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Conceptualizing digital leadership characteristics for successful digital transformation: the case of Tanzania

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ABSTRACT

The objective of this study was to examine the attributes of a compelling leader to lead Digital Transformation in a formal organization. The study conceptualized a digital leader with 26 characteristics grouped into 5 roles. Sample respondents were drawn from some organizations in Tanzania and a self-reported questionnaire was used for data collection. Preliminary analysis involved examining inter-correlation among leadership attributes, dropping 3 out of 26. Exploratory factor analysis of 23 items produced 7 factors which were grouped into 5 roles while dropping 2 factors with one item each. Only 4 factors and 13 items qualified for confirmatory factor analysis which provided better fit for the sample data. The validity check showed that the digital leadership construct somehow converges and the four factors were different from one another. It is implied that good digital leader is anticipated to foster economic growth, promote innovation and entrepreneurship, and improve service deliveries.

KEYWORDS

Digital leadership; digital transformation; exploratory factor analysis; confirmatory factor analysis; digital development

1. Introduction

Digital technologies change the way services are delivered, businesses are conducted, people communicate, and even the way relationships are sustained. Firms are putting in place initiatives to explore digital technologies in order to exploit the benefits thereof to transform key business operations – production, organizational structures, and business management. These dynamics invariably lead to the concept of Digital Transformation (DT). Firms adopting DT and thus using digital technologies are likely to be competitive in this digital era (Magesa & Sanga, 2020).

Digitally transforming firms increase productivity, create value, and improve social welfare (Ebert & Duarte, 2018), thus exerting pressure on firms to go digital. The migration into the digital realm is motivated by the need to survive and accrue business competitive advantages. According to Forrester Research (2015), DT facilitates business transformation via Digital Development (DD). DT focuses on setting clear objectives that are tied directly to measurable business outcomes for businesses to thrive and prosper. Thus, the ideal Digital Leadership (DL) embraces innovations which improve DD by creating jobs, improving access to markets, promoting and commercializing products, and enhancing the acquisition of knowledge.

ICT adoption and DT represent two enabling mechanisms which work to improve business efficiency, effectiveness, and transformation of business models adopted. Consequently, the duo enhances interactivity and flexibility; and smoothly connects business transactions and

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Silvia Masiero is the accepting Associate Editor for this paper
This article has been republished with minor changes. These changes do not impact the academic content of the article.

organizations to their customers. Factors which make firms adopt DT and use ICT include the lower prices of ICT devices and global network connectivity (Bharadwaj et al., 2013; Magesa & Sanga, 2020); pressure from customers, employees, competitors (Westerman et al., 2011); and globalization – which increases competition and pressurizes companies to go digital to survive and attain competitive advantages (Westerman et al., 2011). Firms are, therefore, considering adopting ICT and digitally transform their service delivery, operations, and change structures of their organizations.

Despite the positive effects, contemporary literature indicates that several project failures are major issues in the DT context (Kozak-Holland & Procter, 2020; Rajala & Aaltonen, 2020). Examples of DT failures are scant and are always under-reported for commercial reasons (Kozak-Holland & Procter, 2020). Digital project failures rate remain high despite the efforts made in the past decades to improve ICT projects management (Hidding & Nicholas, 2017).

Studies accord project failures to the reluctance on the part of business management to change their management methodology and plan. This failure includes not involving the users right from the early stage of project conception, inadequate communication of change processes, leaders not managing user resistance to digital changes within the organization, and leaders over-emphasizing the technical aspects of project delivery (Damoah & Akwei, 2017; Ebad, 2018). Abouzahra (2011) attributed the failure to unclear project scopes, undefined risks, undefined stakeholders, and poor digital communication. Poor conceptualization of management requirements; misunderstanding of the requirements, changes in the requirements, inadequate requirements, and unclear requirements may lead to project failure (El Emam & Koru, 2008; Pan et al., 2008). Likewise, inadequate support, lack of executive engagement with the project, ineffective sponsorship, and overall lack of commitment of senior management may lead to project failure (El Emam & Koru, 2008).

