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Business Digital Maturity and Organizational Performance: An Empirical Analysis of Service Sector Firms in a Developing Context

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Abstract
Though studies have reported positive effects of digital maturity on organizational performance, empirical studies examining digital maturity along the lines of technological maturity are scarce. So, the purpose of this study is to examine the extent to which firms integrate core digital technologies into their business management. To answer the research hypotheses, a quantitative method was employed to collect valid data from 266 service sector employees across 10 centers. The findings from this study reveal that technological maturity positively impacts organizational performance (B =.387; p<.000). The second hypothesis that digital literacy mediates the relationships between technological maturity and organizational performance is validated (B =.228; t =4.300; p<.000). Finally, the hypothesis that there are differences in perceptions about technological maturity and digital literacy among groups of employees is also supported. This study distinctively assesses digital literacy and technological maturity based on the extent to which social, mobile, analytics, cloud, and security technologies are integrated into management processes in Africa.
Key words: Digital maturity; digital literacy; digitalization; digital technologies; SMACS technologies.
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1.0 Introduction

Digitalization has become an important concept that needs to be well understood. Today, digital technologies have revolutionized how businesses are carried out. Foster (2009) confirms that digital technologies contain powerful functionalities that can support organizations in reducing costs, improving quality of service delivery, enabling higher productivity, and providing strategic capability. Jatobà et al. (2019) define digital technology as a set of tools with the capacity to transform and enhance organizational processes. In a related study, Heilig et al. (2017) referred to digitalization as a broader process of transforming an organization or a network of organizations on different levels; strategy, governance, leadership, culture, people, and technology by introducing digital technologies. So, an organization's ability to transform all these aspects indicates the extent of its digital maturity. The concept of digital maturity is linked to higher organizational performance; so, it continues to attract the interests of researchers and professionals. Remane et al (2017) conceive of digital maturity as the organizational perception of digitalization and the extent to which it affects its performance. Also, Kane et al (2017) describe digital maturity as consisting of digital culture, digital long-term strategy, digital experimentation, digital skills, and digital leadership. As far as Phin et al. (2023) are concerned, it is a combination of people, processes, and technology infrastructure. Digital maturity is a recent concept with considerable impact on countries' economic and social prosperity. It is for this reason that the European Commission sets up the Digital Economic and Social Index (DESI), a framework to assess the digital maturity of European Union countries and outline areas of priority.

Digital maturity remains a complex phenomenon that has yet to have a universally accepted definition and assessment. Different maturity models have been outlined in the existing literature (Remane et al., 2017; William et al., 2019). Digital maturity incorporates different capability dimensions, namely strategy, leadership, business, operating model, people, culture, governance, and technology. Digital technologies remain the backbone of digitalization. In a study to evaluate the familiarity of educators with information technologies, Dhendup and Sherab (2023) report their lack of knowledge and understanding of information technologies. Also, Foster reveals that managers lack an understanding of the potential of information systems. However, a deficiency in understanding the potential of digital technologies can be disastrous for a firm's competitiveness. Lack of knowledge about the capabilities of digital technologies can impede a firm's successful digital transformation efforts (Mansurjonovich, 2023). Each digital technology is unique and plays a different role but integrating them yields a synergetic outcome. Some years ago, Gartner, an information technology consulting firm, developed a model integrating social, mobile, analytic, cloud, and security systems labeled "SMACs Technologies'. Despite

the publicity about the SMAC's digital architecture, studies on digital maturity have not examined this integrated digital infrastructure. Lack of sufficient studies outlining the potential of digital technologies may account for manager's lack of knowledge. Moreover, considerable investments made in this infrastructure can't be optimized without having digitally savvy and competent employees. Digital competencies are vital for achieving higher business values (Bejakovi and Mrnjavac, 2020; Mihalcea, 2017). Digital literacy represents the people's component of the digital maturity model (Tinmaze et al., 2022; Phin et al., 2023; Kane et al., 2017). Furthermore, Wodecka-Hyjek et al. (2021) have called for future studies to specifically examine the importance of digital literacy in the development of digital models. So, this study is interested in assessing digital maturity based on technological maturity comprising social, mobile, analytic, cloud, and security systems. It also aims to assess the role of digital literacy in the digital maturity model. Technologies and people (competencies, abilities, skills, and experience) constitute the core dimensions of digital maturity models.

Moreover, Williams et al. (2019) reveal that the digital maturity model is currently a relevant topic across several industries but is still limited by a lack of validation and a universally accepted model. They call for further investigation of the digital maturity model. Furthermore, in a meta-analysis of the literature, it has been shown that Africa has been left out of studies examining digital maturity (Williams et al., 2019). The current digitalization of business is driven by five main technologies: social media, mobile, big data and analytics, cloud computing, and securities technologies. However, studies examining digital maturity failed to consider the technological maturity. Roussel (1984) defines technological maturity as a development path through which a firm build its technological capabilities. This study conceives technological maturity as the extent to which core emerging technologies are integrated into the existing capabilities for the purpose of enhancing business performance. So, this study aims at filling the gap by examining digital maturity in the African context with an emphasis on technological maturity (SMACs) and digital literacy. Therefore, to fill in the gap, this study intends to assess digital competencies as a component of digital maturity. Thus, this study is interested in investigating whether digital literacy mediates the relationship between technological maturity and organizational performance. Furthermore, based on reports of a digital divide among firms, this study seeks to examine any differences in employees' perceptions of digital maturity. So, the rational question posed by this study is: what is the extent of digital technology maturity in the African business context? Does digital literacy contribute to organizational performance? This study is important as it attempts to validate the digital maturity model by specifically assessing the extent to which parent digital technologies have been integrated into management processes in Africa. This study also seeks to distinctively outline the capabilities associated with individual core technologies and the synergetic effects that can be derived from them. This can be a useful reference point for managers to formulate their digital strategy with a focus on optimizing technological capabilities. This study extends the literature by empirically examining core technological infrastructure and digital literacy. Specifically, it assesses digital maturity based on the integration of both social, mobile, analytic, cloud computing, and security technologies. Finally, this study contributes to research by examining the concept in a developing context where studies on digital maturity are nonexistent or scarce. The next section reviews the literature based on social, mobile, analytic, cloud, and security technologies. It ends with a review of digital literacy.

