the market for e-wallets continues to grow in India, it is essential to understand the factors that influence Indian women's adoption and intention to continue using e-wallet services. Applying the Expectations Confirmation Theory (ECT) (Oliver, 1980), post-adoption satisfaction of e-wallets results from a customer's comparison of performance (of a product or service) with predetermined standards of performance. According to this view, the predetermined standards are the customer's predictive expectations and any disconfirmation of beliefs results in dissatisfaction. Confirmation is attained when a service is performed as expected (Tzeng *et al.*, 2021). Thus, ECT theory propounds that perceived usefulness, coupled with confirmation of belief, leads to satisfaction. ECT is used in marketing to understand consumer satisfaction and post-purchase behaviour. Consumers have favourable or unfavourable intentions toward specific new technology based on the perceived usefulness received from new technology (Sheth, 2021). The Expectations Confirmation Model (ECM) emphasizes the importance of post-adoption expectations over pre-adoption expectations,

especially in the case of information technology products. Perceived Usefulness is a function of post-use expectancy, and any disconfirmation of this belief leads to discontinuation of the use of a product or service. According to Bhattacharjee (2001), the higher the level of expectation confirmation, the more useful the system is to the user, the more satisfied the user is with the system, and the higher the user's intention to continue using such a system. In the case of e-wallet applications, the user has to really feel the application's usefulness, which will induce satisfaction while using its features and motivate the user to continue using this e-wallet service. Shang & Wu (2017) emphasized Perceived Value in addition to confirmation to examine the factors that influence consumers' intention to continuously use mobile shopping apps. The confirmation of expectations is linked to the quality level of the service and the user experience the individuals derive from usage. Thus, the researchers want to investigate whether **Confirmation has a direct positive effect on customer satisfaction with digital wallets.**

Bhattacharjee (2011) argued that the perceived threat is minimized once the actual usage experience validates the security measures. Cao (2016) found that perceived confidence, perceived ease of use, perceived pleasure, perceived behavioural control, perceived utility, and subjective norm profoundly impact consumer behaviour intention.

Hajazi *et al.* (2021) studied the impact of perceived usefulness, perceived ease of use, perceived security, perceived compatibility, social influence, rewards, and personal innovativeness on millennials in Malaysia and it was found that, except social influence, all other factors had a significant and positive relationship with usage intention of QR mobile payment system. Contrary to this study, Khalifa & Shen (2008) and Mun *et al.* (2017) claimed that social stimulus had a substantial impact on the willingness to use e-wallets.

Studies by Kustono *et al.* (2020) showed that application quality, perceived usefulness, perceived ease of use, and attitude toward using e-wallets was the major predictor of usage behaviour among Indonesians.

The research by Amoroso & Magnier-Watanabe (2012) on consumers in Japan throws light on the construct attractiveness of other alternatives and switching costs, which has a deep influence on the adoption of a particular means of e-payment. This study also emphasized the culture of the society, which works as a push factor for easy adoption among citizens.

The majority of studies conducted in India on the financial technology sector emphasized Perceived Usefulness, Perceived Security & Trust. The study by Seam *et al.* (2017) pinpoints that convenience and rapid processing are recognized as key factors that influence the acceptance of e-wallets. Dastan & Gürler (2016) considered that perceived confidence, perceived versatility, and behavioural factors positively impacted the acceptance of e-payment

services. Perceived usefulness is the extent to which a person believes that using a particular use of product or service would improve their life quality (Daragmeh *et al.*, 2022). In view of the above studies, the researchers test whether **Perceived Usefulness has a direct positive effect on customer satisfaction with digital wallets.**

Women especially are cautious when it comes to security and finance. Perceived Security refers to the extent to which a user believes that the use of a particular technology for online payment is safe and does not pose a risk of loss of information or privacy (Chawla & Joshi, 2019). Lack of security and fear of loss of privacy reduces user satisfaction and trust. Security is vital to the adoption and acceptance of a service, as well as to continue the usage of the same service or product for a longer period. Leong *et al.* (2020) proved that the influence of security is not limited to the initial stage of technology use and acceptance, but extends to the user's intention to continue using a particular technological system. Thakur and Srivastava (2014) has empirically shown that adoption readiness and perceived risk have a significant impact on usage intention for mobile payments in India. Xavier & Zakkariya (2021) emphasize hedonic value derived from the use of mobile wallets. In light of these results, the researchers examine whether **Perceived Security has a direct positive effect on customer satisfaction with digital wallets.**

Trust is the confidence the user has in the mobile device and the application while using it for online financial transactions. Trust denotes the positive perception the user has toward the e-wallet. Perceived security and trust are the most vital antecedents of continuous intentions to use e-wallets. Trust also has a profound impact on user satisfaction (Susanto *et al.*, 2016). Several studies like Safari (2012), Sevim & Hall (2014) and Bauman & Bachmann (2017) focusing on the marketing of online services have found that trust is an essential factor for online customers. The perceived threat is minimized once the actual usage experience validates the security measures, so the overall perceived security is improved after adoption. Consumers, especially women, are more likely to form a strong bond with a service provider if they trust it. The stronger this bond the greater is the chance that they will continue using this application and service for a longer period (Rotter, 1980). On the above considerations, the researchers test to bring out whether **Trust has a direct positive effect on customer satisfaction with digital wallets.**

The research done by Dhingra *et al.* (2020) shows that the popularity of e-wallets in the capital city of Delhi was much less during the pre-pandemic days which prompted their study. The main reason for the non-popularity during pre-pandemic days was found to be a security concern, non-acceptability at places, technical illiteracy and lack of Internet connectivity. This situation changed drastically after the pandemic when consumers sought ways to reduce the number of transmission points by reducing convenience and ease of use. The current statistics

reveal that India, which formerly had a cash-based economy predominately, now leads the globe in real-time digital payments, accounting for about 40% of all such transactions, in only six years (The Economic Times, 2023). The widespread use of the Unified Payments Interface (UPI) during the COVID-19 pandemic went far beyond metropolitan areas to include rural India, which astounded the specialists. The Indian Government has leveraged the use of e-wallets by routing smaller transactions through UPI wallets on mobile devices. It helps reduce the volume of bank transactions by acting as a prepaid instrument. By reducing the risk of transactional failure, merchants will be more likely to accept the payment. Thus, UPI was the pioneer in driving digital transformation in the payment industry. India's Generation Z and Millennials have completely embraced digital wallets; and improved customer experience is the primary goal of all consumers. Throughout this paper, the terms "digital wallets" and "e-wallets" have been used interchangeably to refer to software, electronic devices, or online services that allow individuals or businesses to make compact and secure electronic transactions.

Kumar *et al.* (2018) revealed that, amidst the demonetization in India in 2018, the cash crunch had a significant influence on intention to use the mobile wallet, though it did not significantly influence the perceived security.

In the context of these earlier studies, this research intends to conduct a cross-sectional study on the digital wallet usage behaviour of Indian women and the factors influencing their continued usage, using the conceptual framework of Expectations Confirmation Theory. Hence, from the previous literature, Confirmation, Perceived Security, Perceived Usefulness and Trust have been identified as the factors shaping the usage behaviour of digital wallets among Indian women. The Expectation Confirmation Model (ECM) clearly depicts the impact of a user's expectation and confirmation on their satisfaction. The ECM model is apt to explain the continued usage intentions. When an individual starts to use a product or service, the user will gradually form an understanding of its performance, which they will compare to the initial expectations, so that they can evaluate to what extent the initial expectations are met. Thus, it throws light on the post-acceptance variables. Bhattacharjee (2001) opines that the higher the level of expectation confirmation, the more useful the system is to the user, the more satisfied the user is with the system, and the higher the user's intention to continue using such a system. In the above regard, researchers investigate whether **Customer Satisfaction has a direct positive effect on the continuous usage of digital wallets.**

Figure 1 shows the study's suggested model. This study focused on perceived security, perceived utility, confirmation, and trust as independent variables following a thorough examination of the body of current literature. This research will examine how these variables

affect user happiness, which in turn affects consumers' intentions to adopt new technologies continuously.
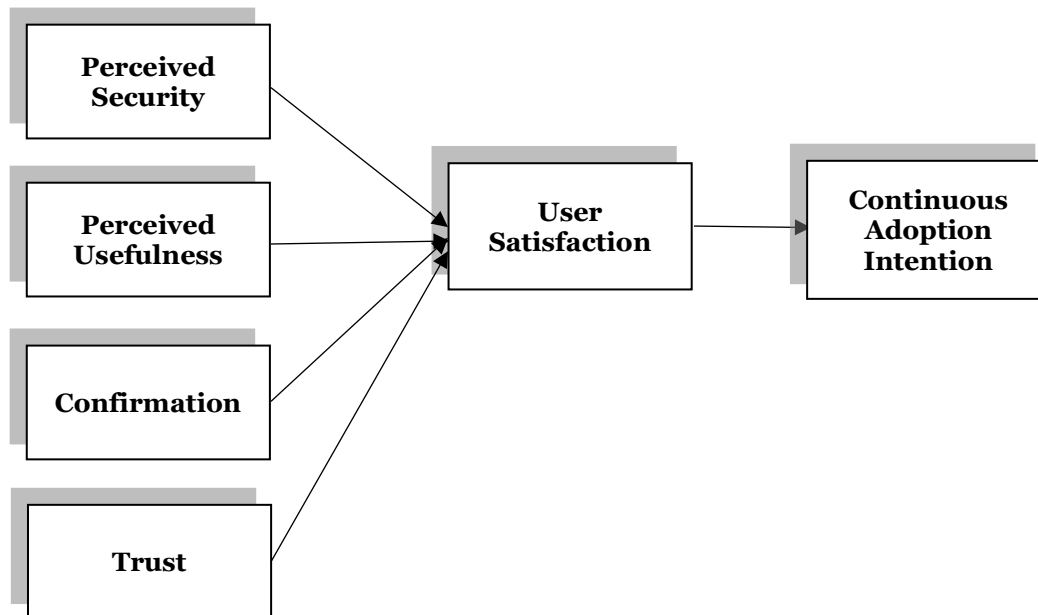

Figure 1. Proposed Model

Research Methodology

To test the research hypothesis, a three-part questionnaire was developed. A survey was conducted through a mall intercept method to collect the needed data. In this study, the independent variables' effects on the continuous adoption intention are examined, as depicted in Figure 1.

Measurement development

The questionnaire was developed based on the research model that was proposed after conducting an extensive literature review. The first session of the questionnaire focused on the demographic data of the participants, like age, gender, income, occupation, etc. The second session consisted of questions on the respondent's usage of e-wallets. The third session consisted of 18 Likert-scale questions that were used to measure the six constructs. All of the constructs used in this study were taken from existing sources to ensure content validity. The constructs for measuring variables such as confirmation and users' continuous intentions were adapted from Bhattacherjee (2001). Measures of customer satisfaction were adapted from Rahi *et al.* (2020). The measures of perceived usefulness were adopted from Daragmeh *et al.* (2021) and items to measure trust were adopted from Kumar *et al.* (2018). Finally, measures of perceived security were adopted from Gao *et al.* (2015). The items were measured using a 5-point Likert scale ranging from 1 for "strongly disagree" to 5 for "strongly agree".

Data collection

The study targeted e-wallet users in India. Since this study is on the factors that impact e-wallet users among women, data was collected from women of different age groups in India. A pilot study of 20 respondents was conducted to ensure there was clarity in the questions, and, based on their responses, a few questions were rephrased and one additional question was incorporated in the final questionnaire. The reliability of the constructs was computed using Cronbach alpha values, and the values were found to be greater than 0.75 for all 6 constructs, thereby indicating satisfactory (Malhotra & Dash, 2020).

A mall intercept method was used to collect data. The researchers intercepted target populations in major malls in India. This method was selected as target audiences of different demographics could be intercepted for data collection. In some cases, the survey was administered on the spot, and, in others, the Google Form was sent to their email address or WhatsApp. The questionnaire was circulated to 350 members of the target population, but only 240 responses were received, of which 217 were valid and were taken for further research. In the sample, 82% of those polled were under the age of 56, while 18% were over the age of 56. The minimum age of the respondents was 25 years, and the maximum was 70 years. Of the 217 respondents, 66.8% are employed, 16% are stay-at-home moms, and 17% are retired. Surprisingly, more than 93% of respondents had a bachelor's degree or higher.

With respect to their e-wallet behaviour, 35% said they use them daily, while 33% said they use them less than five times per week. About 83 % of the respondents have been using e-wallets for more than one year.

Data Analysis and Results

This study has two objectives. The first goal was to identify the factors that influence women's continuous intention towards e-wallet adoption. This objective was assessed using path analysis using structural equation modelling (SEM), which is a tool to empirically test the proposed research model. SEM is a very useful confirmatory model in research to evaluate the measurement instrument and test the hypothesis (Malhotra & Dash, 2020). The second objective was to evaluate the existence of the digital divide among women of two different age groups—56 years and below; and above 56 years. An independent sample t test, a technique used to compare the means of two independent groups, was used to ascertain if the two samples were identical or different.

Measurement model—path analysis

The first step in SEM is to assess the measurement model. The construct reliability was measured using Cronbach's alpha, and the alpha values were found to be greater than 0.75 for all the items, thereby confirming adequate reliability. The SEM results show good model fit (refer to Table 1). In this case, the structural model yielded a CMIN/DF ratio of 2.79 (Table 1), which is within the threshold value of 3.00 (Hair et al., 2010).

Table 1. Goodness of fit indicators in structural model

Fit Indices	Observed Value	Acceptable Threshold Value
CMIN/DF	2.79	≤ 3 (Hair et al., 2010).
GFI	0.989	>0.90 (Hair et al., 2010).
CFI	0.989	≥ 0.90 (Hair et al., 2010).
TLI	0.917	≥ 0.90 (Marsh et al., 2005).
IFI	0.989	≥ 0.90 (Hair et al., 2010).
AGFI	0.886	≥ 0.85 (Schermelleh-Engel et al., 2003).
NFI	0.985	≤ 0.08 (Bentler & Dudgeon, 1996).
P Close	0.089	> 0.05 (Hu & Bentler, 2009).

