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Bridging the Digital Gender Gap: Assessing the Digital Maturity of Women-led MSMEs in Ghana

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ABSTRACT

This study focuses on measuring the digital maturity of Micro, Small, and Medium Scale Enterprises (MSMEs) in Ghana, specifically comparing the relative maturity of women-led. The research was motivated to determine the digital maturity of women-led MSMEs and provide recommendations for improvement. We examined the widely-held view that men have better access to and make better use of communication technologies than women. It also sought to address the gender gap in access to technology and its impact on women's social and economic empowerment. The research used a Digital Maturity Model to assess the digital maturity of MSMEs, considering dimensions such as people and skills, strategy and organization, sales and customer involvement, and process and operations. The model provides descriptive, prescriptive, and comparative insights and serves as a diagnostic and decision-making tool. We adopted a mixed methods approach, combining quantitative data collection tools; surveys and qualitative data collection through literature review and focus group discussions. With a convenience sample of 160 MSME owners in selected geographical locations, the findings have been used to craft information for stakeholders and provide recommendations for bridging the gender gap in digital maturity.

Keywords: Digital maturity, Micro, Small, and Medium Scale Enterprises, technology acceptance, Gender gap

1. INTRODUCTION

We start with the firm conviction that in the 21st century, 'going digital' is no longer a matter of choice [1]. It is also less an issue of competitive advantage now than a few years ago. It is an issue of survival. Preserving an entity in a more digitalised world means taking deliberate steps to use existing and potential information technology better. This starts with assessing one's growth or maturity relative to using such tools.

The research community generally understands the relationship between maturity and organizational performance. It has been demonstrated, for example, that higher maturity leads to higher performance, improved decision making and generally better business prospects [2].

This research set forth to measure, broadly, the digital maturity of Micro, Small and Medium Scale Enterprises (MSMEs), which form the bulk of the informal economy in Ghana. However, we delve deeper to compare the digital maturities of women-led and men-led entities to point out the differences in recommendations. The bulk of the Ghanaian economy is in the informal sector, which is also dominated by women [3].

This is against the background that trade is becoming more and more global, and this is just about to get even more intense with the operationalization of the African Continental Free Trade Area (AfCFTA) [4]. The prescriptions will help Ghanaian women-led MSMEs rebirth themselves to become more competitive and likely to survive. An adapted model is used. With the foreknowledge that adapted models need evaluation and validation before transfer and generalization, we consider this exercise's findings and recommendations as a benchmark for future work. Hence, mediating factors such as perceptions, motives, attitudes, and organizational culture which are critical to successfully deploying any information technology system [5] are conveniently left out of the scope of this work.

The Need for this Research

The research delved into the digital maturity of Micro, Small, and Medium Scale Enterprises (MSMEs) in Ghana, a vital sector in the country's economy. The Ghanaian MSME landscape presents unique challenges and opportunities, making it imperative to explore the digital readiness of these businesses in this specific context. To the best of our knowledge, there is a dearth of comprehensive studies that focus on digital maturity within the demographic of women-led MSMEs in Ghana.

We address the widely-held belief that men have better access to and make better use of communication technologies than women, particularly in Ghana. This gender-based digital divide has far-reaching implications for the social and economic empowerment of women in the region. This critical issue has not been extensively studied in the local context, making our research pertinent and timely.

Our study employs a unique Digital Maturity Model, specially tailored to assess the digital readiness of MSMEs. This model goes beyond mere measurement; it offers a comprehensive framework that provides both descriptive and prescriptive insights. Its uniqueness lies in its flexibility, and capacity to guide decision-making and serve as a diagnostic tool.

In conclusion, our paper seeks to fill a significant research gap by not only assessing digital maturity but also by focusing on a specific demographic (women-led MSMEs) within a unique context (Ghana). We emphasise the innovative aspects of our methodology and how our findings can guide policy and interventions aimed at promoting digital inclusivity and gender equity.

Objectives of the Study

The research's principal objective was to determine the digital maturity of women-led MSMEs in Ghana and make appropriate recommendations for improvement. Specifically, however, the research was motivated by the following objectives;

- To numerically examine the widely-held view that men have better access to and make better use of communication technologies than women
- To make recommendations to various stakeholders on how to close the gaps found by the study

Literature: Women and Digital Skills

Introduction to the Digital Gender Gap

Access to and utilization of digital technologies are vital for economic growth in today's digital world. Unfortunately, there is a significant gender gap in digital inclusion and technology access, especially among women-led micro, small, and medium-sized enterprises in Ghana. [6]. The gender

gap in technology access limits the ability of women-led SMEs to fully harness the potential of digitalization. Women in emerging economies have the opportunity to use digital platforms to transform various aspects of their lives, including social, political, and economic, which could help bridge socio-economic development gaps [7]. The digital economy plays a significant role in empowering women in emerging markets by creating new job and self-employment opportunities and enhancing their personal and social development through increased self-confidence and social connections. Closing the digital gender gap and ensuring women-led MSMEs have equal access to digital tools in Ghana holds the potential for inclusive economic growth and women's economic empowerment.

The digital economy is viewed as a way to promote inclusive economic growth and women's economic empowerment [8]. The absence of access to connectivity and digital technologies for women and vulnerable groups will worsen existing structural inequalities. Without targeted policies to address the digital gender gap, women-led MSMEs may be left behind, unable to fully engage in the digital economy, thereby hindering their overall development and the potential for poverty reduction.