2.0 Literature Review

2.1 Digital maturity

Digital maturity remains a multidimensional concept. It has been conceived differently. For instance, Remane et al. (2017) conceptualized digital maturity as the extent of digital impact, digital skills, digital budget, and a firm's readiness. As far as Kane et al. (2017) are concerned, they perceive digital maturity as involving digital culture, digital long-term strategy, digital experimentation, digital skills, and digital leadership. Digital maturity comprises people, processes, and technology infrastructure, and they constitute the three pillars on which firms need to focus their attention to achieve success (Phin et al., 2023). Moreover, Haryanti et al. (2023) define digital maturity as a combination of organization structure, technology, strategy, employee, customer, transformation process, and culture. Also, William et al. (2019) describes it as a strategy, products or services, technology, people, and culture. Thus, this study is interested in examining the maturity model, which consists of digital technologies and digital skills. Tutak and Brodny (2022) have called for studies to examine industry technologies and digital skills. This part is individually reviewing literature on social, mobile, analytic, cloud computing, and security technologies as they constitute the core technologies that drive the business digitalization agenda.

***Social Media*:** Today, social media has become a household name in every part of the world. Platforms such as Facebook, LinkedIn, Twitter, Instagram, and YouTube, to just mention a few, are the means of everyday

interaction. Social media technology is based on the world wide web and consists of blogs, forums, business networks, photo-sharing platforms, social gaming, microblogs, chat apps, and social networks. Gancho (2017) refers to social media as sites that allow new stories, articles, blogs, posts, videos, and photos to be shared with a community. Kaplan and Haenlein (2012) defined social media as a group of internet-based applications built on Web 2.0 technology to allow the creation and exchange of user-generated content. According to Leonard et al. (2013), social media supports communication relating to marketing, employer branding, and customer relationship management. They outline knowledge sharing and management, communication with new hires, developing relationships, and social capital as their associated benefits in organizations. In a study aimed at evaluating the role of social media within business firms, Siricharoen (2012) discusses that a key feature of social media sites is profile generation, which enables users to search for other users with similar interests to exchange with them. He states that for an organization to benefit from the use of social media, its communication strategies must vary, targeting different populations at different times; otherwise, its efforts will go to waste. He also adds that corporate social media must be appropriate to the business goal. In conclusion, he notes that firms must broadcast their news and pictures in real time to attract the attention of their customers and engage them. Social media technologies have become an organizational tool used to shape the way firms communicate with both their internal and external stakeholders. They can be built in-house or hosted by a third party as software as a service. They support communication relating to marketing, brand management, and customer relationship management.

H1: social media Technologies positively impact organizational performance.

Mobile Technology: The use of mobile phones has significantly increased around the world, particularly for the purpose of managing businesses. Mobile operators are even multiplying their efforts to reach more subscribers. Jarvenpaa and Lang (2005) define mobile technologies as handheld devices such as mobile phones and portable digital assistants, an artifact that comprises hardware, software, and communication and network systems. It is reported that 20% of firms have adopted mobile capabilities, and the development of this capability has increased with the development of cloud computing (Aker and Mbiti, 2010). Mobile technologies are not only used for personal reasons but also for the purpose of professional work (Pitichat, 2013). Also, Soupayama and Scarofone (2015) describe mobile device characteristics as being small in form and using a wireless interface such as WIFI or a cellular network to enable connection to the internet. It has an operating system, a microphone, a digital camera, voice recording, and a storage device. Mobile technologies facilitate voice and data communication, coordinate tasks and people, and improve sociability by uniting employees, families, and friends (Jarvenpaa and Lang, 2005). Also, Pitichat (2013) reports that using mobile devices is valuable as it promotes autonomy, improves relationships between coworkers and their superiors, and improves knowledge sharing. He further clarifies that these advantages, in return, provoke employee satisfaction and enhance the organization's ability to adapt to its environment. Furthermore, Stieglitz and Brockman (2015) examine the impact of mobile devices on organizations. Their study reveals four main benefits linked to the use of mobile technologies. The first is the ubiquitous accessibility of data; the second is that mobile technologies support business processes; the third is that they unify communication by pooling resources together; and finally, they cause employee satisfaction.

H2: Mobile technologies positively impact organizational performance.

Big Data and Analytics: The presence of big data is evident in today's organizations with the presence of different forms of data and storage devices**.** Data has become ubiquitous as it is produced everywhere and at any time in written, oral, and audiovisual forms. It is the era of the knowledge economy, where data has become hard evidence and a source of competitive advantages. Abdulmelik (2017) conceptualizes big data as a concept that integrates a variety of data sources, systems, and skills to make meaning out of it and create a competitive advantage. He describes its features in terms of velocity, variety in data sources, speedy access to datasets, and reliability of its sources. Furthermore, Garcia-Arroyo and Osca (2019) explicate that big data means voluminous, varied, and fast data. Ali et al. (2020) describes big data as data whose size is beyond the capability of ordinary database management systems in terms of storage, capture, and processing power. They remark that the impact of big data on businesses is not yet clearly understood. They report that it has potential in human resources; it replaces the traditional practices of human resource management. As far as Mikalef et al. (2012) are concerned, they postulate that big data impacts organizational capabilities and enhances their operational efficiency. It enables firms to identify deficiencies in products and service delivery but also to identify and better understand the different market segments to provide them with solutions that are better and tailored to the firm's market needs. Delone et al. (2018) explain that the availability and increasing nature of data are changing technology infrastructure, competencies, and information technology organizations. It impacts the information technology