CMIN/DF: Minimum discrepancy function by degrees of freedom; GFI: Goodness of Fit Index; CFI: Comparative Fit Index; TLI: IFI: Bollen's IFI Tucker-Lewis's index; AGFI: Adjusted Goodness of Fit Index; NFI: Normed Fit Index. Source: Primary Data Analysis

The goodness-of-fit statistic (GFI), which calculates the proportion of variance, demonstrates a value of 0.989. The comparative fit index (CFI) is an extended form of the NFI that takes sample size into account. Its threshold values are also similar to those of NFI, with values closer to 1 considered good fits; values above 0.90 (Hair et al., 2010) are also considered to be good. The study reports CFI = 0.989 and NFI = 0.985 (Table 1), indicating a good model. The adjusted goodness-of-fit index (AGFI) evaluates the issue of bias from model complexity. The Tucker-Lewis Index (TLI) is an incremental conformity index that compares the model tested with the baseline model. In this study, TLI was 0.917. The values for the AGFI also range between 0 and 1, with values closer to 1 indicating a good fit. However, threshold values greater than 0.85 may be considered an acceptable fit (Schermelleh-Engel et al., 2003). IFI, also known as Bollen's IFI, is also relatively insensitive to sample size. Zero indicates having the worst possible model, and a value of one indicates having the best possible. The study reports IFI = 0.989 (Table 1). The p-close value was 0.089, which was greater than the acceptable lower threshold limit of 0.05 (Hu & Bentler, 2009).

With all the indices collectively indicating good fit, the hypothesised model depicting the relationship between the drivers of e-wallet users and its impact on continual intention was found to be fit for further analysis. Path analysis using SEM was conducted to test the hypothesis. The hypothesis was tested, and the results are as given in Table 2.

The outcomes of the path study using structural equation modelling are shown in Figure 2. The e1 and e2 in the figure stand for measurement errors in each item, which is the residual variable produced by the statistical model. The path analysis shows confirmation, perceived security, perceived utility and trust as predictors of user satisfaction. The values on the unidirectional arrows indicate the standardised regression weights as shown in Table 2, whereas the bi-directional arrows indicate the covariance between the predictor variables.

Table 2. Outcome of the hypothesis evaluation of the structural model

Hypothesis			Std Reg. Wts	S.E.	Critical Value	Significance	Results
Satisfaction	<---	Confirmation	.34	.05	5.77	<0.05	Significant
Satisfaction	<---	Perceived Security	.05	.05	.90	.37	Not Significant
Satisfaction	<---	Perceived Usefulness	.27	.05	4.83	<0.05	Significant
Satisfaction	<---	Trust	.29	.05	5.01	<0.05	Significant
Continuous Intention	<---	Satisfaction	.40	.07	6.70	<0.05	Significant
Continuous Intention	<---	Perceived Security	.21	.06	4.04	<0.05	Significant
Continuous Intention	<---	Perceived Usefulness	.32	.07	5.63	<0.05	Significant

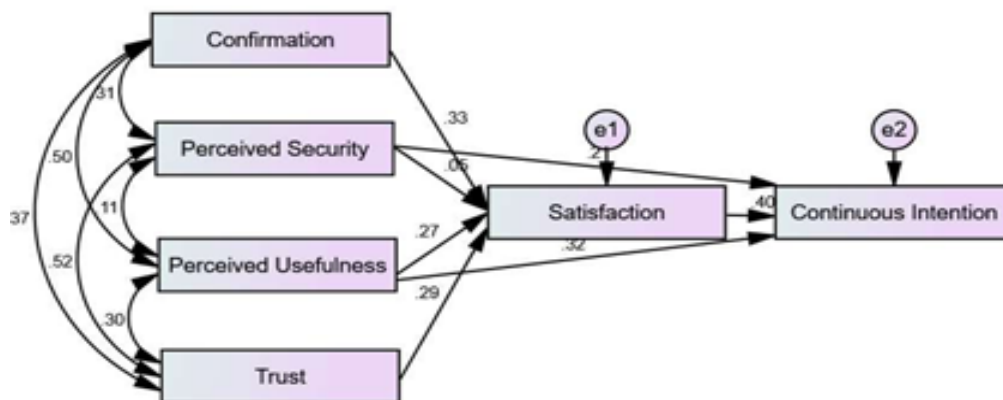Std. Reg. Wts: Standardised Regression Weights. Source: Primary Data Analysis

Figure 2. Path Analysis using Structural Equation Modelling

The results of the path analysis show that confirmation, perceived usefulness, and trust have a direct and significant impact on the respondent's satisfaction with e-wallets (refer Figure 2). Of the four, confirmation has the greatest influence on e-wallet user satisfaction, with a regression coefficient of 0.335. This is consistent with previous studies (Foroughi *et al.*, 2019; Rahi *et al.*, 2020). This means that service providers must ensure that they deliver on their promises in order to enable continuous intention. In line with the previous literature, trust was found to have a positive impact on the satisfaction of e-wallet users. Also, the effect of perceived security on satisfaction was found to be insignificant; however, perceived security

was found to have a direct impact on continuous intention (refer Figure 2). That is to say, service providers have to ensure the security and privacy of the e-wallets in order for women to have a continual usage intention. These results are in agreement with the existing study on e-wallets done in Palestine (Daragmeh *et al.*, 2022). Perceived usefulness and perceived satisfaction were found to have a significant impact on the post-adoption behaviour of women e-wallet users (Duarte *et al.*, 2018; Hsu *et al.*, 2010).

Cross-sectional analysis using independent sample t test

The study's second goal was to see if the adoption of e-wallets differed across different groups of women. Respondents were divided into two age groups to study the digital divide among women in India: 56 and under; and 56 and above—56 is the retirement age. The researchers used an independent sample t-test to assess if the digital divide exists in these two age groups.

Table 3. Statistics -Cross sectional Comparison

Cross sectional Comparison					
	Age	**N**	**Mean**	**Std Deviation**	**Std Error Mean**
Confirmation	56 years and below	179	12.44	1.79	0.13
	Above 56 years	38	12.21	1.42	0.23
Perceived Security	56 years and below	179	9.23	1.80	0.13
	Above 56 years	38	9.53	1.18	0.19
Perceived Usefulness	56 years and below	179	13.53	1.70	0.12
	Above 56 years	38	12.63	1.08	0.17
Trust	56 years and below	179	11.24	1.92	0.14
	Above 56 years	38	11.50	1.74	0.28
Satisfaction	56 years and below	179	12.56	1.66	0.12
	Above 56 years	38	12.13	1.09	0.18
Continuous Intention	56 years and below	179	12.56	1.99	0.15
	Above 56 years	38	12.18	1.61	0.26

Source: Primary Data Analysis

Table 3 depicts the mean and standard deviation statistics of the six variables between two age categories. Comparing these mean values, it can be noted that the age group '56 years and below' reported higher mean values for variables confirmation, satisfaction, perceived usefulness and continual intention, whereas the mean vales of the variables perceived security, and trust were reported high for the age group 'above 56 years'.

Table 4 demonstrates the results of the independent sample t-test, and it reports Levene's test as significant, indicating that the two groups did not show homogeneity of variance on the dependent variables. Hence, the t-test for the equality of means was checked under the condition of equal variances not assumed, and it was found that there is a significant ($p < .05$) difference in the levels of perceived usefulness and perceived satisfaction reported by the two different age groups. Looking at the mean score, women aged 56 and below had higher levels

of perceived usefulness (13.53) than women aged 56 and above (12.63). In addition, women aged 56 and under had a significantly higher mean score of perceived satisfaction (12.56) than women aged 56 and up (12.13) (see Table 3).

Table 4. Independent Sample Test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std Error Difference	Lower	Upper
Confirmation	Equal variances assumed	7.35	0.01	0.73	215	0.47	0.23	0.31	-0.38	0.83
	Equal variances not assumed			0.85	64.64	0.4	0.23	0.26	-0.31	0.76
Perceived Security	Equal variances assumed	5.80	0.02	-0.98	215	0.33	-0.29	0.31	-0.90	0.30
	Equal variances not assumed			-1.27	78.55	0.21	-0.30	0.23	-0.76	0.17
Perceived Usefulness	Equal variances assumed	23.24	0.00	3.2	215	0.00	0.90	0.28	0.35	1.45
	Equal variances not assumed			4.20	79.61	0.00	0.90	0.21	0.47	1.33
Trust	Equal variances assumed	2.26	0.14	-0.75	215	0.45	-0.25	0.34	-0.92	0.41
	Equal variances not assumed			-0.8	57.87	0.42	-0.25	0.32	-0.89	0.38
Satisfaction	Equal variances assumed	17.36	0.00	1.52	215	0.13	0.43	0.28	-0.13	0.98
	Equal variances not assumed			1.97	77.86	0.05	0.43	0.22	-0.00	0.86
Continuous Intention	Equal variances assumed	9.87	0.00	1.09	215	0.28	0.37	0.34	-0.30	1.05

Independent Samples Test							
Equal variances not assumed	1.25	63.45	0.22	0.37	0.30	-0.23	0.97

Source: Primary Data Analysis

Discussion and Practical Implications

The present study investigated the determinants of users' continuous intentions in the context of e-wallets. Overall, the study augments the body of knowledge, specifically in understanding the behavioural intentions of e-wallet adoption among women in India. Most importantly, this study shed light on aspects of the digital divide between two cross-sections of women in Indian society.

The results of the path analysis demonstrate all the proposed hypotheses were accepted, except for the impact of perceived security on user satisfaction. However, in congruence with the results of Daragmeh *et al.* (2022), perceived security was found to have a significant impact on the continuous intention of using e-wallets. One possible explanation for the lack of significance of perceived security on user satisfaction is that security is no longer regarded as an attribute that can lead to satisfaction. In today's tech-savvy world, where e-commerce is so widespread, perhaps people consider security to be a basic attribute of a service, i.e., an "order qualifier attribute" and not an "order winner attribute". To put it another way, while it is critical that customers perceive security when using e-wallets, this attribute alone does not contribute to user satisfaction but is one of the factors that ensures continued adoption.

The results also demonstrate that perceived usefulness and confirmation have a positive influence on user satisfaction with e-wallets, which is consistent with the findings of Gilani *et al.* (2016) and Foroughi *et al.* (2017). This means that the service providers have to ensure that they deliver on their promises. Confirmation is a very critical aspect of building user satisfaction, and any perceived gap between the actual and promised experience will result in loss of trust and eventually affect consumers' post-adoption behaviour. Service providers also have to differentiate themselves in terms of the usefulness of their e-wallet services. To guarantee continuous adoption, e-wallets should be more user-friendly, easy to understand, have a simpler interface, and efficiently communicate the features of the e-wallets; FAQs are one way of enhancing perceived usefulness (Foroughi *et al.*, 2019). Analogous to the results of Manrai *et al.* (2022), trust is also a crucial factor in framing the behavioural intentions to use e-wallets among women consumers.

Finally, results demonstrated that perceived satisfaction has a huge impact on the continuous intention of e-wallet adoption among women, which is in congruence with several previous

studies (Alfany *et al.*, 2019). The more content women are with their e-wallets, the higher the prospects of continuous adoption (Esawe, 2022).

This study also investigated the existence of the digital divide among two cross-sections of women in India concerning e-wallet adoption and continuous intention. The results of the independent sample t-test demonstrate that there was not any significant difference between the means of the two age groups. That is, contrary to our expectations, the values for confirmation, perceived security, trust, perceived satisfaction, and continuous intention were the same across both categories. To put it another way, the study found no difference in women's intentions to use an e-wallet on a consistent basis across age groups. A primary reason for this result could be because the majority of the above 56-year-old women were retired professionals, either from banks or colleges. This could be because their exposure to technology in their respective jobs has made them more adaptable to it. Secondly, as respondents were mostly from metros and tier-2 cities, studies have proven that women's participation in the workforce has enhanced technology adoption (Manrai *et al.*, 2022; Bose *et al.*, 2022).

Limitations

Although this study accomplished its objectives, it has a few limitations that need to be addressed. Firstly, 82 percent of those who took the survey were below the age of 56, so a possibility of bias in the cross-sectional study exists. In the future, a more representative population of various age groups will need to be selected. As the mall intercept method was used for data collection, a representative sample could not be attained. Secondly, the researchers have explored only five variables, which they were convinced have an impact on the behavioural intentions of women. As the features of the e-wallets are upgraded, more relevant variables can be added to the study in the future. Also, this result cannot be generalised for the rural women's population, as this study was conducted among tier-2 cities and metros.

Conclusion

Users' continuous intention is very critical for the success of all digital payment platforms. The findings of this research validate that user satisfaction and the perceived security and usefulness of e-wallets directly impact their continued adoption intentions. Perceived confirmation, usefulness, and trust influence user satisfaction among women. Finally, the study also found that the digital divide among urban women consumers in India, across the retired and working classes, is not true. This study not only contributed to the knowledge of e-wallets in India but also provided insights to banks and e-wallet service providers concerning

the drivers of continuous intention for e-wallets and their perception among various cross-sections of women.

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Impact of Technology-Evoked Mental Imagery on Brand Personality and Brand Association for Beauty Brands among Women in India

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Abstract: The increased dependence of customers on smart technology for convenience has motivated marketers to turn to new-age technologies for the representation of products and promotion of brands. This study analyses the influence of mental imagery generated by augmented reality on brand personality and brand association for skincare/cosmetics products among women in India. The cross-sectional study collected data through the mall intercept method. The significance of this study is the usage of real brands and gathering real experiences towards mental imagery evoked using virtual try-on links. The originality of the brands and the experience of the respondents could create a realistic relationship between the constructs under study and avoid the researcher's bias. Path analysis was performed to analyse the statistics and the data fit with the proposed model through IBM AMOS 22.0 software. The findings showcase that elaboration dimension of mental imagery has a significant relationship with brand personality and brand association. However, the quality dimension of mental imagery did not have a significant relationship with brand personality and brand association. The findings contribute to the existing literature on branding and information processing and provide significant insights for marketers when adopting augmented reality to create brand-evoked mental imagery among customers.

Keywords: Mental imagery, female brand personality, brand association, augmented reality

Introduction

Humans by nature are visual beings and brands primarily capitalise on the visualisation power of the rational customers through attractive brand elements, like logos, package colours, fonts, brand mascots, etc. Marketers, for long years, have motivated consumers to employ their imagination while interacting with brands. The already proven idea that visualization increases consumers' purchase intention (Babin & Burns, 1998; Smink *et al.*, 2020) is reinforced by the brand logos, slogans and visual representations of products (Elder & Krishna, 2012). The study of mental imagery in information processing is garnering interest in consumer behaviour studies, as the integration of the rich senses of the physical world into the online marketplace is resulting in highly context-driven integration with customers' real-time processing of augmented-reality-based brand experiences, making it enjoyable, effective and value adding (Hilken *et al.*, 2017).

In the book *Being Digital,* the "digital revolution" that influenced customer experience over the past 20 years is described as a shift from "atoms" to "bits". Moreover, as per studies, the next 20 years will witness a new phase of the digital revolution which will be highlighted by a shift from "bits" back to "atoms" and instilling digital information into physical and tangible products (Negroponte *et al.*, 1997). At the heart of the new revolution transforming customer experience are artificial intelligence-powered three technology clusters: the Internet-of-Things (IoT), augmented reality (AR)/virtual reality (VR)/mixed reality (MR), and virtual assistants/chatbots/robots; and these technologies are highly argued to enhance the concept of customer experience (Hoyer *et al.*, 2020). The working definition of augmented reality for the current study is "augmented reality is a medium in which digital information is overlaid on the physical world that is in both spatial and temporal registration with the physical world and that is interactive in time" (Craig, 2013).