Gender Disparities in Digital Access

Literature abounds with evidence that the ability to use or access technology plays a crucial role in an individual's capacity to participate in decision-making and, thus, remain relevant in modern society. Some academics argue that access to technology, particularly the Internet, is associated with greater levels of political participation, such as voting and contacting elected officials [9]. Beyond access to political actors, some researchers [10] argue that access to technology can empower women by increasing their access to information and communication channels and opportunities to learn new skills and engage in new forms of work, thereby increasing women's agency and decision-making power. Focusing on African women, some researchers note that technology can enable them to engage in new forms of economic activity and employment [11]. This is also supported by Kaufmann [12], who argues that rural communities can make informed decisions and participate in the development process if they have access to the appropriate technologies. [13] established that mobile phones are associated with increased access to information and communication channels, resulting in better-informed decision-making and enhanced agricultural outcomes. In addition, it is associated with the capacity of civil society organisations to influence decision-making processes [14].

Unfortunately, women are more challenged gender regarding technology access [15, 16, 17] Women, particularly in underdeveloped nations, frequently fall on the innocuous side of the digital divide, despite the fact that Internet and other ICT usage has significantly increased globally [18]. In the Ghanaian tech sector, men outweigh women by an 80 to 20 ratio, making a major gender imbalance apparent [19]. In a review of gendered ICT attitudes and self-efficacy in Ghana, [20] suggested that policymakers and administrators of higher education institutions carry out initiatives to boost female self-confidence and computer usage.

In Africa, the disparity between men and women who access the Internet has widened to almost three men for every two women. These statistics are especially glaring since they show that, despite almost equal gender usage of the Internet, discrepancies exist at the level of meaningful connectedness [21]. The standard agreement among all authors sampled during this study is that this negatively impacts women's social and economic empowerment and can hinder their ability to participate in decision-making processes. The gender gap in access to technology is often influenced by economic, social and cultural norms and institutional barriers [15].

The digital access divide is permanent, fluctuates with technological progress and diffusion, and is directly related to income inequality [22]. There are significant disparities in digital access between nonmetropolitan households, families from racial or ethnic minorities, and low-income households [23]. Some researchers [24] assert that gender disparities in digital access are a pervasive global challenge with far-reaching implications for social and economic development. Despite the growing prevalence of digital technologies, women frequently face greater barriers to accessing and employing them. This inequality manifests in a variety of ways, including limited Internet connectivity and digital device ownership, as well as disparities in digital skills and online participation. In emerging economies such as Ghana, the digital gender gap not only impedes women's empowerment but also the growth and competitiveness of micro, small, and medium-sized enterprises (MSMEs) led by women [25]. Understanding the root causes and effects of these disparities is crucial for developing effective strategies to close the digital gender gap and promote gender equality in the digital landscape, thereby fostering socioeconomic development and women's empowerment.

The Global Context of the Digital Gender Gap

The global context of the digital gender gap represents the worldwide differences in digital access and proficiency between men and women. Women are at a disadvantage compared to men in terms of Internet and digital tool access, as well as possessing the necessary digital skills for effective use [26, 27]. The gender gap in digital access is particularly stark in developing and least-developed countries. It's a significant issue that requires attention to ensure that everyone has equal access to the benefits of digital technologies.

Access to Technology Varies by Gender in Ghana

Some contend that [28] contends that, despite some progress in reducing inequalities, gender disparities in technology access persist in Ghana. These disparities encompass various critical aspects, such as Internet access, digital device ownership, digital skills, online engagement, and cultural and societal norms. Traditional gender roles and societal expectations worsen the challenges women face in accessing technology. Additionally, other researchers [29] are of the view that there may be cultural barriers in Ghana that discourage women from participating in the digital world. As a result, women may face difficulties in keeping pace with technological advancements and innovations, which can restrict their ability to adapt to changing market trends and meet customer demands [30]. Efforts have been made to reduce these disparities, such as improving digital literacy, expanding Internet infrastructure, and promoting women's participation in the technology sector. However, challenges persist, necessitating continued efforts to bridge the remaining gaps and ensure that both men and women in Ghana can fully benefit from technological opportunities.

Digital Maturity of Women-Led MSMEs

In an era defined by digital transformation, the success and viability of businesses depend on their digital maturity. Micro, small, and medium-sized enterprises (MSMEs) play a crucial role in driving economic growth, job creation, and innovation among these businesses. Assessing the digital maturity of SMBs is crucial, but when women-led SMBs are considered, this inquiry becomes even more compelling. A micro, small, and medium-sized enterprise's digital maturity indicates how well it can use and adopt digital tools to improve different aspects of its business, such as marketing, financial management, and supply chain efficiency [31]. Despite the global push for gender equality in entrepreneurship, persistent gender disparities in digital access and proficiency present unique challenges for women-led micro, small, and medium-sized enterprises. This introduction sets the

stage for a more in-depth examination of these challenges and opportunities by acknowledging the progress made in closing the digital gender gap and emphasising the importance of supporting and empowering women entrepreneurs in the rapidly evolving digital landscape. Understanding the digital maturity of women-led SMBs provides insight into how to close the digital gender gap and unleash the potential of these companies.