ecosystem and improves decision-making in organizations. Besides, Bowman et al. (2019) argue that big data technology has caused the emergence of new business models driven by data. They discuss how big data is not only useful in marketing and customer relationship management but also in driving the creation of new business models. Furthermore, Raguseo and Vitari (2016) justify how investments in big data technology can create business value. They examine both direct and indirect effects through mediating variables (market performance and customer satisfaction). They report that the business value of big data analytics solutions explains 62.4% of the variance of customer satisfaction, 71.9% of the variance of market performance, and 78.6% of the variance of financial performance.

H3: *Big Data and Analytics* technologies positively impact organizational performance.

Cloud Computing: the need for greater computer processing power, storage space, and cost associated with a stand-alone computing system created an opportunity for a technology capable of pooling and sharing computing resources. According to Devasena (2014), cloud computing technology emerges because of developments in social media, mobile technology, and e-commerce. He identifies two service models: software as a service with regular updates, patches, and new versions, and infrastructure as a service. Also, Gopichand (2015) defines cloud computing as a virtual space where users launch their applications. He notes that it consists of several servers that are hooked together with a powerful computing platform where developers launch their applications, store data, and retrieve it. Huth and Cebula (2011) conceptualize cloud computing as a subscription-based service of storage space and cloud computing processing power for users. They identified four different types of cloud computing: public, private, community, and hybrid. They argue that they all provide different services and that the selection of each one depends on the needs of the customer. Cloud computing comes with economies of scale advantages. For instance, Etro (2011) identifies some benefits associated with the adoption of cloud computing technology by SMEs. He stresses the reduction of fixed and production costs and the replacement of capital expenditure by operational costs; all this leads to a reduction of costs relating to the entry barrier. In examining the impact of cloud computing on the development of SMEs, Devasena (2014) notes that cloud computing provides cheaper service as the customer does not have to make an investment in information technology infrastructure and it is not required to have skilled personnel to carry out the configuration and maintenance services. Also, Gopichand (2015) outlines the benefits of cloud computing in terms of pay as you use, on-demand access, flexibility, scalability, reliability, efficiency, and low costs.

H4: *Big Data and Analytics* technologies positively impact organizational performance.

Security Technology: The advancement in digital technologies has caused unprecedented information security threats for organizations. Information is vital, and unlike before, it is today transferred, stored, and processed electronically. As a result, it becomes a target for miscreants. According to Ingrund et al. (2008), novel security threats are emerging and targeting business assets and operations. They note that it is the result of integrating digital technologies into the management process. In addressing the role of standards in information security management, Humphrey (2008) identifies insider threats as the greatest security challenge. He remarks that the corrupting of critical files by unhappy employees can be a costly security incident and that it mostly happens because of flaws, gaps, and vulnerabilities in the management system. He explains that standards are made of best security practices, so he entreats management to adopt security standards to curb insider threats and other security threats. He also recommends periodic backups and regular contact with the end user. Moreover, Kritzinger and Smith (2008) indicate that security retrieval and awareness creation can be used to improve employees' security alertness. Similarly, Herdrdstron et al. (2011) discuss how information system technologies help businesses protect vital organizational information assets, which are of strategic importance to firms. Because of these threats, companies are now investing in information security technology and management. Based on the literature review, this study formulates the following hypothesis:

H5: *Security* technologies positively impact organizational performance.

Social media, mobile, analytics, cloud computing, and security technologies (SMACS) constitute the core digital infrastructure ecosystem. They drive the firm's digital innovation. Each technology performs a specific role. How the digital technologies are integrated is shown in Figure 1. Also, a summary of digital technologies as reported in the literature is shown in Table 1.

***Figure 1**: Framework of digital technologies* in businesses

***Table 1**: Summary of identified digital technologies and their uses.*

S#	Type	Uses	Related literature
01.	Social media	Employer branding, recruitment, create community, information and communication, learning and relationship building	Kaplan and Haenlein (2012); Gancho (2017).
02.	Mobile technology	networking of mobile device, support voice and data communication, knowledge sharing and relationship building	Jarvenpaa and Lang (2005), Pitichat (2013), Darko-Adjei (2019), Aker and Mbiti (2010)
03.	Big data and Analytic	Capture and store business related data, integrate variety of data, enable data modeling and analytic, data visualization	Sousa et al (2019), Ali et al (2020), Abdulmelik (2017).
04.	Cloud computing	Enable multi-user, pooling and sharing of resources, data storage and retrieval, application software, enhance computing processing power, virtualization, or service provision	Gopichand (2015), Gameledin (2013), Devasena (2014).
05.	Information security technology	Secure information and assets, to curb insider threats, maintain confidentiality, data integrity, data availability, minimize business risks and ensure security and safety of business information	Al-Dhari et al (2017), Eloff and Eloff (2003), Humphrey (2008).

***Source**: literature review*

Based on the above literature, this study conceptualizes digital maturity as the combination of digital literacy and technological maturity comprising social, mobile, analytic, cloud, and security systems for the purpose of supporting the operational and strategic business objectives of a firm. So, organizations ability to acquire and utilize the above-outlined digital technologies indicates the extent of their digital maturity. Technological maturity based on the integration of SMACS technologies can enhance business processes and lead to higher organizational performance.