Organizations are always eager to register successes in their DT initiatives. Years of research on transformations have shown that success rates of these transformation efforts have been consistently low (less than 30% succeed), which suggests that DTs are not accomplished easily (De la Boutetière et al., 2018). A successful DT involves implementing the best digital solutions step-by-step and the DT implementation process requires an understanding of how data, design, and technology will impact the transformation across the organization. Organizations need to understand the success factors of DT to be able to aim at a strategical transformation. These factors are those things that must go well to ensure success for DT initiative. Thus, success of DT initiative can be achieved when a digital solution has been implemented based on the stipulated steps to attain its goals and its users are fully using it without difficulty. This success is gained when acceptance of digital solution and process changes is achievable. Heeks (2002) argues that for a successful initiative (i.e. DT), most stakeholder groups attain their major goals and do not experience significant undesirable outcomes.

Among the success factors for DT identified by some scholars (e.g. Cichosz et al., 2020; Morakanyane et al., 2020; Sing & Amin, 2020) include having visionary leaders who can set roadmaps for organizations to follow. Such a leader should exhibit strong DL traits required to cultivate a digital culture and should develop digital vision for an organization (Morakanyane et al., 2020). DT success depends on a leader with a vision supported by empowered, knowledgeable and collaborative employees (Cichosz et al., 2020) who can formulate and align DT strategies that provide for growth (Sing & Amin, 2020). Willcocks (2021) acknowledges that the DT is costly, difficult, and require investment, which necessitates early investment in digital talent and building technological platform. Heeks (2002) asserts that today's IS success may be tomorrow's IS failure, and vice versa.

To implement digital projects successfully and minimize failures, scholars including Creasy and Anantatmula (2013), Ebad (2018), and Hughes et al. (2017) have emphasized good leadership and management support. Leadership characteristics for DT that are sought in this digital era include innovation, digital skills, strong networks, collaboration, participatory engagement, and vision. Valentine and Stewart (2015) emphasize that a digital leader should govern technology for competitive advantage and business performance. They also observe that a digital leader should direct and govern technology-enabled strategy, plan to maximize the advantages of technology, enhance

performance at all levels of the organization, and clarify additions from progress reviews and comments. Thus, transforming a firm via DD requires a leader with a digital mindset.

Strategic DT of a firm led by a digital leader promotes DD and general development. Also, Digital Transformation Strategy (DTS) serves to coordinate, prioritize, and implement a pre-digital organization's transformation efforts and; as a long-term objective, to govern its journey to achieve the desired future state of being digitally transformed (Matt et al., 2015). DTS improves DD which in turn, informs the firm's development. DTS reliably improves organizational performance and has a positive relationship with short- and long-term financial performance (Wang et al., 2020). DT relies on a digital leader (Euler, 2015) and DL is essential to the success of any DT of a firm (El Sawy et al., 2016).

This research investigates the pertinent issue of DL in DT observed during the initiation, implementation, and management of DT processes. This is because the available literature pays more attention to corporate management and structure for effective adoption of DT while relegating DL. Therefore, the objective of this study is to examine the characteristics of Digital Leadership in implementing effective DT. The research focuses more on the developing countries because these countries are on the verge of adopting digital technologies. As its contribution, the study conceptualizes DL into different dimensions with different characteristics and based on a clear methodology and statistical analyses, the study establishes the dimensions and characteristics that define DL.

2. Digital leadership and transformation

DT is conceptually described as a process that aims to improve the performance of an entity by triggering significant changes in its properties through combining information, computing, communication, and connectivity technologies (Vial, 2019). Firms adopting DT become more competitive as the DT increases productivity, value creation, and social welfare (Ebert & Duarte, 2018), thus putting pressure on organizations to go digital in order to survive and accrue competitive advantages.

The social goals of DT include fostering the development of a more innovative and collaborative culture in industry and society; and improve the accessibility and quality of digital services offered to the population (Ebert & Duarte, 2018). The economic objectives of the DT include implementing new and innovative business models, increasing income generation, productivity, and value addition in the economy (Ebert & Duarte, 2018).