Previous studies reveal that both elaboration and quality of mental imagery significantly influence consumers' attitude towards the product (Park & Yoo, 2019) and the positive product attitude created by mental imagery helps generate positive purchase intentions among the consumers (Smink *et al.*, 2020). In online retailing, the augmented reality technology has been studied and found to be effective to reduce the mental intangibility with the sensory controls and enhance customer value judgements (Heller *et al.*, 2019b). The artificial intelligence-powered technologies, more specifically augmented reality/virtual reality/mixed reality evokes imagination, enabling consumers to virtually experience the products or services in real-time in 3D. The application of the new age technologies in the pre-transaction stage of the customer journey is observed and found in many industries. In online retailing, for example, customers using the augmented reality technology can virtually furnish spaces and clearly

visualize how a specific table or chair fits into the selected space (e.g., IKEA's place app) or even consumers can visualize and evaluate how specific cosmetic products or eyeware look on their face (e.g., L'Oréal Makeup Genius app or Lenskart app). Thus, the virtual enhancement of the physical environment of the consumers (Hilken *et al.*, 2017) and the capability to evoke the perception of being locally present within customers' environment (Verhagen *et al.*, 2014) enable the visual images generated through augmented reality technology to dominate customers' product purchase intention, decision-making and consumption.

Multiple studies have been conducted to understand the influence of AR on consumer purchase decisions, consumption, brand attitude, etc. However, relatively little research has been conducted to understand the so-called concept of "brand-evoked mental imagery". Brand-evoked mental imagery is the imagery evoked through the marketing of a product or a service as a brand (Gavilan & Avello, 2020) and visualization evoked beyond product-related visual images (Smink *et al.*, 2020). Thus, the goal of this research is to understand the influence of augmented reality-generated mental imagery on brand personality and brand association. Primarily, this research attempts to supplement the existing literature on mental imagery by providing an understanding of the influence of mental imagery generated by brands (through the augmented reality technology) on the brand personality and brand association. This study is significant, since new technologies primarily focus to bring life to brands and be able to evoke all the senses of the customers for a better brand experience. Thus, understanding the influence created by augmented reality-evoked mental imagery for a specific brand on its brand personality and aligned brand association is invariably significant in creating more personified brands that enhance customers' brand association and experiences.

This research also has a few practical implications, and the results would enable marketers to clearly understand the penetration of usage of augmented reality technology, specifically in the skincare or cosmetics sector. The research will outline the significance of the effect of mental imagery on brand personality, as well as brand association. Primary data for the current study was collected through the mall intercept method at various points of time over a period of four months; and a total 165 responses were qualified for the data analysis. The qualified data was analysed using structural equation modelling, and the structural model framework and research hypotheses were tested. The findings of the study revealed that the previous knowledge or experience of the brand do have an influence on the mental imagery evoked through virtual mirrors and this also has positive impact on the brand personality and brand association. However, the interaction during the study with the respondents revealed that previous knowledge about the offerings of the specific cosmetic brand posed a hindrance in a trial of product variants of the brand using AR assistance, since the respondents felt slight

differences between the original product they use and the virtual image of the product. This result will enable marketers in the beauty industry to understand the key association cues to be highlighted as they adopt or integrate artificial intelligence-powered technology in future for their brands.

In the following sections, we present an overview of the beauty industry, the literature review and our hypothesis, then details of the study conducted and, finally, a conclusion by highlighting the specific contributions of the study and suggestions for future study in this area.

Beauty Market and Augmented Reality in India

India is a country in South Asia and is the democracy with highest population in the world. With a thriving young population and growing disposable income, India is considered as one crucial market for future growth by corporations worldwide. India's Beauty and Personal Care (BPC) market is ranked fourth globally with a total revenue of US$8.07bn (Statista, 2022b). The BPC industry in India is expected to grow at a CAGR of 6.45% over the next five years and reach $38 billion by 2028 (IMARC Group, 2022). The beauty and cosmetics product segment primarily includes five categories: body care, face care, hair care, hand care and colour cosmetics. The Indian cosmetics market, in fact, is showing strong signs of growth during the next five years and the market size is expected to grow at a CAGR of 2.87% during the period from 2023–2027 (Statista, 2022a). The Indian market predominantly is capitalised by international skincare and beauty products; however, with the popularity of direct-to-customers (D2C), demand for natural and harmful chemical-free products and increased usage of new mediums like Instagram for shopping, an opportunity has been created for new indigenous companies, such as MamaEarth, Khadi Essentials Plum, and SoulTree, to promote their cruelty-free homemade cosmetics and personal care products.

Besides the growth and popularity of new and natural beauty and cosmetic brands, another sector to witness success was the online discovery and sales of the beauty and personal care products. For instance, in 2012, Nykaa E-Retail Private Limited was founded by Falguni Nayar as an online-only retailer of beauty and cosmetics products; and Nykaa today is one of the leading companies with the highest share in the online beauty and personal care segment (Statista, 2022b). The advent of Covid-19 and the related restrictions in the movement of people and the introduction of artificial intelligence-powered virtual mirrors and apps by brands to attract sales, left consumers wanting more benefits from the convenience of a few taps on their smartphones. Moreover, technology aids enable brands to carry out digital diagnosis of customer problems and provide personalized solutions to individual customers. Customers no longer prefer the 'one size fits all' approach and, instead, prefer a 1:1 tailored

solution. Powered by this demand for personalization, brands are turning to the advantage of artificial intelligence and, specifically, augmented reality technology for online retailing.

According to market trends and research, the total augmented reality/virtual reality market size in India is expected to advance at a CAGR of 38.29%, reaching a total value of US$14.07 billion by 2027. Globally, the augmented reality/virtual reality market sizes stood at US$28 billion in 2021 and have been projected to reach US$250 billion by 2028 (Statista, 2022b). In terms of revenue as well, the AR and VR market is projected to reach US$624.30m in 2023. The AR/VR market has an expected annual growth rate (CAGR 2023–2027) of 14.63%, resulting in a projected market volume of US$1,078m by 2027; and AR software with a market volume of US$211.30m in 2023 is the largest segment.

Problem statement

The artificial intelligence-powered new technologies adopted by various brands, such as the Internet of things (IoT), virtual reality (VR), augmented reality (AR), mixed reality (MR), chatbots, virtual assistants and robots, are enabling brands to provide a more immersive and interactive customer experience (Hoyer *et al.*, 2020). The results of empirical evidence in consumer behaviour gathered through multiple experiments using the Microsoft HoloLens m-AR technology in the context of online retailing indicate that m-AR integrates well a consumer's perception of the physical environment with digitally enhanced interactive and sensory information and expands the multiple sensory control, resulting in active inference and feedback process within the online context (Heller *et al.*, 2019a). Through computer-generated imagery and environment, augmented reality alters how consumers interact and sense products (Qin *et al.*, 2021). Also, the virtual features of augmented reality, such as real-time connectivity, offer a captivating experience of exploring real products (McLean & Wilson, 2019). Hence, it is evident that augmented reality enables customers to better visualize the products in view and help enhance their purchase intentions. However, there is a significant scope to understand the influence of augmented reality-generated visual mental imagery on branding, specifically in enhancing brand personality and brand association.

Literature Review and Hypotheses

Mental imagery

Richardson (1969) in his book titled *Mental Imagery* attempted to provide a formal definition for mental imagery, one that encompasses all the dimensions that enable us to understand the actual meaning of the subject. Thus, he referred to mental imagery as "(1) all those quasi-sensory or quasi-perceptual experiences of which (2) we are self-consciously aware, and which (3) exist for us in the absence of those stimulus conditions that are known to produce their

genuine sensory or perceptual counterparts, and which (4) may be expected to have different consequences from their sensory or perceptual counterparts". In simple terms, mental imagery is defined as "a process by which sensory information is represented in working memory in the absence of genuine and perceptual counterparts" (MacInnis & Price, 1987; Richardson, 1969).

The mental imagery theory states that "individuals mentally represent stimuli and actions based on what they have experienced in the past, combined with perceptual information available at that moment" (Lee & Gretzel, 2012). Imagery anchors heavily on past experiences and stored knowledge and manifests vivid sensory representations of feelings, memories and ideas (Yuille & Catchpole, 1977). Thus, forming imagery is multi-sensory and employs all modalities of human senses: visual, auditory, olfactory, kinaesthetic, gustatory, and haptic. Out of all the senses, perception is created by two-thirds of all information captured through the visual system of the brain, and visual stimuli dominate during decision-making and actual consumption (Schifferstein, 2009).

Visual imagery or visual mental imagery has been highlighted as the experience of "seeing with the mind's eye" (Kosslyn *et al.*, 2006). The formation of clear and robust visual mental imagery is subject to the nature of the stimuli, the individual's cognitive orientation, the availability of information that arouses imagination, and positive (or favourable) experiences that are consistent with an individual's sensory information (Krishna & Schwarz, 2014). In today's information age, as compared to descriptive or symbolic information, imagery is undoubtedly a vital tool for information processing. Imagery, with its unique capability to draw more realistic representations of the stimuli and create a lasting impact on affective, cognitive, physiological and behavioural phenomena (MacInnis & Price, 1987), is only poised to garner more interest among researchers with the advancement in invention and application of technology in all major fields of study and trade.

In an online or virtual environment, mental imagery plays a more significant role, since studies indicate that in such situations, when products cannot be physically experienced or felt, consumers tend to form mental images of using the brand or product by reproducing their previous experiences with it in their mind (Argyriou, 2012) or consumers may even create new images or pictures of prospective future experience using mental imagery. Thus, due to the nature of online retailing, mental imagery is becoming very important in information processing.

Mental imagery is multidimensional and, through analysis and testing, Babin & Burns (1998) established a three-dimensional model consisting of vividness (quality), quantity and elaboration. For previous studies and scales, primarily conducted using ad copies as stimuli to

generate mental imagery, the quantity of images, referred to as the number of images that come to mind when evoked by a stimulus (McGill & Anand, 1989), was significant. However, for our study related to AR-generated visual imagery, the dimensions of mental imagery have been limited to elaboration and quality. Vividness or quality is the clarity with which an individual senses an image and reflects its intensity, and distinctiveness (Bone & Ellen, 1992); and the elaboration dimension of mental imagery is the activation of information, over and above that provided by the stimulus, in generating mental images (Babin & Burns, 1998).

Gender dimension of brand personality

Brand Personality (BP) is defined as "the set of human characteristics associated with a brand" (Aaker, 1997). Like mental imagery, brand personality is also a multidimensional construct, popularly measured along the five dimensions of sincerity, excitement, competence, sophistication, and ruggedness, which uniquely apply to consumers' characterization of brands (Aaker, 1997). Studies indicate that consumers attribute personality traits to brands because marketers highlight specific characteristics of brands or because customers perceive brands as an extension of self and use brands for self-expressive purposes (Fournier, 1998; Sirgy, 1982). Since gender is an integral part of an individual's self-concept, gender dimensions of personality are specifically relevant to symbolic (rather than utilitarian) brands attempting to enhance the masculinity and femininity of consumers (e.g., personal care, fragrance, apparel brands). In practice as well, brands support consumers' interest in self-expression and imbibe masculine or feminine brand associations—for example, using packaging colour (e.g., white or pastel colour packaging to indicate natural and chemical-free products). Thus, gender dimensions of brand personality are effective to positively influence affective, attitudinal, and behavioural consumer responses, especially when congruent with sex role identity of consumers, and enable individual consumers to express a very significant dimension of self-concept (Grohmann, 2009).

The theory of anthropomorphism, which is one of the primary foundations for the concept of brand personality, focuses on attributing human-life characteristics or traits to non-living objects (i.e., products/brands); and this is analysed to be an effective way to increase consumer confidence in acceptance and usage of augmented reality technology (van Esch et al., 2019). An augmented reality-based study among Generation Z also revealed that Gen Z or millennials look forward to using augmented realty across different sectors in comparison to non-millennials; and exhibited positive significance towards openness and extraversion dimensions of brand personality and negative significance towards conscientiousness and neuroticism dimensions of brand personality (Srivastava et al., 2021). The results of another study, which compared virtual reality ads with 2D ads, indicated a significant relation towards

sophistication and excitement dimensions of brand personality and also towards the ruggedness dimension. Thus, logically and also theoretically, it is learned that, in interactions of consumers with anthropomorphised technologies like augmented reality, customers are able to experience a human touch and sense an elevated emotional connection and bond with the brand (Manchanda & Deb, 2021).

H₁a: There is a significant relationship between elaboration of mental imagery and brand personality.

H₁b: There is a significant relationship between quality of mental imagery and brand personality.
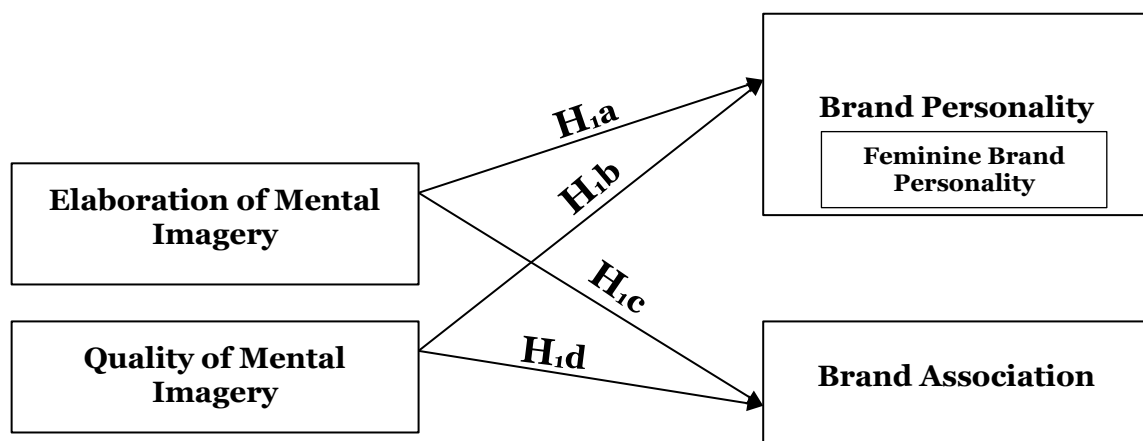
Figure 1. Hypothetical Model

Brand association

One of the four dimensions of brand equity is brand associations, along with the other three dimensions of brand awareness, perceived quality and brand loyalty (Aaker & Joachimsthaler, 2000). Also, there is a vast amount of literature that highlights brand associations being an integral part towards the success of brands. Though brand association has been studied in different facets, it was a qualitative study done by Azar (2015) that highlighted brand sexual associations as an important factor for competitive brand positioning, and encouraged a branding based on sexual associations as highly prospective for brands. Very few studies have been conducted to study the significance of augmented reality-based mental imagery on brand association. Prior studies have highlighted contributions that demonstrate the influence of perceived immersion and perceived enjoyment on brand association in the mixed reality context (Bae *et al.*, 2020). It will be interesting to understand the impact of AR-generated mental imagery on brand association, specifically brand sexual association.