Factors Influencing Digital Maturity in MSMEs

The digital maturity of micro, small, and medium-sized enterprises (MSMEs) can be affected by some internal and external factors. These factors play a crucial role in determining how effectively MSMEs adopt and utilise digital technologies for their business operations. Key factors include access to digital infrastructure, financial resources, digital literacy, technological adoption, market dynamics, regulatory environment, industry sector, access to training and support, business size, and the competitive landscape. [32] believe that several factors have a significant impact on the propensity of micro and small businesses to adopt digital technologies. These factors include perceived risks (financial, security, and loss of time), perceived government pressure, and the knowledge level of directors. In addition, the level of digital maturity of the organisation and its competitive importance moderate the relationship between these factors and the intention to accept digital technologies [33].

The State of Digital Maturity among Women-Led SMES in Ghana

To evaluate the digital maturity of women-led SMEs in Ghana, it is necessary to consider the obstacles they face when employing digital technology for business purposes [34]. This includes but is not limited to, limited access to technology and Internet connectivity, a lack of digital skills and knowledge, financial constraints, and gender bias in the digital sector. In the current state of digital maturity among micro, small, and medium-sized businesses (MSMEs) led by women in Ghana, there are both opportunities and challenges. Despite significant advancements in the adoption of digital technologies by these companies, gender disparities in digital access and proficiency persist [35]. The limited access to digital infrastructure, financial resources, and digital skills faced by women-led SMEs in Ghana can inhibit their digital maturity. Cultural and social norms that limit women's participation in technology-related activities exacerbate these disparities [36]. Despite these obstacles, there is an increasing awareness of the significance of empowering women-led MSMEs in the digital age. Government and non-government organisations, as well as international initiatives, are currently working to provide training, financial assistance, and access to digital resources to female entrepreneurs in Ghana [34, 37]. Particularly in sectors such as agribusiness and e-commerce, some women-led SMEs have demonstrated tenacity and creativity in using digital tools for business expansion. Recognizing the untapped potential of women-led SMBs, there is a shift towards promoting gender equality and closing the digital gender gap, creating a more conducive environment for these businesses to increase their digital maturity and contribute to the economy.

The Role of Education and Training Programmes in Bridging the Gap

Education and training programmes can play a vital role in closing the digital skills gap between workers and businesses [38]. Investments in training programmes can address digital skills gaps among workers, including employees, managers, and businesses. Additionally, training programmes can enhance a company's capacity to meet technological challenges and seize opportunities and this resonates with some researchers [38, 39] concur that education and training programmes play a crucial role in bridging the digital gender gap and add that these programmes can equip women with the skills and knowledge to access and use digital technologies, thereby

enabling them to participate more fully in the digital economy. It demonstrates how policymakers can share information about the demand for digital skills with education and training providers, job seekers, and workers considering upgrading or acquiring new skills that will be in demand. It is observed that training programmes can be designed to be gender-sensitive, taking into account the unique needs and obstacles women face when gaining access to and utilising digital technologies. In addition, many nations have provided support for digital skills through the creation of educational frameworks, the modification of curricula, and the direct provision of training to SMEs [40].

Steps towards Equality in the Digital Sphere

In conclusion, stakeholders must collaborate to close the digital gender gap and enhance the digital maturity of women-led SMEs in Ghana. This includes government policies and programmes, private sector initiatives, and external collaborations. These efforts should address financial limitations, gender biases, discrimination in the digital sector, and cultural obstacles that discourage women from pursuing entrepreneurship and adopting digital technologies.

Framework: Digital Maturity Models

Business maturity may be broadly defined as "the ability to respond to the environment appropriately through management practices" [41]. This research preferred the definition which focuses on "how organizations systematically prepare to adapt consistently to ongoing digital change", as it is both simple and encompassing [42]. Any model seeking to evaluate and measure this would fit into the general description of a Digital Maturity Model.

Scholarly work on Digital Maturity Models is still relatively nascent, with no dominant definitions yet. The paper, nonetheless, recognizes other definitions, such as that of [43] which states that a Digital Maturity Model is a framework which describes "what a company has already achieved concerning transformation efforts" by gauging the status of an entity's digitalization and provide guidance for future investments. Therefore, we proceed with the synthesised definition of Digital Maturity as an entity's current ability to respond to environmental changes and create value using digital tools and techniques. Given the ease of use of maturity models and their practical value, several digital maturity frameworks and models have emerged in recent years, giving researchers a fertile ground to explore.

The use of Maturity models in general, but specifically Digital Maturity Models in this case, has multiple advantages in that they serve descriptive, prescriptive and comparative purposes. This lends them to varied research methods and approaches and is thus usable by many researchers.

- 1) **Descriptive:** A maturity model may be applied to describe the current capabilities of the entity under investigation using a set of criteria [44]. This means it can also be used as a diagnostic tool [45].
- 2) **Prescriptive:** A maturity model may be applied for prescriptive purposes where it may be used to identify desirable maturity levels and provide necessary guidelines on how to achieve same [45,46]. Specific and detailed courses of action can be suggested from there.
- 3) **Comparative:** A maturity model may be applied for comparative reasons allowing for internal and external benchmarking. Given sufficient historical data from a sufficient number of participants, the maturity levels of similar business units and organizations can be compared [47]. In conducting the research, authors had the option of using tools such as the CISCO APAC SMB Digital Maturity Index [48], the Digital Maturity Assessment Tool [49], the Digital Maturity Model 4.0 [50] and the Maturity model of digital transformation [51].