While analyzing the DT of society, Norqvist (2018) argues that organizational development and the presence of competencies are influenced by the DD that; in turn, is influenced by the DT of society. The use of digital technologies to transform various processes, tasks, and activities or to offer services within the society lead to DD. According to Qureshi (2019), DD is a kind of development achieved through the use of digital technologies; that is, the ICT devices. Thus, the adoption and use of ICT lead to improvements in social welfare.

In conceptualizing DD, Qureshi (2019) outlines three different but interconnected perspectives of development: economic, social, and human. This study adopts the three of Qureshi's perspectives in describing how digital technologies affect development as their conceptualization is based on the fact that individuals are agents of change and that human agency is key for the use of ICTs for achieving development outcomes. Thus, under good DL, a firm can digitally transform its processes, services, and operations to lead to DD, that is economic, social and, human development.

Contemporary discourses on development consistently identify ICT as a requirement for economic growth and the improvement of social conditions (Avgerou, 2003). According to Tripathi and Inani (2020), ICTs stimulate economic growth, foster development, and support all economic activities such as trade, education, health care, entertainment, and other related activities around the world. Heeks (2016) observes that ICTs provide employment to individuals and increase demand for products. World Bank (2012) asserts that ICTs serve to reduce poverty, increase productivity, boost economic growth, and improve accountability and governance. Other scholars such as Birke and Knierim (2020) and Magesa et al. (2014) have shown how ICTs have improved

agricultural farming practices and marketing among smallholders. The ultimate outcomes of the application of ICTs have been improved economic growth of individuals, societies, and countries at large.

Digital technologies can also be used to introduce and diffuse the concepts of knowledge sharing, community development, and equality, and thus implicate social development (Kamel, 2008). Gigler (2011) assumes a direct relationship between ICTs and social development. Qureshi (2019) equated social development with government programs that offer healthcare, education, environmental protection, and other public services. Improved social development includes enhanced access to formal and non-formal education, improved access to health services, and improved knowledge and access to social programs of the government (Gigler, 2011). Scholars have indicated how DT has influenced social development in sectors like education, teaching, and lifelong learning methods (Mahenge & Sanga, 2016; Tchamyou et al., 2019); and in medicine, health outcomes and well-being (Aceto et al., 2018; Kouton et al., 2020).

Human development focuses on the improvement of the lives of the people and intends to provide more freedom and opportunities to live the lives they value (UNDP, 2020). Human development broadens individual people's freedom to pursue the lives they choose (Sen, 2013). Qureshi (2019) points that in pursuing the freedom to life choices, income is seen to be an instrument of this freedom forcing individuals to pursue their goals. To determine the impact of ICTs on human well-being, it is necessary to enhance people's ability to access and use information through ICT. It can lead to improvement in people's lives when their abilities to access and use information through ICTs are transformed into expanded human and social abilities in the economic, political, social, and cultural dimensions of their lives (Gigler, 2011). While well-being may vary considerably between individuals (Qureshi, 2019), development, which is about expanding the choices people have, make people lead lives that they value. Again, a motivated and innovative digital leader can utilize digital technologies to foster human development in different countries. Examples of human development are found in governance, service provisions, and building citizens' trust (Adesola, 2012; Mahmood et al., 2019), entrenching democracy (Adesola, 2012), and enhancing human informational capabilities (Magesa et al., 2020).

Digital Transformation is affected by project failures, that is the inability to meet budgetary projections, functional, and time objectives (Finch, 2003). The failures include the system not meeting its objectives, the system not delivering or delivered but failed to meet project specifications, the system not being adopted by stakeholders, benefits not being realized, and the system not meeting the needs and expectations of stakeholder groups (Hughes et al., 2017). Some statistics of DT failure cases include Forbes who reported that 84% of companies fail at DT (Rogers, 2016), and Morgan (2019) who reported that a staggering 70% of DTs fail. In developing countries, ICT project failures are reported in Bangladesh, Sri Lanka, India, Thailand, Malaysia, and South Africa (Masiero, 2016; Rajala & Aaltonen, 2020). Scholars such as Dada (2006), Gunawong and Gao (2017), and Hossan et al. (2006) reported failures of the e-governments which were expected to transform the public administrative system and to improve the efficiency of public service in developing countries. In Heeks (2003), Heeks provided a baseline assessment of e-government failures in the developing world stating that total failures stood at 35%, partial failures at 50%, and success cases at 15%.