2.2. Digital literacy

As technologies evolve, so must the abilities, skills, and experience of employees. Organizations can't make optimal use of digital technologies without having digitally savvy and competent employees. Studies of digital maturity models have recognized digital literacy as vital to organizational survival. Tatminingsih (2022) defines digital literacy as a person's interests, attitudes, abilities, and skills in using digital technology-based devices. These skills are used to access, manage, integrate, analyze, and evaluate the required information to gain and develop new knowledge and relationships. Digital literacy is not only technical but also includes the attitudinal know-how of employees. Apart from knowing how to use the digital device, employees must also know how to communicate with colleagues and manage digital-related fatigue. Tinmaz et al. (2022) describe digital literacy as a combination of information technology, communication, collaboration, digital content creation, research, and decision-making skills. Campanozzi et al. (2023) note that being digitally literate means acquiring the skills necessary to be able to live in a society in which communication is increasingly based on new technologies.

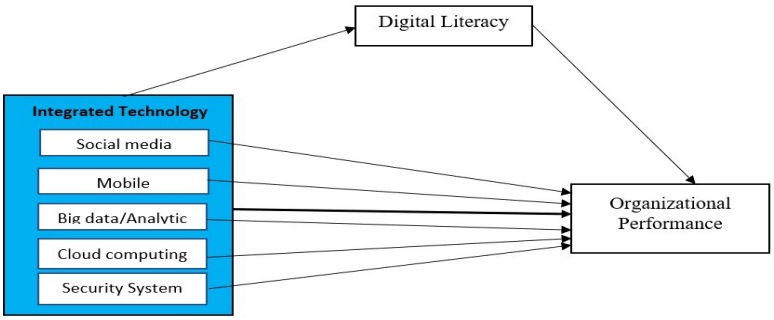
Though knowledge of software applications is important, it does not constitute the only important knowledge area of digital competencies. For example, most job advertisements emphasize software skills such as Word, Excel, and internet navigation. Others require some proprietary software skills. Eshet-Alkali et al. (2004) argue that digital literacy requires more than just the ability to use software or to operate a digital device; it includes a large variety of complex skills such as cognitive, motoric, sociological, and emotional that users need to have in a digitally enabled business environment. Bejakovi and Mrnjavac (2020) state that digital skills are more than desirable qualifications for potential employers. They are among the key factors for dealing with joblessness and are also preconditions for improving economic competitiveness and boosting economic growth. They explained that digital skills, particularly digital literacy, are an important factor for the socioeconomic development of society and the employability of its labor force. They illustrate that without adequate digital literacy, it is not possible to participate in the economy and the digital society, particularly with the digital transformation that the world of work is experiencing.

Furthermore, Delita et al. (2022) measure students' digital literacy on the dimensions of understanding and utilizing digital devices, hypertextual navigation, content evaluation, creating digital content, and communicating information. Some studies have highlighted the importance of policies that promote digital competencies. For instance, Mihalcea (2017) comments that digital maturity in management implies a shift from the traditional paradigm in the workplace towards engagement, learning, and development of employees and the search for talents. She clarifies that to obtain business value, one of the major challenges that management needs to face is the development of digital skills for managers and employees. Also, Wodecka-Hyjek et al. (2021) show that the inclusion of digital competencies into the processes of employee recruitment, evaluation, and development is significantly linked to an organization's performance. Besides, Bejakovi and Mrnjavac (2020) posit that it is critical for governments and employers to seek, propose, and implement new strategies that will promote digital inclusion, literacy, and training for the whole workforce. Based on the above literature, this study hypothesizes that:

H6: Digital literacy mediates the relationships between digital maturity and organizational performance.

2.3 Theoretical and conceptual framework

The phenomenon under study is viewed through the lens of the media richness theory of Daft and Lengel (1984). The reason this theory is used is due to its compatibility with the current digital context. That is, different digital technologies are integrated into the management of businesses. The promoters of this theory are of the view that a firm can possess many communication technologies. They outlined available media technologies and structured them from lean to rich media, from which a manager selects. The choice of medium depends on the nature of the tasks to be executed. According to the proponents, the complexity and ambiguity of the mission in hand require the use of rich media capable of transmitting the message relating to the job without any distortion. Media Richness Theory is a framework that explains a medium of communication that is effective and capable of sending the exact intended message without distortion or information loss. The theory states that a richer media format is suitable for more ambiguous and uncertain tasks. Also, Ishii et al. (2019) note that the media richness theory became very popular with the diffusion of electronic communication media. This is because the theory promotes the adoption of a multitude of media depending on the tasks to be performed. They perceived every communication medium as unique and playing a specific role. Based on a review of the literature, this study identifies five main technologies constituting the digital ecosystem. The extent of integrating these technologies indicates the level of maturity in this study. So, based on the underpinning theory, this study identified and used three main constructs to develop a conceptual model that explains the phenomenon under observation. Adom et al. (2018) state that the conceptual framework outlines the key constructs of a study. Bordage (2009) refers to a conceptual framework as a reflection of a researcher's thinking about a problem; it can emanate from theories, models, or best practices. Digital maturity is used as an independent variable, digital literacy as a mediating variable, and organizational performance as a dependent variable. However, how the variables relate to each other in explaining the phenomenon under observation is shown in figure 2 below, which illustrates the concept of this study.



Based on this study model, the following hypotheses are formulated:

1. Social media impacts organizational performance.
2. Mobile technology impacts organizational performance.
3. Big data/Analytic impacts organizational performance.
4. Cloud computing technology impacts organizational performance.
5. Information security system impacts organizational performance.
6. Technological maturity (SMACS) positively impacts organizational performance.
7. Digital literacy mediates the relationships between technological maturity and Organizational Performance.