The CISCO APAC SMB Digital Maturity Index [48], developed by IDC CISCO, is based on a survey of 1,340 SMBs across major economies in Asia Pacific. Similar to the model of choice for this research, the tool places businesses into four levels; Stage 2: Digital Indifferent, Stage 2: Digital Observer, Stage 3: Digital Challenger and Stage 4: Digital Native. All respondents, though were selected from small and medium-sized businesses that employed between 50 and 499 employees. The use of Asia-only respondents and businesses with a minimum of 50 employees made researchers opt out of using the tool for the current research.

The Digital Maturity Assessment Tool [49] evaluates organisations across 15 competencies to produce digital maturity scores and places the organisation in one of five levels; Level 1: Sceptical, Level 2: Respectful, Level 3: Participative, Level 4: Inclusive and Level 5: Evangelical. It would fit very well into this research but was not used because the tool's questions were deemed quite technical and their meanings were likely to be lost in translation since the research included a large percentage of respondents (72%) who needed the English language questionnaire translated to them.

The Digital Maturity Model 4.0 [50], based on responses provided, places organisations in four Level One: Skeptics, Level Two: Adopters, Level Three: Collaborators and Level Four: Differentiators. Assessment is based on three equally important functions; developing digital strategy, governing digital activities across their firms and driving operational excellence into their digital execution. Also, a competent candidate for this research was not used largely because of the slight lack of flexibility with putting weight on the functions that are measured. The research preferred a model that would allow researchers and/or respondents to place context-based weights on the significant dimensions of the framework.

The Maturity model of digital transformation [51], though gave the research a deeper insight into the general thinking behind assessing the digital maturity of organisations, tended to focus on technology adoption in educational organisations. The tool would have required significant modification for the objectives of this research

In the end, the research used an adapted Digital Maturity Model due to its suitability for the objectives of the research and because of some factors, including; Prior use by team members and adaptability to allow comparison of demographics. In a recent study (unpublished), the team adapted the Digital Maturity Model to study the extent to which Ghanaian MSMEs are in their digital transformation. That study heavily influenced the thought, content and methods of this one who studies the digital maturity and skill gap across the gender divide in the informal sector. Table 1 details the different levels of the Digital Maturity Index.

Table 1: Levels of the Digital Maturity Index

Level	Indicative Score	Characteristic Features
Level 1: Digitally Indifferent	1: ≤ 1.75	<ul style="list-style-type: none"> — Digital efforts do not exist — MSMEs are reactive to market changes — No automation: business processes are manual — Digital technologies are not used — Digital skills are non-existent
Level 2: Digital Observer	2: Between 1.76 and 2.50	<ul style="list-style-type: none"> — Digital efforts have started but are done ad-hoc — Bite-size initiatives — Technology investments are siloed

		<ul style="list-style-type: none"> — Digital technology efforts are focused on efficiency — Digital skills are at a basic level — Strategies do not exist or are not well-coordinated
Level 3: Digital Challenger	Between 2.51 and 3.25	<ul style="list-style-type: none"> — Has a strategy for the use of digital technologies — Focused on becoming adaptable and agile — Core processes have been automated — Moving from reactive to proactive in market response — Has a roadmap for digital investments — Invest in talent management
Level 4: Digital Native	3.25 +	<ul style="list-style-type: none"> — Integrated digitalization strategy — Focused on driving continuous innovation — Pro-active and data-driven — Cloud-first and digital technologies embedded in all business processes — Digital technologies are used to amplify its presence and competitiveness in the market

Source: Adapted from DMI Model

Adapting the Digital Maturity Model for Ghana

In a pre-test evaluation of the model with some selected MSMEs, where possible actual respondents discussed the model, and weights were placed on each of the four dimensions of the model. The People & Skills dimension was regarded as the most important and given a weight of 35%. Strategy & Organization was considered the least critical and thus given a weight of 15%. The other dimensions, Sales & Customer Involvement and Process and Operations and Infrastructure were weighed 30 and 20%, respectively.

2. RESEARCH METHODOLOGY

The team applied a mixed methods approach using primarily quantitative (secondary data search and retrieval, and survey tool) and complementing same with qualitative data (through literature review and focus group discussions for anecdotal insights) as the different phases called for different approaches and techniques.

In an initial focus group meeting with leaders of the various MSME groups, weights were collectively assigned to the various dimensions of the digital maturity tool. This method and result ensured that the tool put more weight on what industry players considered more important; rather than considering every dimension as of equal importance or wrongly assigning weights.

To compute the digital maturity of MSMEs in Ghana, the study measured the granular digital maturity of individual MSMEs and proceeded to take averages of the same. This was achieved using an additional five focus group discussions with MSME associations in their usual meeting grounds on normal meeting days. The Focus Group meetings were scheduled with the convenience of respondents as a major consideration. The meetings provided the researchers with a more descriptive understanding of the issues.

To quantify the responses and digital maturity of respondents, however, the research used a survey tool. The quantitative technique was initially intended to be implemented completely using an online tool. Due to Internet connectivity constraints, however, hard copy versions were made available for a complement. In some cases, research assistants helped to translate and/or explain portions of the questionnaire to respondents. The research assistants later keyed in the completed hardcopy forms.