H₁c: There is a significant relationship between elaboration of mental imagery and brand association.

H₁d: There is a significant relationship between quality of mental imagery and brand association.

Methodology

Methodological premises

The current study has a cross-sectional descriptive research design; and primary data was collected through the mall intercept method at various points of time over a period of four months. The understanding of the reality that not many customers have purchased skincare/cosmetic products online with augmented reality assistance enabled framing the questionnaire in an experimental manner by inserting virtual try-on links of four popular brands, namely: L'Oréal Paris, Lakme India, Revlon and Colorbar. This insertion of links enabled us to evaluate the mental imagery generated by AR better among respondents who had not experienced augmented reality before for beauty products (though many had experience of augmented reality for purchase of fashion items). The significance of this study is the usage of existing and real brands (vs imaginary brands) and, thus, gathering real experience of respondents towards the mental imagery experienced by them. The originality of the brands and the experience for the respondents enabled us to create a more realistic relationship between the constructs under study and helped avoid the researcher's bias.

Sample size and data collection

The sample size was estimated statistically by considering the variation in the data. The same was estimated to be 158. In total, 170 questionnaires were distributed and, after removing questionnaires without full information, data from 165 respondents finally qualified for the data analysis. The study approached the respondents with a mall intercept survey method. The respondents who showed willingness to participate in the study at various malls were provided with the survey questionnaire link and the responses gathered were used to test the proposed hypothetical model employed. The survey questionnaire had two sections. The first section had seven questions probing the respondents' age, frequency of using skincare products, frequency of using cosmetic products (like lipstick, foundation, etc.), and prior experience of online purchase of skincare/cosmetics brand with augmented reality assistance. If the response of the respondents was 'Yes', indicating prior experience with augmented reality-based online purchase, then the respondents were asked to specify the brand and the specific products they had purchased. In the case that the response of the respondents to the question of having prior experience with augmented reality-based online purchase was 'No', the respondents were directed (within the questionnaire) towards virtual try-on links of four popular brands, namely: L'Oréal Paris, Lakme India, Revlon and Colorbar. The respondents

could click any link to the virtual try-on of the listed four brands and experience for themselves the sensory experience of trying out any specific beauty product of their choice.

The second section of the questionnaire had in total 20 questions to analyse mental imagery, brand personality and brand association constructs. The 7-point Likert scale (1="strongly disagree" to 7="strongly agree") items, relating to the elaboration of the dimension of mental imagery construct, were adapted from a modified scale for measurement of communication-evoked mental imagery by Babin & Burns (1998); and the four semantic differential scale items, adapted from the study of Park & Yoo (2019), were used to measure quality of mental imagery dimension. The 9-point Likert scale (ranging from 1="not at all" to 9="fully applies") for the construct of Feminine Brand Personality (FBP) was adapted from the study by Grohmann (2009); and the 5-point Likert scale (anchored at 1="strongly disagree" and 5="strongly agree") for Brand Association was adapted from the study of Yoo & Donthu (1997, 2001). All the existing scales used for variables have been validated by previous studies.

Skincare/cosmetics brands were selected as the area for study owing to the symbolic nature of the product and the growing significance, since Covid-19, of virtual mirrors for purchase of beauty products online. Thus, considering the nature of the products, the population for the study was taken as females and the feminine brand personality (FBP) alone was considered under the brand personality construct. The primary data was collected from females and a convenience sampling technique was employed to select the respondents. The questionnaire developed in Google Forms was circulated to a total of 200 females, and only 165 respondents were considered for the current study, since other responses were unsatisfactory under certain sections.

Table 1. Construct Measurement Scales

Measure	Anchor	Source
MENTAL IMAGERY ELABORATION AR helped me to fantasize about the product. AR helped me to imagine what it would be like to use the product. AR helped me to imagine the feel of the product. AR features helped bring to my mind concrete images or mental pictures. AR features helped me to visualise the product trial. **QUALITY:** Overall, the images that came to mind while I used the AR were: Sharp – Dull Intense – Weak Clear – Unclear Vivid – Vague	7-point Likert-scale: 1= "strongly disagree" to 7= "strongly agree"	Babin & Burns (1998) Park & Yoo (2019)

Measure	Anchor	Source
BRAND PERSONALITY **FBP: Rate your perception about the specific skincare/cosmetic brand personality:** Expresses tender feelings Fragile Graceful Sensitive Sweet Tender	9-point Likert scale ranging from 1="not at all" to 9="fully applies."	Grohmann (2009)
BRAND ASSOCIATION/AWARENESS I can recognize the brand among other competing brands. I am aware of the brand. Some characteristics of the brand come to my mind quickly. I can quickly recall the symbol or logo of the brand. I have difficulty in imagining the brand in my mind.	5-point Likert scale anchored at 1="strongly disagree"and5="strongly agree"	Yoo & Donthu (1997, 2001)

Data Analysis and Results

The data collected was analysed using structural equation modelling and the structural model framework and research hypotheses were tested. Path analysis was employed to analyse the statistics and the data fit with the proposed model through IBM AMOS 22.0 software.

The ratio of chi-squared minimum to the degree of freedom (CMIN/DF) was 4.381, which falls in the ideal fit criteria of less than 5 and illustrates an ideal fit between the data and the model. The value of other indices that indicate the model fit are GFI (goodness-of-fit index) = .952, CFI (comparative fit index) = .922, and AGFI (adjusted goodness-of-fit index) = .824 (Table 2). Thus, it can be reported that the hypothetical model illustrating the influence of variables specified in the hypothesis was found to be fit for further analysis.

Table 2. Model Fit Statistics

Measures	Threshold Values	Observed Value
CMIN/DF	< 3 Ideal. The values are acceptable between 3 and 5 (Hair *et al.*, 2010)	4.381
CFI	> 0.90 (Hu & Bentler, 1999)	.922
GFI	> 0.95 (Baumgartner & Homburg, 1996)	.952
AGFI	> 0.80 (Baumgartner & Homburg, 1996)	.824

The relationship of elaboration of mental imagery on feminine brand personality (FBP) and on Brand Association were found to be significant; hence, H1a and H2a were accepted (p<0.05). The path analysis also checked the association of quality of mental imagery to FBP

and BA and it was found to have no significant relationship. Hence, H1b and H2b were rejected (p>0.05). See Table 3 and Figure 2.

Table 3. Regression Coefficients

IV	DV	Regression Coefficient	Standard-ised Regression Coefficient	CR	P Value	Decision	Type
Elabor-ation	Brand Personality	.449	.277	3.137	<0.05	Accepted	Hypothesized
Elabor-ation	Brand Association	.211	.446	5.358	<0.05	Accepted	Hypothesized
Quality	Brand Personality	.544	.155	1.754	>0.05	Rejected	Hypothesized
Quality	Brand Association	.077	.075	.902	>0.05	Rejected	Hypothesized
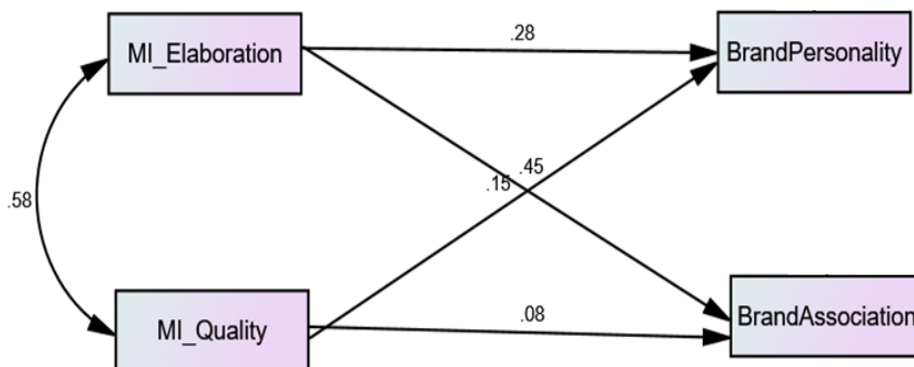
Figure 2. Path Diagram

Discussion and Implications

The fact that augmented reality-based technology enables marketers to 'bring life' to brands and create 'telepresence' of the advertised products is key to the better acceptance of such technologies in the retail sector. Moreover, studies have revealed that the application of new technologies (specifically AR and VR) in the retail sector have helped to enhance purchase intentions of customers and, additionally, have helped to grow sales (especially during and post Covid-19 restrictions) and revenues. Past studies have highlighted that augmented reality-based technology is the most appropriate technology to be adopted to engage the customers in the early stages of their customer journey, i.e., at the pre-purchase/pre-consumption stage (Zarantonello & Schmitt, 2023). With its playful elements, augmented

reality can enable customers to have an immersive experience with the featured products (Kang *et al.*, 2020); and, also, studies in virtual try-on settings have revealed that augmented reality is capable of increasing the variants and range of products in the consideration set of customers (Romano *et al.*, 2021). The flow experience created by augmentation of a customer's surrounding environment and self by virtual mirrors and virtual try-on features immerse the customer into a better experience of the featured product, rather than the brand featuring the specific product. Hence, the flow experience created by augmented reality (Javornik, 2016; Barhorst *et al.*, 2021) help increase customers' purchase intention, but has no significant effect in enhancing brand presence or brand-related thoughts in the minds of customers.

The current study focuses on how mental imagery created by augmented reality influences brand personality and brand association. The study found that the elaboration element (vs quality) of the mental imagery construct has a significant influence on brand personality and brand association. The finding rather highlights that the processing of visual mental imagery created by augmented reality indeed contributes towards elaboration of brand features and not just enhances the featured product(s).

Theoretical implications

The results of the current study contribute to the literature on branding and information processing and highlight the significance of AR-evoked mental imagery for appropriate brand personality association and overall brand association among customers. Previous studies have highlighted that mental imagery processing plays a crucial role in the virtual setting (Overmars & Poels, 2015) and leads to enhanced customer purchase intention and brand attitude (Zanger *et al.*, 2022).

Our study showed that AR-based product experience also enabled respondents to relate positively to the personality characteristics of the brand. The current study, using virtual mirrors (not AR apps), showed that AR enabled right visualization of the specific product of the chosen brand; and respondents (with or without previous AR-based purchase experience) were able to experience significant feminine brand personality traits for the brand. The results of the current study thus contribute to information processing theory and branding theory by highlighting the existence of a significant influence of the elaboration element of mental imagery on brand personality while processing imagery information during an online purchase. Also, while previous AR studies have contributed to branding theory by highlighting how interactive and experiential features of AR lead to better brand recognition and create better brand perception and attitude, the current study highlights that AR-based mental imagery is able to create better and significant brand association. This result highlights that AR, if rightly employed in combination with other marketing practices, can contribute to

better brand association, leading to better brand differentiation from competitors. As far as cosmetics and beauty products are concerned, the products of different brands remain similar to a large extent, with minor changes in the available shades. Thus, customers largely tend to be attracted to the product and are willing to try new brands (especially if it is organic or natural). In such a scenario, the application of an AR-powered virtual mirror will help brands to create better awareness and association among targeted and existing customers.

The current study found that no significant relationship existed between the quality element of mental imagery and the other two constructs of brand personality and brand association. One possible explanation for such a negative relationship can be the focus of the study on the impact of visual mental imagery processing on the specified brands and not on any one specific product range.

Practical implications

The current study enabled us to realise that the new technologies are only one among different means to familiarize brands, increase sales and enhance brand-evoked mental imagery. This realisation is in line with the results from the study by Gavilan & Avello ([2020](#)), which highlights that a familiar brand (against an unfamiliar brand) evokes in the customer enhanced levels of visual mental imagery; and brand favourability has a positive and significant moderating effect in the relationship between brand familiarity and visual mental imagery. To generate real brand awareness and brand familiarity for better brand-evoked mental imagery, marketers need to create an omni-channel marketing strategy for the brand, consisting of direct relevant advertisements, call-to-action sponsored ads in social handles of the brand, creation of brand communities, and also adoption of relevant new technologies (AR/VR/MR) appropriately for the brand's online store.

The hypotheses H_1a and H_1b accepted in the current study ($p<0.05$) are consistent with the results of previous studies that higher levels of elaboration during information processing help better cognitive responses by customers to encoded information (vs low-elaboration information processing limited to eliciting recognition of the object/product presented); and in imagery processing, higher levels of prior knowledge help create more vivid and experiential imagery that has greater influence on cognitive, physiological and behavioural intentions ([MacInnis & Price, 1987](#)). The analysis of the current study reveals that virtual try-on of beauty products enabled evoking of concrete mental imagery among female customers and the elaboration dimension (extent of integration with prior brand knowledge) of mental imagery (vs quality dimension) showed a significant relationship with brand personality and brand association.

Unlike the result of a previous study by Zanger *et al.* ([2022](#)), our study and interaction with the respondents revealed that customers familiar with the brand, but not familiar with the product, or customers not familiar with both the brand or the product were more elated while trying out the AR-based virtual mirrors than those who had prior experience with a specific product of the brand as well as prior experience of online purchase using AR assistance. An explanation for such an experience may be that familiarity with the brand and product lead to a disparity between the original outcome they usually experience with the product and the outcome mirrored by the virtual mirror. The respondents with prior brand experience also seemed sceptical to try other products of the brand, after experiencing a disparity in the virtual image of a product they occasionally or regularly use of the specific brand. Thus, marketing professionals should try to enhance the image representation of virtual mirrors in order to increase sales from existing customers for other product ranges of the brand online. Also, AR assistance for purchase should be highlighted to target new customers and promote new products of the brand, since already popular products would be purchased by customers through online, offline or phygital mode.

Also, the study highlights that customers do give weight to the visual mental imagery evoked by virtual mirrors while evaluating and relating to the personality of a brand. This is more significant for symbolic products, like skin care and beauty products, since symbolic products (vs utilitarian products) are primarily purchased by customers to enhance representation of their self. Thus, it is important that virtual mirrors portray images close to the real self of the customer; and, also, relevant directive information to capture the dimensions of the real environment/face should be provided within the brand website.

Policy implications

The current study among women in India enabled us to understand that the majority of the women respondents are ones who have not made an online purchase of skincare/cosmetic product with AR assistance up to that time, or are ones who prefer traditional shopping for skincare/cosmetic products. This highlights that a phygital mode of marketing, rather than pure virtual market, would be rather high yielding for an Asian population, especially for cosmetic customers of a country like India. The symbolic nature of the product of the brands under the current study and the variants available for the specific cosmetic products highlight the significance of real-time recommendation of popular shades for specific customers with specific skin tone or normal shade preference, etc. Thus, the study provides implications that, for symbolic products purchased by customers to better express their self, the marketing policy should stress inclusion of certain advanced features for the AR application for better brand association among customers.