In addition, observations are made about the digital divide among countries. The DESI study indicated that Scandinavian countries are more digitalized than other parts of the continent. Other studies have highlighted the existence of a digital divide that is reflected in various aspects of life, such as in the health, employment, and education sectors (Tinmaz et al., 2022). In a meta-analysis of the literature, Lythreatis et al. (2022) show that the factors affecting the digital divide can be categorized into different dimensions, which are the sociodemographic, socioeconomic, personal elements, social support, type of technology, digital training, rights, infrastructure, *and* large-scale events. Based on this concern, this study assumes that this digital disparity may also find itself within organizations. So, this study postulates that there are differences in employees' perceptions of digital maturity and literacy. Thus, the following hypotheses are formulated:

1. There are differences in perceptions of digital maturity among employees (junior, senior, and managerial staff).
2. There are differences in digital literacy between groups (junior, senior, and managerial staff).

3.0 Methodological Approach

The methodology section answers two main questions: how is the study data collected? How is it analyzed? It is an approach to the design of a research project. This section also looks at the research paradigm, the research design, the study population, and the sampling procedure. It ends with the questionnaire design. The philosophical assumption of this study is positivism. Creswell (2009) states that it is important for a researcher to clarify his philosophical assumption as it helps in understanding why he or she chooses either a qualitative, quantitative, or mixed method. The reason for adopting this approach emanates from the nature of this study, which is testing hypotheses, checking relationships between variables, and examining a larger sample size. According to Creswell (2009), when research has a larger sample size, examines relationships, explores theories, and has an observable phenomenon, it is ideal for a positivist approach. A quantitative approach is employed to

gather data from the sampled population. The context of this study is Ghana, a west African nation. Ten service centers of two leading service companies constitute the population of this study. This study employs convenient sampling techniques. The choice of this technique is due to the researcher's inability to assess employee records or file directories to enable him to randomly select the study participants. According to Etikan et al. (2016), convenient sampling has been dominant in quantitative studies. They further explained that it is useful when randomization is impossible. The research uses survey questionnaires to collect primary data to test the study hypotheses. Data on three (3) variables, namely technological maturity, digital literacy, and organizational performance, are collected. They are assessed using a 5-point Likert scale, ranging from strongly disagreeing (1) to strongly agreeing (5). A Krejcie and Morgan (1970) sample size determination table is used to select a sample of 327 respondents out of a total population of 2,270 employees. A convenient sampling technique is used to gather a valid response rate of 266 respondents (n = 266; representing 81.34%).

The variable "technological maturity is measured based on the five dimensions of digital technologies as outlined in the literature review: First, social media technology is measured using two items, namely, 1. This company has social media platforms. This company advertises on social media. Secondly, mobile technology is measured using two items: 1). This company has a mobile app; 2). This company has an internal mobile phone usage policy. Thirdly, big data and analytic technology are measured using two items: 1). This company has a dedicated storage and backup device. 2). This company has analytic software and a dedicated data analyst. Fourthly, cloud computing is measured using two items: 1). The application software used by this company is accessible through the web. 2). The company application software is accessible online through my user account. Finally, the information security system is measured using two items, which are: 1. I know the importance of confidentiality when processing computerized data. 2). I am aware that this company has an information security policy. The variable on digital literacy is adopted from Wodecka-Hyjek et al. (2021). It is measured using seven (7) items, namely, I use a computer system to perform my work. 2). I believe I am competent in using the computerized system to perform my work. 3). Digital competences are important criteria for employee evaluation. 4). I am provided with enough digital-related training to carry out my work. 5). Digital competences are key requirements for recruiting and retaining employees. 6). I can search, analyze, and share processed data with colleagues. 7). Overall, I am satisfied with the digitization processes of this company. Finally, organizational performance is measured using 10 items. 1). I believe our customers are highly satisfied with our products and services; 2). As compared to our competitors, I believe we have better performance in the industry. 3). As compared to the industry, our employee productivity is higher than that of our competitors. 4). We have a higher market share compared to competitors in the industry. 5). Employees of this company are more qualified and committed to working with this company (6). I believe we have a positive profit margin. 7) Compared to our competitors, this company has a more innovative focus. 8.) This company has a steering committee that provides leadership and formulates strategies. 9). The company budget is driven by the corporate strategy. 10). This company has functional teams that meet regularly and discuss process improvement. To analyze the data, SPSS version 22 and SmartPLS version 4 are used, and both goodness of measure and structural models are examined using the PLS algorithm and bootstrapping techniques.

4.0 Study Results

Data analysis will not produce any meaningful results until the data to be analyzed is of good quality (Rovai et al., 2014). To identify missing values and outliers, the missing values data analysis command of SPSS is used, and it reports less than 2% of missing values, which is below the threshold of 10%. So, an indication that the data is good for analysis Firstly, the results obtained on gender show that the workforce is dominated by men (n = 181, representing 68%) of the sample against women, who remain a minority (n = 85, representing 32%). Secondly, the outputs on age indicate that most of the respondents are young (n = 158, representing 58%), having between 25 and 35 years, followed by those in the age bracket of 36 to 45 (n = 78, representing 29.30%). The remaining respondents (n = 30, representing 10.20%) of the sample population are older, having aged between 46 and 60 years. Thirdly, the above data shows a pyramidal form of the organizational structure with a few managerial staff at the apex (n = 37, representing 13.90%), followed by the supervisory staff (n = 88, representing 33.10%), and finally, the rank and file, who are the operational staff constituting the wider base of most organizations (n = 141, representing 53%). Fourthly, the results on educational variables show that these companies are knowledge-based firms with a predominantly educated workforce. The educated workforce with a high national diploma and bachelor's and master's degrees constitutes 80% of the sample population. Finally, the fifth variable, which is work experience, indicates that the sample population is extensively experienced, as those with 6 to 20 years' experience constitute 53.40%.