Sample Population

Table 2 gives details and summaries of the sample population. Generally, the research was guided by; Gender Balance, Traceability and Feasibility by way of cost. It sought to comparatively determine the digital maturity of women-led MSMEs relative to that of similar men-led entities. The informal sector, which according to the Ghana Statistical Service [52], employs over 84% of Ghanaians, was preferred by the team mainly on the basis that it would also offer a good opportunity for researchers to elicit the views of a wide category of entrepreneurs. Given the broad nature of the informal MSME sector, however, the research opted to focus on sectors that would increase the possibility of encountering women-led entities. The considerations aforementioned are explained herein:

Gender Balance: The goal to obtain a near 50-50 balance of male and female respondents with a slight skew towards female participants, similar to the general population distribution, led the team to actively decide to work with members of trade associations with a clear domination of either sex. Thus, the following categories of trade associations were targeted for interview; Hairdressers and beauticians' associations (Female dominated, 2 associations), Dressmakers and Tailors Associations (mixed, 3 associations) and Electricians and electronics Associations (male-dominated, 2 associations).

Traceability: After the preliminary studies, the team was faced with the fact that the informal sector is characterized by highly temporary business addresses and a situation where business owners occasionally switch trade. To make room for the possibility of future trend studies, the research sought to work with business owners recognised by any or some of the known trade associations working in the area

Cost: With limited funding available, the team chose to focus on three densely populated 3 conterminous geographical locations accessible to the team at manageable transport costs; Sagnarigu Municipality, Savelugu Municipality and Tamale Metropolis.

Table 2: Population and Sampling Details

Association	Location	Est Population	Sample
GHABA	Savelugu Municipality	430	35
GHABA	Tamale Metropolis	670	55
GNTDA	Savelugu Municipality	40	3
GNTDA	Tamale Metropolis	65	5
GNTDA	Sagnarigu Municipality	35	5
PETAG	Tamale Metropolis	450	32
PETAG	Sagnarigu Municipality	312	25
Total		2002	160

Source: Field Data, 2022

In the end, the study aimed for a convenience sample of 160 MSME owners in Sagnaregu, Savelugu and Tamale as shown in Table 2. Per association registration and dues payment figures, the total population of the targeted enterprises is about 2000 business owners. There was no official figure available on the accurate number of MSME owners in the area under survey.

To determine sample size, the research considered a well-tested Green Rule guide [53] which provides a comprehensive overview of procedures used as well as two rules of thumb for calculating the minimum acceptable sample size:

Rule 1 is derived from the Regression Model Overall Test which indicates that the minimum sample size is calculated as $50+8k$.

Rule 2 is based on an Individual Predictor Test which requires that the minimum sample size is $104+k$

In both rules k = number of predictors. In the research, there were three predictor variables; Sex, Age, and Education Level albeit, this paper focuses on the first predictor.

Using Green's rule 1; the minimum sample size should be $50 + 8k = 50 + 8 \times 3 = 50 + 24 = 74$

And going by the second rule; the minimum sample size should be $104+k = 104+3 = 107$

Green's recommendation is for the researcher to select the larger value. Therefore, the minimum sample size which will produce reliable data and analysis would be 107 respondents. In sampling, however, the research opted to go significantly beyond the minimum but, guided by convention and some expert assertions [54], took cognizance of a possible maximum sample size of 200. Eventually, the team settled on a 160-target sample as shown in Table 2.

Data Collection

The data collection component of the research started with a focus group meeting with leaders of the selected trade associations. This meeting served a dual purpose of community entry and giving a general qualitative understanding of the MSME sector in Ghana to the research. It also offered an opportunity for adapting and pre-testing the digital maturity index. Participants were not predetermined but comprised ten women and four men MSME leaders – a gender distribution not too far from the anticipated one for data collection. This initial focus group meeting highlighted the need to include face-to-face focus group discussions with the potential to complement the original idea of an online questionnaire with hard copy versions.

In a later stage of data collection, five focus group meetings were held with randomly selected members of the selected trade groupings. In these meetings, the needs and objectives of the research were explained, and with the help of trained enumerators, the English language survey was explained and translated into Dagbanli. Respondents could fill in the form directly via the available Google Form or on the preprinted paper questionnaire. Most respondents preferred to fill in the form on paper (sometimes with the help of enumerators). A total of 156 (out of 160 expected) participants were involved in the meetings, with 153 respondents adequately responding, representing a 98% response rate. The team considers this extraordinarily successful and attributes that to the heeding of the advice received during the preliminary focus group meeting.

3. RESULTS AND DISCUSSION

Although the research interest is the digital maturity of women and women-led MSMEs, the research collected data from both men and women to be able to make a direct comparison. Apart

from the Process, Operation & Infrastructure dimension, where participants were placed in Level 1, all other dimensions scored a weighted average in Level 2.

The scores were obtained for all respondents, as detailed in Figure 1.