Conclusion, Limitation and Directions for Future Research

This study focused on analysing the significance of the relationship between dimensions of mental imagery (elaboration and quality) with Brand Personality and Brand Association. From the analysis, it was revealed that the elaboration dimension of mental imagery has a significant relationship, while the two other constructs of the model and quality of mental imagery were not statistically supported to have established any significant relationship with brand personality and brand association. This supports to a great extent the previous study by Krishna & Schwarz (2014) indicating that lasting visual mental imagery is influenced by the nature of the stimuli, the cognitive orientation of the individual, the information availability that arouses imagination, and favourable experiences that are consistent with an individual's sensory information.

The current study learned about previous experience of respondents purchasing a beauty brand online with AR assistance with a direct Yes/No question. Respondents who did not purchase beauty products with AR assistance were directed towards a virtual experience by listing virtual try-on links of four popular brands (L'Oréal Paris, Lakme, Revlon and Colorbar). This experiment revealed that the majority of respondents lack a previous experience with AR for beauty products and, hence, the experience of a virtual try-on was a fun experience for the respondents. This revealed that AR is capable of enhancing enjoyment, inspiration and brand attitude and may be considered as an effective tool for relationship-building and customer retention (Zanger *et al.*, 2022) by brands. The variants of different beauty products (like ©/matte lipstick to fair/medium shade of foundation, etc.) create an impact on customer visualization of the product. Thus, interaction with respondents revealed that past knowledge or current usage of any of the products of the brand is significant to some extent to have an immersive brand association through the visual mental imagery generated by AR. However, the familiarity with certain products of the specific brand can lead to existing customers purchasing only a familiar product/shade of the product and not try a new product range or product variant. The lack of real representative imagery while using AR can cause hindrance in proper brand personality assessment and also in enhanced brand association in the long-term. Provision to highlight the brand along with highlighting product features should be a priority for brands specifically targeting customers online or through virtual settings. The interactive characteristics of AR definitely help to attract new customers having no previous knowledge about the brand.

Suggestions and scope for future research

The study reveals that there is significance in the relationship between AR-generated mental imagery and brand personality and brand association. However, specifically for the beauty brands, it is important that the marketers enhance the technical sophistication of AR technology that enables customers to better visualize the difference in nature of the variants of the products. Also, brand familiarity is revealed to enhance perceived immersion (rather than perceived enjoyment) of customers and, hence, marketers should try to implement relevant and effective omni-channel marketing strategies for better brand recognition by customers. Future research may consider understanding the impact of AR-generated mental imagery on personality and associations for brands in other segments, like fashion or eyewear, with a higher representative sample. Also, the mediating effect of brand loyalty among customers while purchasing using AR assistance can also be studied. Understanding the construct relationship in the current study in a virtual reality or mixed reality context also has high scope for future research.

Limitation of the study

Though the sample for the study is representative and highly valid, the sample size is relatively small. Moreover, the percentage of respondents with prior experience of shopping for skincare/cosmetic brands online with virtual try-on is comparatively few. In future, one could try to conduct a study with a higher sample size of those having prior experience of purchasing online with AR assistance. Another limitation was choosing skincare and cosmetic brands for the study. Since in India respondents revealed that, to purchase beauty products, they prefer to experience the product and the brand before purchase, this was a major limitation. Also, the study was limited by time and resources for collection of more data.

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Media Activities and Telecommunications Consumers' Awareness of Their Rights

A Study of Mobile Phone Users in Calabar, Nigeria

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Abstract: This study assessed how Nigerian Communications Commission's media activities helped to create meaningful positive awakening on the knowledge, attitude and perception (KAP) of telecoms users' rights among mobile phone users in Calabar, Nigeria. It adopted the descriptive survey research method and used Perception Theory and Uses and Gratifications Theory to lend theoretical support to it. Out of 400 copies of a questionnaire distributed, 385 were retrieved. Findings included that NCC's media activities on telecoms users' rights were intensive and helped to create positive awakening on the knowledge of telecoms users' rights in Calabar, thus leading them to exhibit positive attitude and perception towards the overall awareness campaign on their rights. It was recommended that NCC should carry out more independent studies in other localities across Nigeria with a view to ascertaining the extent of telecoms consumers' knowledge of their rights, particularly among rural dwellers.

Keywords: Awareness, media activities, mobile phone users, NCC, telecommunications.

Introduction

At the initial deployment of the Global System for Mobile (GSM) network in Nigeria, telecoms users were excessively exploited by service providers. For example: a SIM card, which currently goes for almost nothing, was sold for as much as N50,000.00; billing for calls was made per minute; and incoming calls were billed. In recent times, mobile network users still faced some unsatisfactory practices in such areas as interconnection disconnection, unsolicited promotional messages, and mobile number non-portability.

Nigerian Communications Commission (NCC) controls and regulates the activities and operations of these telecoms service providers. Expectedly, adequate provisions exist in the Nigerian Communications Act 2003 and its subsidiary legislations regarding the promotion and protection of the rights and interests of consumers against unfair practices by telecoms service providers. In order to successfully do this, NCC had to periodically undertake some useful public enlightenment programmes ,which include regular telecoms consumer parliaments, consumer outreach programmes, consumer town hall meetings, radio phone-in programmes, industry road shows, etc. All these activities are adequately publicised in the mass media.

Even with these enlightenment programmes, there is still uncertainty on whether these media activities by the NCC were properly planned and executed. If they were, the pertinent questions are: Were the NCC's media activities on telecoms users' rights effective enough to enable mobile phone users in Calabar to know and use their rights? What was the attitude of mobile phone users in Calabar to know and enforce their rights? What was the attitude of mobile phone users in Calabar towards the NCC's mass media activities on telecoms users' rights? What was their perception towards the media activities?

The following research questions were, therefore, formulated to guide this study:

i) To what extent did mobile phone users in Calabar have awareness of their telecoms rights prior to NCC's mass media activities?
ii) To what extent did the NCC's mass media activities on telecoms users' rights enable mobile phone users in Calabar to have knowledge of their rights?
iii) What was the attitude of mobile phone users in Calabar towards the NCC's mass media activities on telecom users' rights?
iv) What was the perception of mobile phone users in Calabar towards the NCC's mass media activities on telecom users' rights?

Telecommunications Service Operation in Nigeria

The Nigerian Communications Act 2003 defines telecommunications as "any transmission, emission or receptor of signs, signals, writing, images, sounds or intelligence of any nature by wire, radio, visual or other electromagnetic systems". This implies that telecommunications is a big network of different companies and involves television, radio, mobile phones, Internet and fixed telephones (Tersoo, 2018). Telecommunications is a vital engine of economic growth and an essential infrastructure that promotes the development of other sectors, like agriculture, education, industry, health, banking, defence, transportation and tourism (Hassan, Niran & Oluseyi, 2009).

The history of telecommunications operation in Nigeria started during the colonial era when telegraphic submarine cable lines were laid from London to Lagos in 1886. Thereafter, between 1893 and 1923, fixed phone service was provided to government offices in few locations. By 1952, there was an inner telephone line between Ibadan and Lagos, and, subsequently, to other parts of the country (Tersoo, 2018; Olaoluwa, 2019). Also, along with the fixed phone lines was the introduction of telegraph, which helped in improving the phone service within the country, since all the external services were owned and controlled by a British company, Cable & Wireless Ltd.

Indeed, the establishment of telephone lines aided other forms of communication like radio, television and the Internet in Nigeria. For example, in 1933, the Nigerian telecoms industry witnessed the parallel development of radio in the country following the establishment of the first Radio Distribution System (RDS), which made it possible for Lagos citizens to receive British Broadcasting Corporation's programmes. Two years later, this was renamed Radio Diffusion System and it served as the purveyor of the radio industry in Nigeria. By 1959, television service was added when the Western Nigerian Television Corporation was established in Ibadan (Okon, 2021).

In 1985, Nigeria Telecommunications Limited (NITEL) was established by merging the telecommunications arm of the Posts and Telecommunications (P&T) Department and Nigerian External Telecommunications (NET); and it monopolised the communication sector. While the P&T handled internal communication services (e.g., telegraph services and manual telephone exchange services), NET was responsible for external communication purposes, such as the provision of international telephone, telex and telephone services to major cities in Nigeria (Olaoluwa, 2019). In addition, mobile/cellular telephone, paging and electronic mail services

were parts of what NITEL offered through the X.25 and X.40 switching facilities in its network (Alabi, 1996).

Owing to complaints of ineffective services, such as congested lines, inefficient billing system, inadequate completion rate for long-distance calls and dissatisfaction with the use of analogue infrastructure, NITEL was reformed for enhanced services. This resulted in the partial deregulation of the telecoms industry by phasing out NITEL and establishing NCC through Decree No. 75 of 1992, which liberalised the terminal end-equipment and created room for competition and private-sector participation.

Prior to the full deregulation of the industry through the Nigerian Communications Act (NCA) of 2003, the country embraced GSM communication in 2001 when Econet (now Airtel) launched its services on August 8, 2001; while MTN began its operations in the same month of the same year. Other key players in the industry include Etisalat (now 9mobile) and Glo-mobile. As at July 2021, the number of active GSM lines in Nigeria was put at 187,470,860 (NCC, 2021a).

The Nigerian Communications Commission and Its Functions

NCC is the independent regulatory authority for the telecoms industry in Nigeria. It was established under Decree No. 75 of November 24, 1992, which was later abrogated and replaced with the Nigerian Communications Act (NCA), 2003. Its responsibilities are: to regulate the supply of telecoms services and facilities; promote competition; and set performance standards for telephone services in Nigeria. In other words, NCC promotes and protects consumers' interests against unfair practices, particularly as they relate to tariffs and charges; guarantees availability and quality of communication services, equipment and facilities; ensures licensed operators comply with licence terms and conditions and operate the most efficient and accurate billing system; and develops and monitors performance standards and indices for quality of communication services/facilities supplied to consumers in Nigeria, having regard to best international performance indicators.

The Nigerian Communications Act 2003 confers extensive powers on NCC to enable it to perform its regulatory functions. These include powers to issue, suspend or revoke licences for communication operations and provision of communication services or facilities; to give written directions to licensees regarding the compliance, or otherwise, of any licence conditions or provisions of the Act or its subsidiary legislation; to impose fines for non-compliance with such directions; to summon persons to appear before it; and to inspect licensees' books of account (Ukwueze, 2014; NCC, 2021b).

Telecoms Consumers' Protection and Rights

In furtherance of its mandate, NCC established the Consumer Affairs Bureau to protect, inform and educate Nigerian telecoms customers. It uses this bureau to organise conferences, seminars, fora and the highly commendable monthly Telecommunications Consumers' Parliament (Okom, 2018). Also, it has created a consumer bureau website which lists the various ways consumers can contact NCC and lodge complaints or seek redress. This has substantially created awareness of consumers' rights and the regulations of service providers in solving consumers' problems (NCC, 2021b).

NCC's extensive rule-making and enforcement powers have, however, been criticised by Otubu (2013) as amounting to the legislature abdicating its law-making responsibility, and violation of the separation of powers doctrine. Otubu's criticism anchors on two points: first, the enabling statute does not require the legislature to check regulations made by NCC; and, second, NCC's power to make regulations and guidelines and punish those who breach them presents it as the law-giver and judge in its own case. However, this criticism has been debunked by Ukwueze (2014) thus:

> Firstly, to accuse the legislature of abdicating its responsibility is to totally ignore the legal basis for, and the utility of delegated legislation in administrative law. The power for subsidiary law-making derives ultimately from the power of the legislature which has been "donated" (not surrendered) by the legislature. Such power must be exercised in accordance with the enabling statute and only for the purpose(s) for which it was donated and will be declared *ultra vires* if exercised otherwise… (p. 130).

Yet, despite NCC's assiduous efforts to protect consumers, telecoms service providers in Nigeria are still accused of poor service delivery; and consumers are grappling with various challenges of unacceptable service quality by Mobile Network Operators regarding billing, value-added services, SMS, call set-up, data services, SIM, recharge card, unsolicited text messages, etc. Indeed, NCC, through its various consumer portals, recorded 271,112 complaints between January 2015 and July 2020, out of which 95 percent were successfully resolved (Okom, 2018). Monitoring the level of resolution of every consumer query by NCC is continuous; and this helps to ensure improved telecoms service delivery and maximum protection of consumers' rights.

According to Ukwueze (2014), these consumers' rights, as provided for in the Act and the regulations and guidelines under it, include:

(i)   *Right to Information,* which makes consumers entitled to complete, accurate and up-to-date information from licensees, which must be given in simple, clear language.

(ii) *Right to Quality Service*, which requires all telecoms service providers to meet such minimum standards of quality of service as NCC may periodically specify and publish. To ensure that this provision is effected, NCC made and published the Quality of Services Regulations (QSR) in 2012.

(iii) *Right to Fair Charges and Accurate Billing,* which provides that before a contract for services is entered into, the licensee shall inform the consumer of the applicable rates and composition of charges; and that a licensee is mandated, among other things, to ensure accurate, timely and verifiable billing; and to send end-of-operation notification (EON) to prepaid consumers, indicating how much they were charged for every operation.

(iv) *Right to Privacy and Protection of Personal Information* that provides for privacy, fair use and confidentiality of consumer information; and requires any licensee who collects information on individual consumers to adopt and implement a policy regarding the proper collection, use and protection of that information.

(v) *Right to Redress,* which confers on NCC the powers to resolve disputes between stakeholders in the industry. For an inexpensive, fair, impartial and effective arbitration to resolve consumer-related disputes, NCC made and published the Dispute Resolution Guidelines (DRG) 2004.

(vi) *Right to Consumer Education*, which in this context "refers to the process of exposing people to the knowledge about their rights and duties as consumers…" (Ukwueze, 2014, p. 146).

Research Methodology

The research design used in this study was the descriptive survey method. This method was considered appropriate because, as observed by Nwodu (2006, p. 67), "it facilitates the study of a representative sample derived from a population that is deemed too large for the researcher to realistically observe all the elements".

The population of Calabar Municipality and Calabar South Local Government Area of Cross River State of Nigeria, the study area, is 501,400 (Nigerian Population Commission, 2021). The sample size for the study comprised 400 mobile phone users drawn from the study area. This was determined using the Taro Yamane's formula (1964), as cited in Israel (2003). This sample size was considered adequate, appropriate and representative of the study's overall population; which ensured that, through the various sampling procedures adopted herein, every ward, street and person in the study area had an equal chance of being selected.