Also, factor analysis is one of the techniques used to examine the goodness of a measurement model. According to Sekaran (2003), the goodness of measurement can be assessed through the analysis of questionnaire items. It examines the ability of each item to discriminate between the factors by loading either high or low. Factor analysis helps determine the validity of a concept. A total of 27 questionnaire items measuring three variables are loaded using the SmartPLS4 algorithm. Moreover, reliability is a key measurement criterion. For instance, Leary (2008) describes it as the consistency and dependability of a measure. Furthermore, Sekaran (2003) notes that the reliability of a measure indicates its stability and how unbiased an instrument can be when administered in a similar condition. The Cronbach's alpha test statistic is the most widely used test to measure reliability (Leary, 2008). The reliability measures can range from.00 to 1;.00 means no reliability, and 1 means perfect reliability. A reliability measure of 70 indicates good reliability (Sekaran, 2003). Besides, one assumption needs to be met before one can proceed with the assessment of a structural model. Related literature has cited multicollinearity as one assumption of a structural model (Rovai et al., 214; Adam, 2015). The issue of multicollinearity occurs when two or more variables are highly correlated. This can, however, be problematic for the outcomes of a study. Ravai et al. (2014) added that multicollinearity is an indication of a redundant variable that needs to be identified and removed. The rule of thumb for the VIF is a value of less than 10. Table 2 below presents the results of the goodness of measures in this study.

***Table 2**: Summary of Goodness of Measures*

Variables	Items	Loading	CR	AVE	VIF
	SM1	0,779	0,809	0,515	1,8
	SM2	0,636			1,419
Technological maturity	MT1	0,636			1,429
	MT2	0,747			1,669
	BDA1	0,817			2,025
	BDA2	0,666			1,519
	CC1	0.743			1.569
	CC2	0.734			1.745
	ST1	0.691			1.842
	ST2	0.684			1.545
	DL1	0,635	0,856	0,538	2,28
	DL2	0,716			3,128
Digital Literacy	DL3	0,779			3,302
	DL4	0,746			1,87
	DL5	0,787			2,29
	DL6	0,681			1,593
	DL7	0,776			2,153
	OP1	0,797	0,903	0,537	2,69
	OP10	0,657			1,951
	OP2	0,778			2,463
	OP3	0,746			2,371
Organizational Performance	OP4	0,639			1,742
	OP5	0,675			1,756
	OP6	0,802			2,757
	OP7	0,782			2,516
	OP8	0,733			2,221
	OP9	0,698			2,222

Note: CR= Cronbach Alpha; AVE=Average Variance Extracted VIF=Variance Inflation Factor
SM=social media; MT=Mobile Technology; BDA=Big Data Analytic; CC= Cloud Computing; ST=Security Technology.

The items of social media, mobile, analytics, cloud computing, and security technologies have been computed into technological maturity (IDT). The discriminant validity of the computerized variables is assessed using the heterotrait-monotrait ratios and Fornell-Larcker criteria. The heterotrait-monotrait ratio is used as it can provide a more accurate result than the Fornell-Larcker criterion. The decision rule is that its ratio must be lower than a cut-off value of between 0.85 and 0.90 (Henseler et al., 2015). The decision rule for the Fornell-Larcker criterion is that the square root of the AVEs should be greater than the correlations of the constructs (Henseler et al., 2015). Thus, this study had acceptable convergent validity and discriminant validity in measuring the measurement model. Table 3 below presents the results of the discriminant validity of these study constructs:

***Table 3**: Summary of Discriminant Validity*

HeterotraitMonotrait Ration			**Fornell-Larcker criteria**		
Constructs	DL	IDT	DL	IDT	OP
DL			0,733		
IDT	0,831		0,7	0,717	
OP	0,66	0,716	0,596	0,615	0,733

Note: IDT= Technological maturity; DL= Digital Literacy; OP=Organizational Performance.

After confirming the goodness of the measurement model, this study proceeds to examine the structural model. Seven main hypotheses are formulated. The first hypothesis that social media technology positively impacts organizational performance is supported (B =.153; p.001). The second hypothesis that mobile technology positively impacts organizational performance is validated (B =.094; p.009). The third hypothesis that analytic technologies positively impact organizational performance is validated (B =.081; p.030). The fourth hypothesis that cloud computing technology positively impacts organizational performance is rejected (B =.046; p .308). This is the result of lower ratings on the items, indicating the absence of cloud computing technology. The fifth hypothesis that security technologies positively impact organizational performance is supported (B =.155; p.001). The items of the core technologies are computed into technological maturity. So, the sixth hypothesis that technological maturity (SMACs) positively impact organizational performance is supported (B =.387; p.000). The seventh hypothesis that digital literacy (DL) mediates the relationships between digital maturity and organizational performance is also found to be true (B =.228; t =4.300; p.000). The result of R Square reveals that 37.30% of changes in organizational performance are explained by the combined effect of the five main digital technologies. The Anova test also indicates that the model of digital maturity fits the data well (F4, 263 = 30.736; p.000). The results of the analyses are presented in Table 3, as shown below:

***Table 4:** Results of Structural Model*

Relationships	Original sample (O)	Sample mean (M)	Standard deviation (STDE)	T statistics (|O/STDEV|)	P values
(Constant)	1,76	0,175		10,073	0
SM	0,153	0,044	0,232	3,459	0,001
MT	0,094	0,036	0,155	2,646	0,009
BDA	0,081	0,037	0,128	2,179	0,030
CC	0,046	0,045	0,063	1,021	0,308
ST	0,153	0,044	0,227	3,477	0,001
IDT -> OP	0.387	0.393	0.075	5.149	0.000
IDT -> DL -> OP	0.228	0.228	0.053	4.300	0.000
IDT -> OP	0.615	0.621	0.044	14.118	0.000
IDT -> DL	0.700	0.641	0.030	15.024	0.000

Note: SM=social media; MT=Mobile Technology; BDA=Big Data Analytic; CC= Cloud Computing; ST=Security Technology, IDT = Technological maturity; DL= Digital Literacy; OP=Organizational Performance.