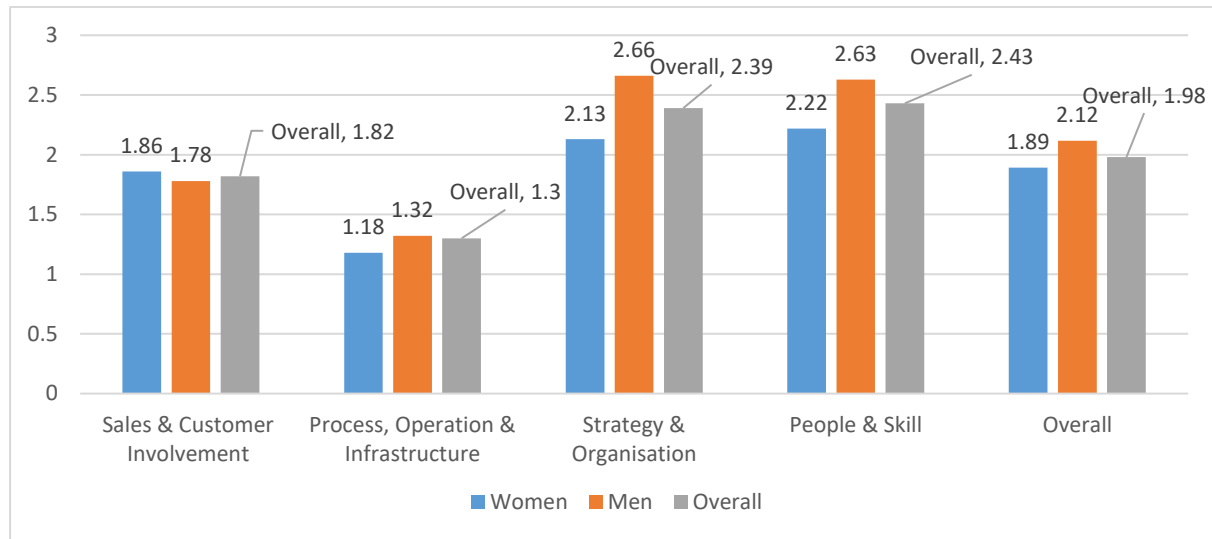


Figure 1: Dimension & Sub-Dimension Scores across Gender

The overall weighted digital maturity was thus computed as 1.98. This placed the average MSME leader at a low level, Level 2. The general characteristic picture obtained from the focus group discussions was that many MSMEs, for example, keep their financial and staff records manually in a book or memory. Some had considered digital options but needed to follow up with a strong commitment. The use of mobile money was, in most cases, the most advanced tool regarding financial transactions and records. Some relevant views of some of the respondents are quoted/translated here:

"Me, I don't even have a computer, not to talk of using it to do my work. Maybe my girls will do that when they are on their own later". (IDI, 2022) Respondent 1

"We advertise some of the designs we sew on our WhatsApp status and DPs. But....., no I don't know how eCommerce works though. I would like to try it". Respondent 2

Table 3: Maturity Score across Gender

<i>Dimension & Sub-Dimension</i>	<i>Maturity Index Score</i>		
	<i>Women</i>	<i>Men</i>	<i>Overall</i>
Sales & Customer Involvement	1.86	1.78	1.82
<i>Sales Channel Management</i>	<i>1.81</i>	<i>1.83</i>	<i>1.82</i>
<i>Digital Marketing</i>	<i>2.41</i>	<i>2.12</i>	<i>2.27</i>
<i>Customer Feedback</i>	<i>1.37</i>	<i>1.39</i>	<i>1.38</i>
Process, Operation & Infrastructure	1.18	1.32	1.30
<i>Internal Processes</i>	<i>1.34</i>	<i>1.54</i>	<i>1.44</i>
<i>Data analyses</i>	<i>0.98</i>	<i>1.47</i>	<i>1.23</i>
<i>Financial Management</i>	<i>1.18</i>	<i>1.14</i>	<i>1.16</i>
<i>Usage of Digital Financial Services</i>	<i>1.20</i>	<i>1.12</i>	<i>1.16</i>
Strategy & Organisation	2.13	2.66	2.39
<i>Use of Digital Tools to run business</i>	<i>2.21</i>	<i>2.56</i>	<i>2.35</i>
<i>Digital Strategy</i>	<i>2.20</i>	<i>2.47</i>	<i>2.34</i>
<i>Current Investment priority in digital technology</i>	<i>1.98</i>	<i>2.96</i>	<i>2.47</i>
People & Skill	2.22	2.63	2.43
<i>Digital skills level of employees/apprentices</i>	<i>2.07</i>	<i>2.21</i>	<i>2.14</i>
<i>Capacitating employees/apprentices with digital skills</i>	<i>2.91</i>	<i>3.67</i>	<i>3.29</i>
<i>Perception of overall digital skill availability in business</i>	<i>1.69</i>	<i>2.01</i>	<i>1.85</i>
Overall			1.98

The Gender Factor

A primary objective of the research was to determine the digital maturity of women-led MSMs in Ghana. This is better explained and contextualised compared to men-led MSMEs in the same

businesses. This informed the reason for collecting data from both men and women and presentation of same as in Table 3. In the end, 153 valid MSME responses were used. The overall Digital Maturity Index score of surveyed MSMEs was 1.98. The research proceeded to break this down further according to the sex of the respondents. Overall, women-led MSMEs (1.86) only performed slightly better than men-led MSMEs (1.78) in the area of Sales and Customer Feedback. The high usage of digital tools boosted the relatively high score in this dimension for Digital Marketing among women-led MSMEs, where they scored 2.41 compared to the 2.12 score obtained by men-led MSMEs. Men-led MSMEs scored better along the Digital Maturity scale in most other sub-dimensions. An intra-level presentation of maturity between the two genders is shown in Table 4.