The multistage sampling technique was adopted for the selection of sampled respondents. First, the two local government areas used in the study were equally treated and each allotted 200 copies of the questionnaire. Next, eight wards were selected in each local government area. The 200 copies of questionnaire per local government area were subsequently shared 25 copies per ward. Also, five streets were selected per ward; and each got five copies of the questionnaire. Since each

of the selected streets has a minimum of 40 houses, subjects were drawn at a skip interval of every eighth house.

Thereafter, in selecting respondents, the accidental sampling technique (also known as grab, convenience, or opportunity sampling) was applied. This non-probability sampling was adopted because it allowed the use of only persons who were available and close to hand. Also, the purposive sampling technique (also called judgmental, selective, or subjective sampling) was applied in picking the actual respondents, since it allows researchers to use their judgment "to choose respondents … that best meet the purpose of the study" (Asemah *et al.*, 2017, p. 171). This technique was deemed appropriate since this study was directed mainly at those who are literate and use mobile phones.

Theoretical Framework

Lending theoretical support and backing to this study are the Perception Theory and the Uses and Gratifications Theory.

Perception Theory

As cited in Anaeto, Onabajo & Osifeso (2008, pp. 66–68), Berelson and Steiner propounded the Perception Theory in 1964. The theorists note that the primary intention of the communicator in a typical mass communication setting is to cause or influence his/her audiences to pay attention to his/her message(s), learn the contents of the message(s) and make appropriate changes in attitudes or beliefs, or produce the desired changes in behaviour.

The theory holds that the afore-stated communicator's goals may be difficult to achieve because the process of interpreting messages is, in itself, complex. This is more so because people selectively perceive an object, a message or an event such that, even though a message may successfully get to the target, it may still not accomplish its purpose; or may not have the intended meaning for all receivers. This is because perception is selective, and as explained by Watson & Hill (2015), people are surrounded by many sensations but they tend to pay attention to only a few of them. This, therefore, affects how they perceive each event that occurs around them.

Severin & Tankard (2001) further explain that three other psychological processes, namely, selective exposure, selective attention and selective retention, which are similar to selective perception, sometimes come into play in the communication process. Selective exposure can occur when audience members attend to or expose themselves to certain mass media outlets or messages as a result of their pre-existing beliefs, attitudes and interests; and avoid those they feel

may conflict with what they believe in. Selective attention is "a general tendency for human beings to focus on only some of the sensory data or information available to them at any given time" (Chandler & Munday, 2011, p. 378) since it is impossible to pay attention to everything that happens around them. Selective retention, on the other hand, is the "process by which people tend to remember best and longest information consistent with their pre-existing attitudes and interests" (Baran & Davis, 2012, p. 182).

The theory is relevant to this study for, although the NCC has adequate provisions in the Nigerian Communications Act 2003 to promote and protect the rights of telecoms consumers; and that, through the Consumer Parliament, it periodically organises public enlightenment programmes to further create awareness on these rights, it is however not possible that these messages can have the same meaning for all the receivers. This is because, while some consumers may accept the messages and make good use of same, others may choose not to be exposed to the messages at all; or do so with selective perception (Okon, 2017).

Uses and Gratification Theory

The second theory, Uses and Gratifications Theory, was propounded by Katz, Blumler and Gurevitch in 1974 (Katz, Blumler & Gurevitch, 1973-1974). The theory focuses on the audience member rather than the message, or the media via which the message is channelled. Unlike the tradition of the powerful effect theory of the media, this theory sees the audience member as a discriminatory and selective user of media who actively utilises the contents thereof, rather than being acted upon by the media. This means that the theory does not assume any direct relationship between messages and effects, but postulates instead that, by actively putting messages to use, audiences act as an intervening variable, thus influencing the effect process.

The theory is relevant to this study because, owing to the discriminatory nature of the individual in selectively utilising media contents, it could convincingly follow that a situation in which telecoms consumers (or, specifically, mobile phone users in Calabar) have a high level of knowledge about their rights and make use of same is a function of the extent to which they actively utilise the contents of the appropriate media in this respect. If, therefore, the knowledge level is low, it would mean the consumers have not actively accessed and utilised the relevant media and the contents therein. The effect in either case cannot be attributed to the message but to the individual audience member.

Data Presentation and Analysis

Data collected from the 385 respondents who returned their validly-filled questionnaire are presented and analysed here. It should be noted from the outset that all the 385 respondents (100%) owned a mobile phone connected to at least one telecoms service provider; and that all of them use their phones regularly. This means that they were all not just relevant but useful and knowledgeable for the study.
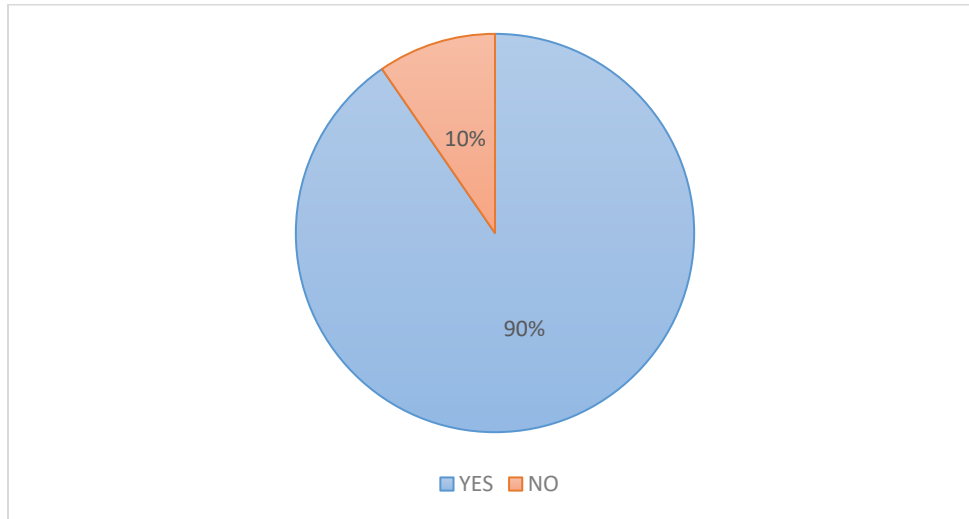

Figure 1. Respondents' exposure to NCC's mass media activities on telecoms users' rights
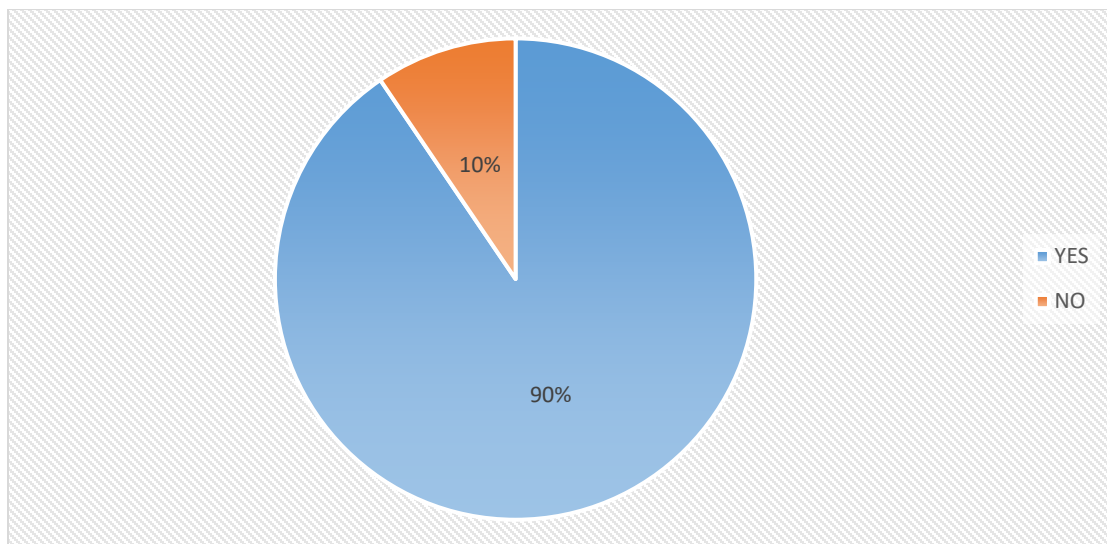
Figure 2. Responses on whether or not the NCC's mass media activities have been intensive

In Figure 1, the majority of the respondents, totalling 90.4%, had exposure to the NCC's mass media activities on telecoms users' rights. They are, therefore, well positioned to have adequate understanding of the essence of this study and contribute meaningfully to its overall success.

Intensity of NCC's mass media activities would help to identify how strong these activities actually were. Figure 2, therefore, provides this information, and shows that, out of 348 respondents who agreed to having been exposed to the NCC's media activities, 315 or 90.5% of them agreed these media activities on telecoms users' rights were intensive: that is, being thorough, in-depth, rigorous, and concentrated on the issue of telecoms users' rights.

Figure 3 shows that, out of the 315 respondents who saw the campaign as being intensive (as shown in Figure 2), 64.4% rated the level of intensiveness as high, while 26.7% rated it average and 8.9%, low. This confirms that almost two-thirds of the respondents highly approved of the media activities of NCC as being strong enough to create adequate awareness on the rights of telecoms users in Calabar.
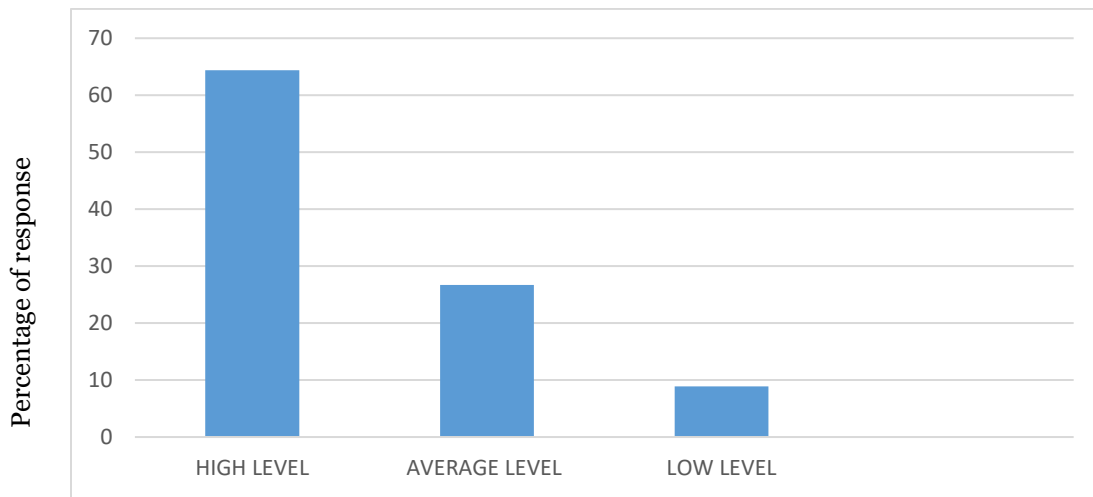

Figure 3. Respondents' perceived level of intensiveness of the NCC's mass media activities

Figure 4 indicates that 333 respondents, representing 95.7% of the entire respondents, agreed that the mass media activities had caused them to know their rights.
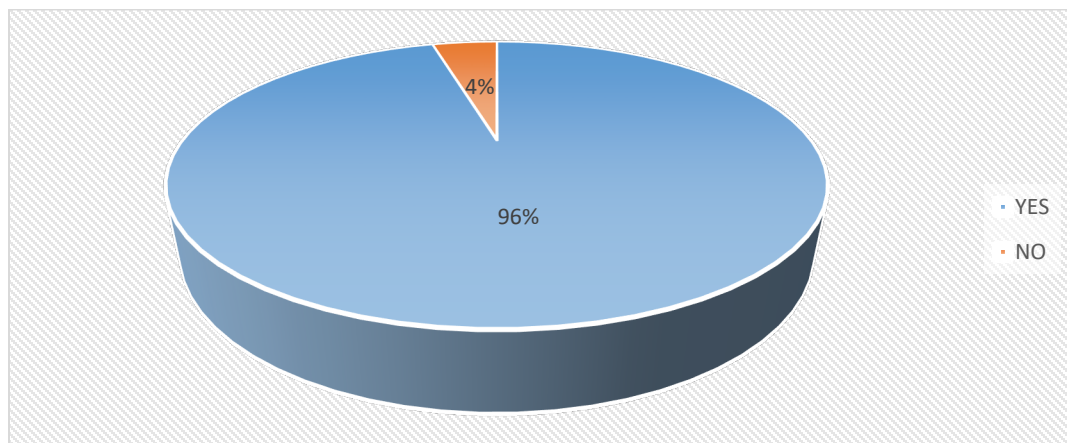

Figure 4. Responses on whether the media activities have helped respondents to know their rights as telecoms consumers

Figure 5 shows just 6.6% of the respondents as having real knowledge of their rights before they became exposed to the media activities; 75.6% totally lacked such knowledge, while 17.8% had a faint knowledge. Therefore, the fact that three-quarters of the respondents (75.6%) reported lack of knowledge of their rights prior to being exposed to the media activities suggests a rather high degree of effectiveness of the NCC's media activities.
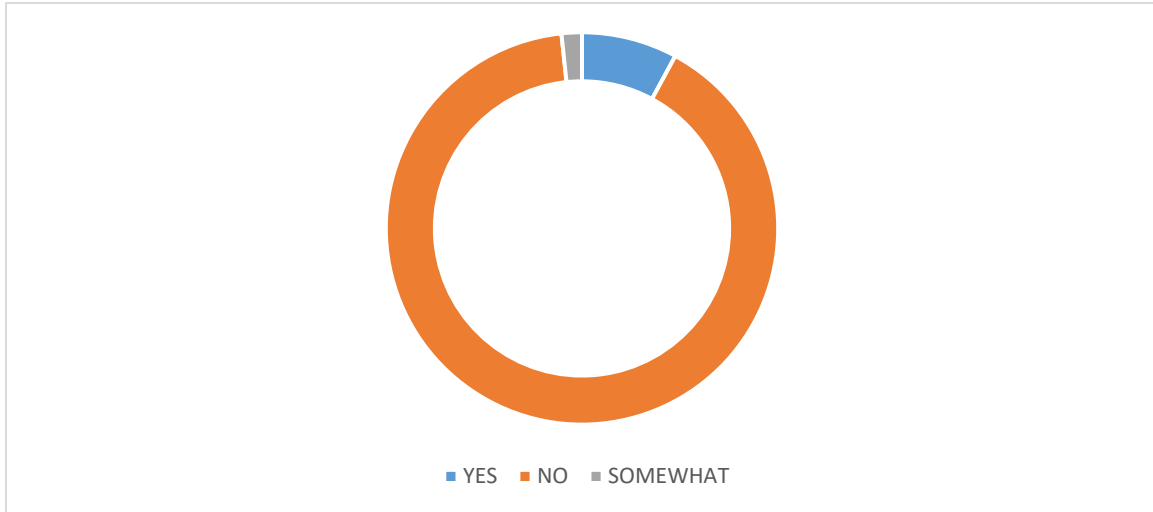