Furthermore, this study aims at investigating any differences in digital maturity in employees' perceptions. So, it is hypothesized that there are differences in perceptions of digital maturity among employees (junior, senior, and managerial staff). The ANOVA test suggests that the digital maturity scores among groups of employees differ

significantly (F2, 263 = 15.958; p.000). Also, Levene's statistic is significant, so the equal variance assumption is not supported. In this case, to check for any differences between the groups, the post-hoc test of comparisons using Dennett's T3 is selected. The test shows that the mean score of junior staff (M = 3.471; SD = 0.705) significantly differs from the mean score of senior staff (M = 3,720; SD = 0,560). The mean score of senior staff (M = 3.720; SD = 0.560) significantly differs from the mean score of managerial staff (M = 4,111; SD = 0,481). The results also indicate that the mean score of managerial staff (M = 4,111; SD = 0,481) significantly differs from the mean score of junior staff (M = 3.471; SD = 0.705). The mean differences are significant at the 0.05 level. So, the hypothesis is supported. Table 5 below presents the summaries of the ANOVA test.

Table 5: *Summary results of comparative analysis of digital maturity*

	Descriptive	**Test of Homogeneity of Variance**		**ANOVA**	
Levels	Mean	Std. Deviation	Levene's Statistics	Sig	F Sig
Junior Staff	3,471	0,705	.548	0,005	15.958 .000
Senior Staff	3,372	0,560			
Managerial Staff	4,111	0,481			
		Group Difference			
	Mean Difference	Sig	95% Confidence Interval (LL - UL)		
Junior – Senior	-0,248	0,001	-0,451	-0.045	
Senior - Managerial	-0.639	0.000	-0.880	-0.398	
Managerial – Junior	0.639	0.000	0.398	0.880	

This study also aims to investigate any differences in digital literacy between employee levels (junior, senior, and manager). So, it is hypothesized that there is a difference in employees' digital literacy between groups (junior, senior, and managerial staff). The ANOVA test suggests that digital literacy scores among groups of employees differ significantly (F2, 263 = 22.440; p.000). Since Levene's statistic is significant, the equal variance assumption is not supported. In this case, to check for any differences between the groups, the post-hoc test of comparisons using Dennett's T3 is selected. The test shows that the mean score of junior staff (M = 3.58; SD = 0.826) significantly differs from the mean score of senior staff (M = 3,959; SD = 0,504). Junior-level employees mean score (M = 3.587; SD = 0.826) differs significantly from that of managers (M = 4.393; SD = 0.479). The mean score of senior staff (M = 3,959; SD = 0,504) differs significantly from that of managerial staff (M = 4.393; SD = 0.479). The mean differences are significant at the 0.05 level. These findings indicate that digital literacy differs between the groups. Managerial staff have higher digital literacy than senior and junior staff, and senior staff have a higher literacy level than junior staff. It can be remarked that the higher the extent of digitalization, the higher the employee's digital literacy. Thus, digital maturity is assumed to be associated with employee literacy levels. So, the hypothesis is supported. Table 6 below summarizes the results of the ANOVA test.

Table 6: *Summary results of comparative analysis of Digital literacy among employees*

	Descriptive statistics		**Test of Homogeneity of variance**	**ANOVA**		
Staff level	Mean	Standard deviation	Levene's Statistics	Sig	F	Sig
Junior	3.5876	0.8263	13.766	.000	22.440	.000
Senior	3.9594	0.5047				
Managerial	4.3938	0.4790				
Group Differences						
Levels		Mean difference	Sig	95% Confidence Interval (LL - UL)		
Junior – senior staff		-.3717	.000	-.5838		-.1602
Junior – managerial staff		-.8061	.000	-1.0602		-.5511
Senior – managerial staff		-.4344	.000	-.6674		-.2014

5.0 Discussions

Digital technology is a key component of the digital maturity model. However, studies on digital maturity have ignored examining integrated digital technologies. So, this study aims at investigating digital maturity by evaluating the role of core digital technologies, namely social, mobile, big data and analytics, cloud computing, and security systems, on organizational performance. The technological maturity depends on the level to which these core technologies are integrated. The results indicate that technological maturity positively impacts organizational performance. This finding has been corroborated in similar studies. For instance, Gopichand (2016) argues that technology-based maturity helps businesses increase their profit margins due to its omnipresence. It reduces operational overhead and enhances visibility. Also, Verma et al. (2016) examine the link between integrated digital technologies and supply chain performance. They find an increase in productivity, competitive advantage, and innovation. Moreover, Faruqui et al. (2017) study the impact of combined technologies in three main sectors (banking, retail, and telecom), and their findings report an improvement in organizational productivity, business competitiveness, and customer relations. Individually, the impact of each technology is enormous. For instance, social media enables the creation of communities for the purposes of sharing information, learning, or businesses. Mobile applications have enhanced social media capabilities by making them mobile-compatible, ubiquitous, and convenient. Mobile technology has reduced the cost of communication and made information delivery timely.