Examples of failures cited include Indira Gandhi Conservation Monitoring Centre in India. This project was intended to be a national information provider based on a set of core environmental information systems but never became operational (Puri et al., 2000). The Tax Computerization Project in Thailand's Revenue Department set out seven areas of taxation that were to be computerized. Unfortunately, only two areas were partly computerized at the end of the project (Kitiyadisai, 2000). The creation of a set of touch-screen kiosks for remote rural communities in South Africa's North-West Province which were initially well received by the communities was removed within less than a year later because the kiosks lacked updated or local content and interactivity which led to their disuse (Benjamin, 2001).

Thus, firms need to have DTS since the failure to plan may be an obstacle to digital maturity within an organization. Matt et al. (2015) argued that a DTS is supposed to coordinate, prioritize, and implement a pre-digital organization's transformational effort and; as a long-term objective, to govern its journey to achieve the desired state of being digitally transformed. SAP (2017) reported that 84% of global companies considered DT as critical to their survival in the next five years. SAP (2017) also found that DT was cited as a top-three driver of future revenue across all industries and among companies of all sizes. Within organizational contexts, DTS enabled organizations to quickly profit from the innovative image within their industries owing to their DT intentions and highly developed knowledge of social actors (Chanias et al., 2019).

DTS of a firm can lead to its development. However, Euler (2015) insisted that DT relies on leadership, especially DL. El Sawy et al. (2016) noted further that DL is essential to the success of any DT and requires a focus on customer engagement, the need for advanced technical tools, a high capacity for storage, and framing of the culture to support DT in different forms. Digital leaders can lead digital natives and provide leadership during the process of DT (Euler, 2015). Morakanyane et al. (2020) identified DL among the factors leading to successful DT. DT is about leadership and Kane et al. (2015) pointed out that what separates digital leaders from the rest is a clear digital strategy combined with a culture and leadership poised to drive the transformation.

Thus, organizations require digital leaders who must focus on generating innovative ideas that create value for customers, design digital-enabled services quickly using advanced technologies, and build organizational capability to deliver such services to meet customer expectations (Tanniru, 2018). A digital leader is one who can make quick and right decisions and influence others to achieve desired goals (De Waal et al., 2016). These abilities require agility within the information technology under the co-leadership of IT executives (Tanniru, 2018), with the central role in driving fast decision-making processes and propelling the change.

To windup, scholars have described DL differently based on digital technology and digitalization, innovative behavior, environment (context) in which it is applied, and existing leadership styles and theories. Mihardjo and Sasmoko (2020) point out that DL comprises the culture and competence of a leader to use digital technology to add value to the organization. De Waal et al. (2016) conceived DL in terms of accomplishment of goals that rely on ICT through the direction of human assistants and uses of ICT.

We adopt a definition by El Sawy et al. (2016) who define DL as doing the right things for the strategic success of digitalization for the enterprise and its business ecosystem. According to El Sawy et al. (2016), such a definition indicates the difference between leadership and management. Bennis and Townsend (1989) argued that leadership is about doing the right thing for the success of the organization while management is about doing the thing right.

3. Conceptualizing digital leadership

There are different views about how DL is conceived, measured, and investigated upon. The different views come from contexts or points of departure. Contexts are situational opportunities and constraints that explain the occurrence and meaning of organizational behavior (Johns, 2006); contexts include multiple levels, that is meaning can exist at the individual level, the group level, the organizational level, the societal level, as well as across these respective levels (Hernandez et al., 2011).