Figure 5. Responses on whether respondents had knowledge of the telecoms users' rights prior to the NCC's mass media activities

Earlier in Figure 4, a total of 333 or 95.7% of respondents exposed to the NCC's media activities agreed they became knowledgeable of their rights in the telecoms industry due to the media activities. Figure 6 shows that a total of 60% said the media activities exposed them to the knowledge of their rights to very great or great extent; while 24% did so to an average extent; 16% with minor exposure, and 0.0% with "very minor extent".
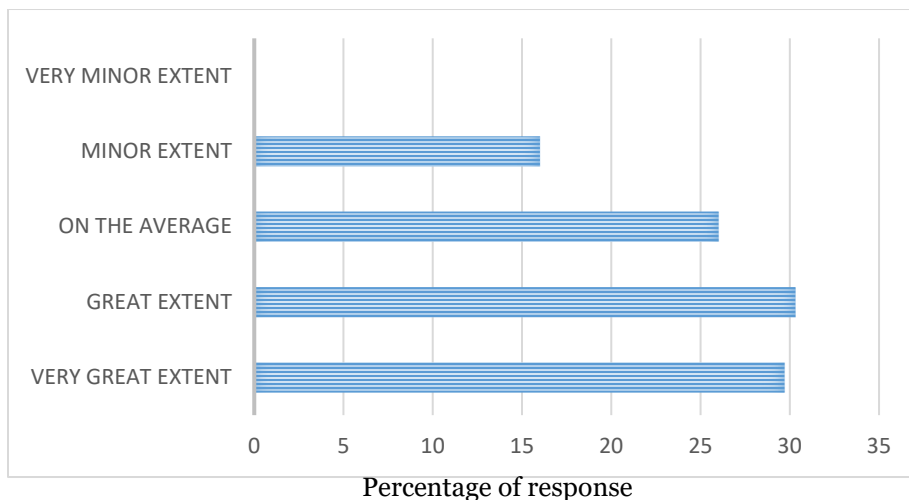

Figure 6. Extent to which the NCC's mass media activities have helped to expose respondents to their rights as telecoms consumers

There are people who have rights and do not know they do; and there are those who have such rights but do not know how to use them or are not even willing to use them. For telecoms users in Calabar, Table 1 shows a vivid picture of people who know they have rights and are willing to use them, as 99.4% of the 348 respondents who were exposed to NCC's media activities were willing to enforce their rights, while only two (0.6%) were not. This goes to confirm that the NCC's media activities have made the people to know their rights as telecoms users and be willing to enforce those rights.

Table 1. Responses on respondents' willingness to enforce their rights after acquiring knowledge of them

Responses	Frequency (n)	Percentage (%)
Yes	346	99.4%
No	2	0.6%
Total	**348**	**100%**

In Table 2, the entire 100% of the 348 respondents who were exposed to the NCC's media activities agreed that the media activities were both necessary and useful. Thus, the efforts made by NCC to bring to public knowledge the rights of telecoms users have not been in vain.

Table 2. Responses on whether respondents saw the NCC's media activities as necessary

Responses	Frequency (n)	Percentage (%)
Yes	348	100%
No	-	-
Total	**348**	**100%**

Table 3 reveals the entire 100% of the 348 respondents exposed to the NCC's media activities as agreeing they would like to keep having the media activities from time to time.

Table 3. Responses on whether the media activities should be continued from time to time

Responses	Frequency (n)	Percentage (%)
Yes	348	100%
No	-	-
Total	348	100%

Other Findings

Answers to questions 1–5 in the questionnaire provided the demographic information of respondents, which are recorded in Table 4.

From the table, we see that female respondents were slightly more than male by 2.4%. On age, those between 18 and 29 years presented the single largest entity among the respondents. This goes to confirm the submission by UNICEF (Rojas, 2020) that "[t]he group of people that goes from 14 to 29 years of age constitute the largest generation in history". As regards marital status,

more than half of the respondents (54.8%) were single. For occupation, students constituted the single largest group at 46.5%. The last variable was "educational qualification" and those with WASC/GCE/SSC had the highest percentage – 48.8%. This can be understood because most of the students are university undergraduates whose main qualification is the School Certificate.

The high level of knowledge of NCC's media activities on telecoms rights, as seen in this study, can be traceable to the high number of youths, students, and those with educational qualifications from School Certificate and above among the respondents. These same dominant groups also influenced the positive and satisfactory attitude most respondents had towards the NCC's media activities on telecoms rights. Also, most of the respondents, being students, young, single, and educated, had a positive perception of their rights as mobile phone users and expressed their willingness to enforce these rights. However, apart from the dominant group as mentioned here, other segments of the audience – the old, less-educated and rural dwellers – are among the 95.7% who were exposed to their telecoms rights by the NCC media activities, and the 99.4% of the respondents who expressed the willingness to enforce their rights whenever these are infringed upon.

Table 4. Demographic Background of Respondents

Variables	Categories	Frequency (n)	Percentage (%)
Sex	Male	188	48.8%
	Female	197	51.2%
Total		**385**	**100%**
Age (Years)	18–29	174	45.2%
	30–39	101	26.2%
	40–49	68	17.7%
	50 and Above	42	10.9%
Total		**385**	**100%**
Marital Status	Single	211	54.8%
	Married	156	40.5%
	Divorced	8	2.1%
	Widowed	10	2.6%
Total		**385**	**100%**
Occupation	Civil/Public Servant	94	24.4%
	Businessman/woman	60	15.6%
	Politician	52	13.5%
	Student	179	46.5%
Total		**385**	**100%**
Educational Qualification	F.S.L.C.	53	13.8%
	WASC/GCE/SSC	188	48.8%
	OND/NCE/HSC	44	11.4%
	HND/Degree	89	23.1%
	Post-Graduate	11	2.9%
Total		**385**	**100%**

Discussion of Findings

Findings of the study as they relate to the four research questions earlier raised are discussed in this section of the work, as follows.

Research Question One: To what extent did mobile phone users in Calabar have awareness of their telecoms rights prior to the NCC's mass media activities?

This first research question helps to determine where mobile phone users in Calabar were in terms of awareness of their telecoms rights before they were exposed to the NCC's mass media activities on those rights. Figures 1 and 5 are useful in providing answers to the research question.

From Figure 1, we see that 90.4% of the respondents agreed to have had exposure to the NCC's mass media activities on telecoms users' rights; and Figure 5 shows that only 6.6% had knowledge of their rights as telecoms consumers prior to the NCC's mass media activities. This means that, prior to their exposure to the NCC's media activities on telecoms rights, a vast majority of respondents had little or no knowledge of their rights as phone users.

These findings tend to support the position of Nagler (2017) that, for the media to affect the attitude and perception of any individual or group of individuals, there must first be media exposure. This author went ahead to define media exposure as "the extent to which individuals encounter specific media messages or content". For this study, the "individuals" in the definition are mobile phone users in Calabar and the "specific media messages or content" they encountered are the NCC's media messages on telecoms rights.

Such exposure to the NCC's media activities brought about some direct or indirect change in the knowledge of the people, and modification in their attitudes and perceptions. We see in this study that 60% of respondents, as shown in Figure 1, after being exposed to NCC's the media activities, became more knowledgeable of their telecoms rights to a very great and great extent. Also, in Figures 1 and 3, we see a significant modification in respondents' attitudes and perceptions.

Research Question Two: To what extent did the NCC's mass media activities on telecoms users' rights enable mobile phone users in Calabar to have knowledge of their rights?

Merriam-Webster's Collegiate Dictionary defines knowledge as "the fact or condition of knowing something with familiarity gained through experience or association". Here, association refers to relationship created in communication. This is why Duck & McMahan (2009, p. 1) declare that "any type of communication you ever participate in both has a relationship assumed underneath

it and does or achieves something for you as a result, namely communication creates a world of meaning". From here, we can vividly see that, when information is sent out, as was done in the case of NCC's media activities, the receiver becomes familiar with what he/she was being informed about.

To properly answer the second research question, the researchers refer to Figures 1, 2, 3, 4, 5 and 6. Apart from the fact that 90.4% of all the sampled respondents accepted being exposed to the NCC's mass media activities, as presented in Figure 1, it is also clearly shown in Figure 2 that, while only a negligible 9.5% claimed that the campaign was not intensive, the remaining 90.5% said it was. Beyond this, the level of intensiveness of the campaign, as revealed in Figure 3, was reported to have been impressively high. Again, beyond the revelation in Figure 4 where 95.7% of the respondents who were exposed to the NCC's mass media activities said the media activities had helped them to know their rights, it is also clearly shown in Figure 5 that, while only 16% and 0.0% of this category of respondents claimed to have been aided to a minor extent or very minor extent, respectively, by the campaign to have knowledge of their rights, an overwhelming 84% in Figure 6 reported that they were aided to a high or impressive extent. All these figures point to the fact that the NCC's mass media activities on telecoms users' rights were effective enough to enable mobile phone users in Calabar to come to a knowledge of their rights, and therewith the willingness to enforce the same.

Also corroborating these facts are recent unfolding events within the telecommunications industry. According to reports, during the first quarter of 2021 alone, telecoms subscribers lodged 3,019 complaints against Mobile Network Operators (MNOs), showing a 5.9 percent increase over the 2,854 complaints received in the first quarter of 2020 (Adepetun, 2021).

The findings in this study, as well as the increased complaints by telecoms users, further support the uses and gratifications theory. This is because, owing to the discriminating nature of individuals in selectively utilising media contents, it can only logically and convincingly follow that the high level of knowledge gained by mobile phone users in Calabar about their rights in the telecoms industry was a function of the extent to which they actively utilised the contents of the NCC's media activities; and not because they were acted upon by the campaign media, to determine the effect.

Research Question Three: What was the attitude of mobile phone users in Calabar towards the NCC's mass media activities on telecom users' rights?

The answer to the third research question of this study lies in Table 3, which displays responses on whether the respondents would like NCC to come up with more mass media activities from

time to time. In the table, 100% of the respondents who had earlier agreed to have been exposed to the NCC's media activities agreed that they saw the media activities as necessary and would invariably like these activities to be launched occasionally. Such show of liking for the campaign messages and the planners is an exhibition of positive attitude towards a referent or cognitive object, which, in this case, is the NCC's media activities on telecoms users' rights.

In sum, this finding indicates that the attitude of mobile phone users in Calabar towards the mass media activities on telecoms users' rights was friendly, positive and accommodating. It would not be wrong to allude here to the possibility that the respondents' positive attitude could have been enhanced by the satisfaction or pleasure (gratification) they derived from actively accessing and utilising the NCC's mass media activities (uses). This goes to support the uses and gratifications theory used in this study.

Research Question Four: What was the perception of mobile phone users in Calabar towards the NCC's mass media activities on telecom users' rights?

Perception is "the process of acquiring and interpreting information from sensory data". It is "what we see, hear, smell, taste and touch in our daily interaction with others" (Griffin & Bone, 2014, p. 31). However, in building our perception about something, these authors maintain that we may, consciously or unconsciously, decide to give attention to some senses (like what we see and hear in media activities, as in this study) and ignore others (such as touching, tasting and smelling). In the course of our perception building, there are some factors that help us to determine what we focus on. Two such factors are repetition and intensity.

As can be seen in this study, the NCC's mass media activities involved a conscious repetition of the media messages sent to telecoms consumers, which became intensive in their penetration of the target audience. In Figure 3, all the respondents agreed that the NCC's mass media activities were intensive, that is, they were thorough, in-depth and concerted, though in different degrees. This confirms that the messages sent out provided audience members with adequate information which helped them to develop an enduring perception about their rights as telecoms consumers.

Also, we refer to the content in Table 2, which presents responses that tell how mobile phone users in Calabar view, feel about, or perceive the NCC's mass media activities on telecoms users' rights. It is clearly revealed that 100% of those who were exposed to the NCC's mass media activities saw them as not only necessary, but useful. This finding is a pointer to an overwhelming positive perception about not only the generality of the media activities, but also about their planners. In this regard, Paisley (2001) has noted that one of the key factors for any public communication campaign to succeed is when the public perceives or views its source (stakeholders/planners)

positively as a group that is entitled to, or has the right to offer, the message, place same on the public's issue agenda, and attempt to change the behaviour of the audiences.

This finding supports the perception theory used in the study. This is because, even though consumers of media content have many activities and events happening around them, they pay attention to, appreciate and/or accept a given message and make good use of same (as is the case with the respondents in this study).

Conclusion and Recommendations

The study established that NCC's mass media activities on telecoms users' rights were quite successful, as the majority of the target audience (mobile phone users) in Calabar were exposed to the media messages. Although a great majority of the respondents had no knowledge of telecoms users' rights prior to the campaign, the reverse was the case during and after the campaign. This is because, besides being very intensive, the media activities brought to them the knowledge of their rights as consumers in the telecoms industry. The study also indicates that respondents viewed the campaign as useful and necessary; and this explains why their attitude and perception towards the media activities were very positive.

To continue, therefore, in helping telecoms consumers know and enforce their rights, the researchers recommend that NCC should always maintain high standards in planning and executing its mass media activities. Also, further research could be carried out to determine how other user groups – older, less-educated, rural dwellers, etc. – might be reached through the NCC's media activities.

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George Edward Hams AM (1928–2023)

A leader amongst

Australian telecommunications engineers

Steve Black

Former colleague and friend

Abstract: George Edward Hams AM (29 July 1928–2 February 2023) was a much respected engineer, international telecommunications adviser and leader in the field of telecommunications. In 1990 these achievements were acknowledged with the award of Member of the Order of Australia (AM) for public service "particularly in the field of telecommunications". George also had a significant presence in community activities and served on Royal Flying Doctor Service (RFDS) Boards for 10 years. As a young man, George was a 1953 Premiership player in the Victorian Football League for the Collingwood Football Club, where he played 108 games. He was a devout man with a strong sense of fairness and Christian faith.

Keywords: George Hams, obituaries, history of Australian telecommunications, Collingwood Football Club, ITU

Introduction

George Hams AM, one of Australia's most respected leaders in the field of telecommunications, died on 2 February 2023, leaving his wife Frances, children Marcus and Lisa, and grandchildren Alicia, Natasha and Alex. This obituary celebrates George's contribution to telecommunications in Australia and developing countries in the Indo-Pacific Region and the strategic and operational leadership strengths he brought to these countries.

Born on 29 July 1928, George had an elder brother, Ron, and a younger brother, Bruce. He spent his early life growing up in Ivanhoe in Melbourne, kicking a football, yabbying in the local creeks and exploring the paddocks in the then semi-rural area. George was born into a hard-working, middle-class family with a healthy love for Melbourne's great passion —

Australian Rules Football. George's potential for academic achievement was recognized early by his teachers and he was encouraged to set his sights on a university education after attending University High School in Parkville.