Table 4: Digital Maturity Level by Gender

Gender	Men		Women	
	Number	Percentage	Number	Percentage
Level 1	8.00	12.9	27	29.3
Level 2	48.00	77.4	59	64.1
Level 3	6.00	9.7	6	6.5
Level 4	0.00	0.0	0	0.0
Participants	62	100	92	100
Average Digital Maturity	2.18		1.94	

Female entrepreneurs scored a lower Digital Maturity Level (1.94) than their male counterparts (2.18). This is evidenced by the higher representation of female entrepreneurs (29.3%) than male entrepreneurs (12.9%) within level 1 of the index. In the higher levels, however, there are higher proportions of male representatives in either category than females. There was a 77.4% male representation in Level 2 compared to 64.1% female. A similar trend is found in level 3 (9.7 and 6.5%, respectively). All trade groups scored weighted indices within Level 2 but with different strengths. The research team decided to dig deeper by studying the maturity within trade groups. Of particular interest were the single-sex-dominated trade groups. The male-dominated trade group, Progressive Electronics Technician Association of Ghana (PETAG), had the highest index score (2.3), even with 15% of participants within this subpopulation scoring within Level 3. On the other hand, the female-dominated group, the Dressmakers and Tailors' Association scored the lowest maturity value of 1.85; 39% of these tailors were Level 1 business owners. The metrics in Table 4, show for the first time, metrics indicative of gender disparity in access and use of technology among MSME owners in Ghana. For stakeholders of the trade associations or categories that agreed to participate in the research, Table 5 further presents the Maturity Indices of the trade groups with a highlight on their respective gender-make up.

Table 5: Digital Maturity by Trade Association

Trade Group	Description	Maturity Index Score
PETAG	Male Dominated	2.3
Ghana Progressive Hairdressers Association	Female Dominated	2.09
GESTA	Male Dominated	2.01
GHABSU	Mixed	2.01
Woodworkers Association – Savelugu	Mixed	1.99
Ghana Hairdressers and Beauticians Association	Female Dominated	1.91
Tailor's Association – Savelugu	Female Dominated	1.85
Average Male Dominated		2.155
Average Mixed		2
Average Female Dominated		1.95

Discussions:

The data revealed several key insights into the digital maturity of women-led MSMEs in Ghana. Female entrepreneurs faced greater challenges in terms of digital skills and maturity compared to their male counterparts. While they excelled in Digital Marketing, other dimensions like Sales Channel Management, Customer Feedback, Financial Management, and Digital Financial Services demonstrated a clear need for improvement.

The research highlighted that the MSME sector, in general, continues to rely on manual processes and faces barriers to embracing digital tools, including concerns about cyber fraud and taxation. This points to a need for better support and education to bridge the digital gender gap.

Furthermore, the disparities within different trade groups emphasise the need for tailored interventions to address gender-specific challenges. To advance digitalization and gender equity within MSMEs, it is imperative to focus on providing equal access to digital training and resources. Additionally, raising awareness about the benefits of digitalization in these sectors is crucial to fostering sustainable growth.

The research assessed digital maturity across various dimensions. The overall digital maturity index yielded an average score of 1.98, indicating a relatively low level of digital maturity among the surveyed MSME leaders. This overall picture raises concerns, particularly in the context of a rapidly evolving digital landscape.

The study revealed stark differences in digital maturity levels. Female entrepreneurs exhibited a lower digital maturity level (1.94) compared to their male counterparts (2.18). This difference was further elucidated by the distribution of participants across maturity levels. While female entrepreneurs were overrepresented in Level 1 (29.3%), male entrepreneurs dominated Level 2 (77.4%). It also showed, within specific trade groups, substantial disparities. The male-dominated

Progressive Electronics Technician Association of Ghana (PETAG) outperformed the female-dominated Dressmakers and Tailors' Association in digital maturity. These findings confirm the presence of gender-specific challenges within different MSME sectors.

Digital Maturity per Dimension

Sales & customer involvement

This dimension focuses on how an MSME uses critical digital technologies to engage customers and increase its visibility and competitiveness. The Sales & customer involvement dimension weighted 30% of the overall Digital Maturity by the pre-test participating team. It consisted of three sub-dimensions: Sales Channel Management, Digital marketing and Customer Feedback. The use of digital technologies for Customer Feedback scored the lowest, with an index of 1.38. This indicates that the average MSME is more interested in making itself visible than learning from its customers, as Digital Marketing scored relatively high at 2.27.

During the focus group sessions, some members demonstrated how they use social media to sell their businesses and products.

"I use my WhatsApp status a lot to show people the kinds of clothes I have just sewn" - Respondent 3

"Almost every time, I snap pictures of my client's hairstyle after finishing I post on my status and I caption it with a short description. It makes people contact me". Respondent 4

Although most respondents raised their hands on the question of who has an account on specific social media platforms (WhatsApp, Facebook, Instagram), for most participants, these tools are more for personal rather than business. Only three respondents (all male electricians) were using WhatsApp Business.

In the sales Channel Management and Customer Feedback subdimensions, men-led MSMEs outperformed their female counterparts. Women-led MSMEs, however, scored better at Digital Marketing.

Process, Operation & Infrastructure

This dimension focuses on using digital tools for internal processes and how data is used in the decision processes. This dimension weighed 20% of the overall Digital Maturity. This dimension is in its infancy for most responses and the entire MSME sector, as most processes in the participating MSMEs were still carried out manually. The use of digital tools for Financial Management and Digital Financial Services scored especially low (1.16 out of 4.0). All respondents claimed to have at least one mobile money wallet during the focus group meetings. A further probe during the focus group meetings pointed out that respondents use mobile money more for personal matters than business matters, as only 11% have a dedicated mobile money account (known as a Merchant Number) for receiving and making business payments. Although out of the scope of the study, the study picked up hints from members that they may deliberately be avoiding mobile money due to the then recently imposed electronic transactions tax popularly known as e-levy.