Moreover, big data and analytics have not only made the storage of voluminous data possible, but they have also added value to the creation of databases and analytic capabilities. Data and its analytic capabilities constitute a source of competitive advantage. Based on their analytic capabilities, firms can make predictive and prescriptive analyses. Besides, cloud computing emerges to increase not only the computational power of firms by pooling their resources, but also drastically reduce their costs of investments in digitizing. However, these technologies present real opportunities for today's businesses as well as some threats. The highest threat to digitalization has been security. Miscreants see opportunities in this technological development. Thus, security technologies and protocols emerge. Millions of information security attacks occur every day and cause the loss of important resources and damage to corporate reputations. Firms that want to leverage the capabilities offered by this technological maturity must seriously consider integrating security systems and information security management. Doing so will lead to the protection of valuable information, which is key to organizational survival. The findings of this study also reveal differences in perceptions of digital maturity and digital literacy among a group of employees. This indicates the existence of inequality in the deployment of digital infrastructure. Management must take the necessary measures to bridge this digital divide, as digitalizing both operational and strategic activities is key to a firm's competitive advantages.

Also, the purpose of this study is to investigate the mediating role of digital literacy in the relationships between digital maturity and organizational performance. The hypothesis is supported and corroborated by the existing literature. For instance, Campanozzi et al. (2023) recognize digital literacy as a critical success factor in the delivery of effective and efficient health services. They argue that employee digital literacy is key to successful information system implementation. Moreover, Bejakovi and Mrnjavac (2020) postulate that digital skills are more desirable qualifications for employers. They explain that it aids in dealing with joblessness and is a prerequisite for improving economic competitiveness and boosting economic growth. Their findings report a positive impact of digital literacy on organizational performance. A model of critical success factors outlines the importance of digital literacy for the end-user in the relationships between technology adoption and information system implementation success. This study's results indicate a link between digital maturity and digital literacy; the higher the level of digital integration, the wider the employee's digital literacy must be. As an organization integrates more digital technologies, so must its corresponding digital literacy development. Each parent's digital technology is unique and requires different skills. For instance, to leverage social media technology, firms must have competencies in content development and bookmarking. However, the integration of big data and analytic technologies by the same firms will require the possession of additional competencies such as data mining, predictive, and prescriptive skills.

6.0 Limitations and Implications

This study is not without limitations. The first limitation concerns the sampling size. The scope of this study is limited to ten service centers of two leading service companies. So, the sample is inadequate to represent the sample population of the service sector in Ghana. However, the aim of this study is to gauge employees' perceptions about this observed phenomenon. So, this study is solely interested in assessing employees' insights. Furthermore, it is due to limitations in time and resources that the researcher couldn't go for a larger sample size.

Second, the questionnaires are self-perceptual in nature, and this exposes the study to the risk of common method bias. To control for this problem, Harman's single factor test is used to assess items total variance. The result reveals a value of 37.23% of total variance less than the 50% threshold, an indication that this study is free from common method bias. Another limitation of this study is its scope; it only considers two components of a digital maturity model, namely technology and digital literacy. Meanwhile, the strength of this study is its attempt to examine the technological ecosystem. So, this study is arguing that the technological dimension of digital maturity must not be assessed based on a single technology. Most firms' digitalization today is not driven by a single but a combination of digital technologies.

The technology dimension of technological maturity is an architecture comprising social media, mobile, big data and analytics, cloud computing, and security technologies. Each of these technologies contributes significantly to enhancing organizational performance. When management adopts an integrated digital strategy based on the SMACs framework, they will create a synergetic effect on the business bottom line. Additionally, this study contributes to the literature by revealing that the integration of more technologies requires a different skill set to optimize a firm's technological capabilities. Also, this study confirms the relevance of media richness theory in explaining a firm's integrated digital strategy. It offers managers the choice to adopt appropriate media based on their operational and strategic needs. Social media is used to communicate with both internal and external stakeholders. Analytical tools are used for decision-making. Information security is used to protect vital information and the cloud for a reduction in operational cost due to its economy of scale, scalability, and pay-as-you go service. Mobile technology is used to allow voice communication and data transfer at any time and everywhere. Thus, the managerial implication of this study is that top management must adopt an integrated digital strategy in such a way that each business process integrates a specific digital solution that can enhance superior economic performance.

7.0. Conclusion

In conclusion, this study reveals that digital technologies and their inherent digital competencies constitute the core of a firm's capabilities. They can be used to gain superior economic performance. It is one thing to adopt technological maturity, but it is another to ensure that employees or end users are equipped with the necessary skills to use it. Digitalization simplifies processes, reduces costs, and reduces operational time. This subsequently affects employee and customer satisfaction and organizational performance. This study has shown that the greater the extent of digitalization, the higher the organizational performance. Based on this finding, this study recommends that top management adopt an integrated digital strategy. No organization can succeed without competent and committed employees. Again, it has been revealed that the extent of digitalization must be linked to the corresponding digital literacy level. To maximize the utilization of digitalization, top management must gain employees' commitment to its use. They must also provide employees with the necessary digital competencies. Doing so will not only create positive behavioral attitudes but also lead to greater economic performance. It is incumbent on top management to invest in the digitalization of company processes if they want to survive and remain competitive. This study reveals that each parent digital technology plays a distinctive role, so the firm's top management must invest in integrated technologies to satisfy the needs of each business process. This study also calls on management to examine the causes of digital inequality and adopt policies that will aid in bridging the gap. In addition, this study encourages managers to be interested in and learn about emerging technologies to gain an in-depth understanding of their capabilities. Thus, the right technology can be integrated into the right business process. Finally, this study calls for future studies to emulate this study model with consideration of other dimensions of digital maturity, namely digital strategy, leadership, and culture. They can equally make an industry comparative analysis to examine whether firms with a higher level of technology integration yield corresponding business outcomes. A firm's size can be used as a controlled variable to examine any correlation with maturity level.

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Consent for publication

The author consents for this manuscript to be published in Information Systems Frontiers.

Availability of data and material

Data on this study is available on request.

Competing interests

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