Early Telecommunications Career

George's career in telecommunications commenced at Melbourne University, where he graduated with a Bachelor of Science, majoring in Telecommunications Engineering.

George commenced as a Cadet Engineer with the Postmaster General's Department (PMG). After graduation, he began work with the Telephone Equipment Planning and Maintenance Group in the Victorian administration. In 1955, George retired from Australian Rules Football to focus more fully on his flourishing career in telecommunications.

George had joined the PMG at a time of great innovation and change and he became a key player in its visionary management team. In the mid- to late-1950s, new developments in network switching, transmission and telegraph technologies were in the process of implementation. Telecommunications research was producing further switching, transmission, telegraph and incipient data technologies that would drive industry growth and greater automation of subscriber trunk dialling over the decades to come. The following key fundamental innovations were all contributing:

1. Switching design was changing from traditional step-by-step technology to crossbar switching, with further migration to computer-controlled local exchanges in the 1970s;
2. Subscriber Trunk Dialling (STD) technology: by the late 1950s some 75% of the nation's calls were connected automatically; however, only 25% of country calls were connected automatically (in 1957);
3. Transmission design was moving to microwave technology and major inter-capital coaxial-cable-based transmission systems;
4. International connectivity expanded strongly, with the new COMPAC cable linking Australia to New Zealand and Canada and from there to Europe;
5. Telegraphy upgrades included the introduction of TRESS (Teleprinter Reperforator Exchange Switching System); and
6. Substantial capital investment in suburban and country networks to meet the growing demand.

There were also new federal government initiatives that required much greater focus on the PMG's commercial planning and the need for self-funding. The government moved in 1959 to a Single Line Trust Account based on Financial Budgets and introduced an interest component

on capital borrowings from the consolidated fund that was backdated to Federation (January 1901)!

Whilst the Single Line Trust Account allowed the PMG much greater flexibility in its tariff and pricing strategies, the interest requirement drove a self-funding imperative and a need to improve commercial planning. The imperative was to bring together staff with skills to develop financial budgets and plans that integrated engineering plans (for capital works, operations and service delivery, product deployment of new and existing products) with commercial targets, tariffs and prices, and population forecasts into a coherent self-funding financial budget, in an environment of major technology change that was unprecedented at that time.

To meet this need, PMG Headquarters brought together a multi-disciplined senior management team with a group of highly capable commercial and engineering managers to develop a Master Plan. It was a major step for an organization that had an image as "an engineering fraternity" (Moyal, 1984, p. 223) to bring together a team of visionary experts across several disciplines.

It was in this environment that George commenced to make his mark in the second half of the 1950s.

Career Highlights

In 1957, the Director General, Assistant Director General and Deputy Directors (State Directors) appointed a small team of carefully chosen staff to form a committee (the Automatic Network and Switching Objectives Committee — ANSO) to prepare a National Telephone Plan that would bring about a totally integrated automatic (STD) dialling system in Australia. The key leaders of the Committee were Bill Pollock (later to become Telecom Australia's second Managing Director in 1981), overseeing the commercial and customer aspects, and Ron Turnbull for the engineering aspects.

This committee selected a small team of young, gifted leaders with an engineering background and operational experience to develop the national plan. The members selected were George E. Hams, B. F. (Barney) Marrows and the "young Turks", E. R. (Roger) Banks and I. A. (Tony) Newstead (Moyal, 1984, p. 224).

As a member of this small team, George was a key participant in the development of the Australian National Telephone Plan in 1958. This plan defined the forward plans for national telephone services in Australia. The Plan was ultimately presented to Parliament on 1 September 1959 and published by the Parliament as the Community Telephone Plan in 1960. The plan formed the foundation of the integrated automated telephone service in Australia and became the model for numbering plans in Britain and other countries (Moyal, 1984,

p. 225). The related decision taken by the PMG in 1959 to adopt crossbar telephony to operationalize the National Telephone Plan quickly proved influential in world telecommunications planning. The crossbar technology suited Australia's needs and had low maintenance costs. The decisions made at this time would strongly affect the telecommunications industry in Australia and abroad. Australia was not only a key market in itself, it was an influential proving ground for telecommunications technology from abroad (Moyal, 1984, pp. 226–227).

From 1968, George began a new aspect to his career when he took an important role in the development of telecommunications in Indonesia. Under the provisions of the Colombo Plan, George was appointed to provide strategic advice to the Indonesian Government on the development and modernization of its telecommunication network. This role also included the identification and oversight of potential major telecommunications projects that would be of high benefit to Indonesia and appropriate for funding through the Australian Aid program.

This role developed George's skills in developing and managing the complex business and management strategies needed to successfully work with management teams having quite different business cultures and government approaches to policy development and implementation.

When the Australian Government asked George to identify a high priority project to be funded through Australian Aid, he recognized the opportunity to radically improve the resiliency and reliability of the Indonesian telecommunications network. The project he identified was the development of major backbone capacity links between the Bandung and Jakarta main telecommunications centres.

George finalized the funding protocols with the Australian Government and called together the key strategic management teams that would operationally deliver the project. Recognizing that, in Indonesia, major projects were delivered through third-party contracting, rather than the traditional Australian "in-house" heavy engineering groups, George worked closely with the Indonesian strategic management teams to deliver the project within the tight timelines required for Aid projects. George completed this role in 1970 and returned to the PMG.

In 1973, George's international career continued when he was seconded to the World Bank. In this role he provided advice to governments in developing countries on the strategic development and forward planning needs for their telecommunications networks and identified projects that would be appropriate for funding by the World Bank. George worked with many Indo-Pacific countries, including India, Pakistan, Thailand, Korea, Kenya, Nepal, Burma and Papua New Guinea. Another gifted Australian telecommunications leader, Richard E (Dick) Butler, was the Deputy Secretary General of the International Telecommunications

Union (ITU) over that period from 1968 to 1982, and was driving recognition of the importance of telecommunications to developing countries (Gerrand, 2012; ITU, 2023).

ITU studies (ITU, 1985) of the time had established that telecommunications policy and capability were a major determinant of economic growth in the developing countries of the Indo-Pacific region. The governments of these countries were very much aware of these links and so the role that George undertook was recognized as exceedingly important for their countries' economic growth and the wellbeing of their peoples. In this role, George mused on the difference in environments between the World Bank and the developing countries. The World Bank was highly regimented with a very strict protocol for the passage of major policy papers, culminating in a final policy white paper. By contrast, when in the field, George would find himself as a lone voice advising Prime Ministers, senior Ministers and strategic management teams of the developing countries on wide-ranging forward planning issues in what was the fastest growing industry of that time.

In 1976, George returned from his secondment to the World Bank to a newly formed Telecom Australia[i] and took a major interest in the newly formed State Administration-based Operations Departments. The creation of Operations Departments, each with responsibility for all operational aspects of telecommunications in a regional "Operations District", was a major new initiative. It was introduced with the newly formed Telecom Australia from 1977 as an outcome of the Davidson Inquiry (Davidson, 1982), and was a highly successful innovation. George took on the role of Chief Operations Manager for Victoria. Bringing together Customer Service, Financial, Personnel, Telecoms Network and Exchange Maintenance, and Telephone Installation and field support functions required a new set of management skills. In 1977, the initial trial of 8 Telecommunications Districts was extended to 30; and, by March 1978, 74 Districts had been established across Australia.
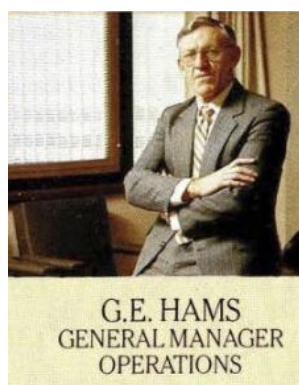

Figure 1. George Hams, 1984

In 1983, George was appointed to the Headquarters Group of Telecom Australia as the first General Manager Operations Department, with National Headquarters' responsibility for 49,926 Operations staff throughout Australia. The 84 Operations Districts nationally were staffed by Telecom's front-line customer-focused staff, who were instrumental in delivering and maintaining telecommunications services to all communities across Australia.

George was much respected at Headquarters for his calm matter-of-fact approach to life, his business judgement and his untiring efforts to mentor those who worked with him. His initiatives as General Manager Operations revitalized the

State-based Operations Departments through an Australia-wide consultative program that had an enduring positive influence on the leadership aspirations of the operations district management teams. This initiative led to a renewed focus on customers and service delivery throughout Australia.

George's guidance was instrumental in refocusing the 84 Operations Districts on commercial management rather than engineering-based performance measures. He championed the introduction of financial performance measures and their use. At the national level, he commenced innovative work on international comparative analysis, national performance measures and customer satisfaction reporting.

George was also instrumental in implementing a new, specialized and incentivized Business Sales Force and its integration into Telecom's customer-focused operational support activities.

George was much admired by professionals from all the disciplines within Telecom, from engineers to marketers, product development and customer service staff, and accounting and finance professionals.

It was common for professionals from other departments in Headquarters to approach George to seek his support for major new business initiatives, as his reputation for quickly grasping and progressing valuable new initiatives was recognized throughout the senior ranks of Telecom. He also had a great focus on the personal development of individuals. This attribute led to his recognition as a leader and a builder of energized and focused management and operational teams.

With the major reorganization of Telecom in 1987–1988 into national, customer-focused business divisions that subsumed the previous State-based organizations, George undertook the newly created role of Senior Executive General Manager of the Metropolitan Division. In this role he had the corporate responsibility for all Telecom's business and residential operations in the major cities and metropolitan areas of Australia. As the leader of the Metropolitan Operations Division, he continued to provide leadership and focus on the business activities of the Corporation. This was the continuation of a role that George particularly enjoyed. He continued to visit and motivate staff and teams throughout the administration and provide the guidance, encouragement and business support needed, overseeing customer service delivery activities across all Australian capital cities. George continued in this role until his retirement from Telecom in 1990-91.

Community Activities

Throughout his working life, George used his business and personal skills to support community organizations and groups. He had a significant presence in community activities

and served on Royal Flying Doctor Service (RFDS) Boards for 10 years. After his retirement, George continued to provide guidance to the International Telecommunication Union (ITU) as the Australian representative of a 21-Nation Committee which examined the organization and working methods of the ITU. He also provided guidance to the industry as Executive Adviser to the Managing Director of NEC Australia.

In 1990, George was named in the Queen's Birthday Honours List, being appointed a Member of the Order of Australia (AM) for his significant contribution to telecommunications in Australia. This was a fitting acknowledgement of George's significant contribution to the wellbeing and development of the communities he served so diligently and well during his career in telecommunications.

A Sport-filled Life

The two great loves of George's sporting life were Australian Rules Football and golf. Sport helped shape George's early life. It left him with a deep understanding of the benefits of encouragement and support in enabling individuals and teams to achieve their full potential. George would take this knowledge into his later business life with great success.

George's love of golf had many benefits for him. The Latrobe Golf Club, of which George was both a member and Captain, had a long-standing arrangement with the nursing staff at the Heidelberg Hospital that they would be regular attendees at the dances the nurses arranged. It was at one of these dances that George met Frances, his future wife. George continued with golfing in his later years, and was a regular at the golf club in Warburton where he had built his innovative mud-brick holiday home. George excelled at golf: he played with a very desirable handicap of three.

But it is in the annals of Australian Rules Football that George made the greatest impact. George commenced his football career with the Ivanhoe Amateurs but, at the age of 17 in 1946, George was offered the opportunity to play for the Collingwood Football Club. Football was a common topic in the Hams' household when the young George was growing up; players were, and still are, looked on with great affection throughout Melbourne. George accepted the offer with alacrity.

He played well in the Victorian Football League reserves during 1946, ranking second in the 'best and fairest' count; and in 1947, he ranked second in Collingwood reserves' best and fairest. In 1948, George made his debut in the Senior side in round six as a half-forward flank. He held his place in the senior side and, after his second game, he found his niche position in the back pocket where he excelled.

George was soon regarded as one of the best specialized back pocket players in the game, where he formed a wonderful understanding with Jack Hamilton at full back. George was effective at quelling the impact of resting rovers, being strong and close-checking; and he was not afraid to throw his weight around to unsettle an opponent. But he also loved to launch attacking forays down the ground and out of defence ('Vale George Hams', 2023).

He would finish third in Collingwood's Copeland trophy in 1950 and *The Argus* rated him the best back pocket in the League that same year. He was also wonderfully consistent, playing 57 consecutive games after his debut.

In 1951, *The Argus* wrote: "Hams is a back pocket player with pace, judgement and, above all, determination. He has settled down to being one of the best players in the league at a difficult position. He is intelligent and thoughtful, as master of a neat and well-judged defence. He is one of the most consistent players of his type in the game" (quoted in 'Vale George Hams', 2023).

In 1952, George suffered from some on-field injuries but became fit and played in the winning Collingwood 1953 Grand Final team. Overall, in his career George played 108 games for Collingwood, including 10 finals matches and two Grand Final matches, one of which was the 1953 Grand Final win.

In his business life, George was always described as both well-respected and very respectful. However, these terms were not always applicable to a resilient and reliable Collingwood back-pocket player during the rough and tumble of an Aussie rules football game. One senior executive at Telecom in the mid-1980s found an old newspaper article suggesting that George was somewhat ungentlemanly in his treatment of an opposing player in a particularly tough match. George recognized that this was very far from his current image and his colleagues were treated to a wry smile and an acknowledgement that the contest on a football field was played hard to win.

In those early times on the field, George learned that a football game was no place for the faint-hearted. When his nose was broken, George ran off the field and the coach reset the nose and then immediately sent him back to play on. The second time George's nose was broken, he reset it himself and played on. George never forgot his time at Collingwood and in later life recalled that, in his early football career, one of the highlights was the purchase of a set of brogue shoes in the club's colours, black and white, which he thought looked very smart at the time.

George finished his career with Collingwood in 1955 as Captain of the Reserves team. During this period, he developed many leadership skills, in terms of motivating individuals and teams,

setting challenging and seemingly unachievable objectives in new directions, and leading change. These leadership skills he later applied throughout his telecommunications career.

Family and Friends

George met and married Frances on 4 November 1961 after a whirlwind romance. In 2021 George and Frances celebrated their 60th wedding anniversary and were honoured with congratulatory cards from the Queen, the Governor General and the Prime Minister. He is survived by his wife, Frances, his son, Marcus, his daughter, Lisa, and grandchildren Alisha, Natasha and Alex.

George had a wide circle of friends from all walks of life. He also had a lifelong love of music and was an avid attendee at symphony concerts, plays, musicals and operas.

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Endnote

[i] Telecom Australia came into being on 1 July 1975 as a Government Business Enterprise, 100% owned by the Australian Government.