In other operations management, respondents indicate the widespread use of WhatsApp groups to communicate with co-workers and apprentices. The same tool also played essential roles at the trade group association level.

"At the National and Regional levels, we have a Faults & Solutions platform where people post faults, questions and search for scarce products. Most of the time, someone somewhere

has a solution to your problem. If you can't get a solution to your problem there, forget it".
Respondent 6

One of the reasons behind the low use of technology for operations, or financial operations specifically, is distrust and severe concerns about cyber fraud. It was a common complaint by participants in the group meetings of rampant mobile money fraud, mainly on the back of social engineering.

"Look, they managed to take over 5000 cedis from a friend's wallet. Another one lost 2500 and me myself, they almost got me. I was fortunate to discuss this with a friend who stopped me from giving away my money. It will be difficult for me to keep my business accounts on mobile money." Respondent 7

In the subdimensions of Usage of Digital Financial Services and Financial Management, women-led MSMEs were more digitally mature than men-led entities. The opposite was, however, the case in the subdimensions; Internal Processes and Data analyses. Overall, however, the digital maturity of women-led MSMEs lagged at a score of 1.30.

Strategy & Organization

This dimension quantifies the kind of planning (more future-focused) on entities towards digitalization. Although regarded as the least important of the four dimensions (15%) of overall Digital Maturity, this dimension showed the highest level of maturity among respondents at the higher end of Level 2 (2.39). In all three sub-dimensions, Use of Digital Tools to run business, Digital Strategy and Current Investment priority in digital technology, men-led MSMEs performed better in score than women-led MSMEs.

People & Skill

This dimension, perceived by MSMEs as the most important, was given a weight of 35% of the overall Digital Maturity. The dimension focuses on the digital skills level of the respondents and their employees or apprentices. The sub-dimension, "Acquisition of Digital skills for employees/apprentices," scored highest with an average score of 2.14, with 2.07 and 2.21 being the scores for women-led and men-led MSMEs, respectively. Again, on this score, the men-led entities performed better along the scale. The TVET trainers interviewed admitted they do not do tracer studies of their products and do not place much emphasis on digital skills beyond the very basics. No training on mobile device use is given in any TVET service provider. However, the reality is that business owners are more likely to use mobile devices than desktop or laptop computers. As our TVET respondents said,

"You know, these syllabi take a long time to revise. We are still living in the era of desktop and tower machines meanwhile our learners have gone mobile." Respondent 8

and

"There is a ban on the use of mobile phones by students in second-cycle institutions. So there is no need to talk about training them on the use of mobile phones. It is assumed they will learn that when they leave school" Respondent 9

In the course of the study, other than curiosity and constant practice, there was no other apparent reason for the higher maturity levels observed in male-led businesses than in female-led businesses. Per responses during the group meetings, we observed that male and female respondents of the same age group had been owning or/and using smartphones for roughly the same number of years.

However, the male respondents often showed better skill and maturity than their female counterparts.

4. CONCLUSION

This study provides a comprehensive analysis of the digital maturity of women-led MSMEs in Ghana, emphasizing the importance of addressing the gender gap in digital skills and adoption. The findings underscore the need for targeted strategies, support, and education to empower women entrepreneurs and promote equitable access to digital resources. Bridging this gap will not only benefit individual businesses but also contribute to the overall economic development of the country. More specifically;

- There is a low level of digital maturity for informal sector MSME leaders in Ghana. But this is even worse for MSMEs led by women who as a consequence cannot take the desired advantages of the technology tools available at their disposal.
- The average digital maturity of the average informal sector business leader is level 2. What this means is that digital efforts have started. This is especially so concerning sales and customer involvement. Efforts are, however, ad-hoc and not necessarily planned, and where digital technologies are used, it is often at the personal level and less for business purposes. In all dimensions and sub-dimensions, women-led MSMEs lag except in the area of Digital Marketing.
- There is a disconnect between TVET/formal training and the world of work. We found out, for example, that the digital skills taught at school are basic office productivity skills and not geared towards integrating digital skills into technical trade skills. The TVET Centres, also, do not train students in mobile phone usage skills, although this is important to run a business.

RECOMMENDATIONS

With a collective digital maturity of the lower 2, deliberate efforts are needed to make women and women-led MSMEs more competitive. Such efforts are expected from the individual, trade association, governmental and non-governmental levels. The results of this research show specific areas to target in such future efforts. Some strategies could include encouraging more digitally mature women business leaders to share their experience and skills with others to improve their digital maturity. This can be integrated into regular association activities and meetings.

TVET training institutions should, in the regular revision of their curricula, include more practical digital skills training for their trainees. This should be done alongside regular meetings with industry players and tracer studies of past trainees to further tailor training.

This research focused on the leadership of MSMEs in Ghana. We recommend a further study along the same lines with a focus on trainees and apprentices. There is a likelihood they may be at different maturity levels and thus require a different set of strategies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

AUTHORS' CONTRIBUTIONS

KK is team leader and conceptualized the idea, prepared the skeletal document, led the data collection and managed the division of labour among team members. FI studied the long audios and transcripts of interviews to select the most relevant statements, analysed same and ensured data

used was in line with the set objectives of the research. DA was a major contributor to the background literature and ensuring internal cohesion of parts of the document. AA led the numerical data analysis using the selected framework and was responsible for accurate documentation of the methods and methodology. Output from individual authors frequently overlapped but only contributed to the richness of content. In the end, all authors actively contributed to and approved the final manuscript.

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