Thus, scholars identify at least two leadership styles – transactional and transformational leadership. Transactional leadership makes clear what actions and roles followers must take to achieve goals. The motive is to do what is expected by the leader (Kark et al., 2018). Transformational leadership transforms followers, prompt the followers to think about the interests of the organization rather than their own interests, boosting their morale, encouraging them to examine how their values align with those of the organization, appealing to their ideal sense of what the organization can be, and encourage them to do their best for the greater good (Bass, 1985).

Based on Hambrick and Mason (1984), DL can be considered as part of the study about leadership based upon the upper echelon theory where the characteristics of the manager determine the output of an organization. DL is created by combining a person's leadership skills and digital capability to optimize the benefit of digital technology in order to increase business performance (Wasono & Furinto, 2018). Günzel-Jensen et al. (2018) point out that DL is linked with three leadership styles – *transactional*, *transformational*, and *empowering* (authentic) leadership. They also assert that the three styles of leadership go hand in hand with innovative behavour. According to them, innovation is critical for organizations to identify the kind of innovation needed in new product development and continuous improvement. Tidd and Bessant (2020) argue that innovation is generally driven by the ability to see relationships, opportunities and take advantage of those opportunities. Thus, it is expected that a digital leader should display a wide range of capabilities and may be explored based on a combination of leadership styles (transactional, transformational, and empowering). This suggests that DL relates to digital technologies, strategies, and skills, and has different attributes; that is leadership characteristics and behavours.

This study explores five (5) roles of DL showing characteristics, behavour, or skills necessary for describing a digital leader during Digital Transformation. These roles are inspirational role, visionary role, absorbing uncertainty role, innovative role, and adaptation role. These are summarized in Table 1.

Based on the discussions above, Table 1 describes a summary of the characteristics of different roles of a digital leader. The roles and the associated characteristics and behavours of a digital leader are conceptualized and presented in a framework in Figure 1. The framework shows a

Table 1. Descriptions of characteristics of roles of digital leader

	Roles, characteristics, and descriptions	
1	Inspirational role	
	Convincing	Unusually able to persuade others of his/her viewpoint
	Influence	Capacity to influence the organization, convince others to influence
	Enthusiastic	Demonstrates and imparts strong positive emotions for work
	Trustworthy	Deserves trust, can be believed and relied upon to keep his/her word
	Motivational	Stimulates others to put forth efforts above and beyond the call of duty and make personal sacrifices
	Openness	Willing to consider ideas and opinions that are new or different to his/her own
2	Innovation role	
	Anticipatory	Anticipates, attempts to forecast events, considers what will happen in the future
	Digital savvy	Prepared to meet emerging business challenges, anticipates and responds to new paradigms of competition, navigating complexity and leveraging on data and analytics to make decisions
	Risk taker	Willing to invest major resources in endeavors that do not have high probability of successful
	Confidence	Thinks positively about the future and is willing to take the risks necessary to achieve their personal and professional goals
	Transparency	Practises what one says, set crystal-clear expectations and communicate effectively with every team member
	Diplomatic	Skilled at interpersonal relations, tactful, facilitating participation in decision making
3	Absorbing uncertainty role	
	Sensible	Based on or acting on good judgment and practical ideas or understanding
	Communicative	Communicates with others frequently
	Direction	Providing vision and purpose
	Agile	Adapt to an ever-changing and uncertain environment
	Collaborative	Works jointly with others (i.e. management and followers)
	Lobbyist	Ability to network in order to lobby for both resources and stakeholder support
4	Adaptation role	
	Informed	Knowledgeable; aware of information
	Planning	Prioritize activities
	Decisive	Makes decisions firmly and quickly
	Curiosity	Desire to know or learn something – open the mind, enable growth, and encourage new ideas
	Inspirational	Inspires emotions, beliefs, values, and behaviors of others, inspires others to be motivated to work hard
5	Visionary role	
	Visionary	Has a vision and imagination of the future
	Encouraging	Gives courage, confidence, or hope through reassuring and advising
	Focused	Maintain focus while focusing on achieving results

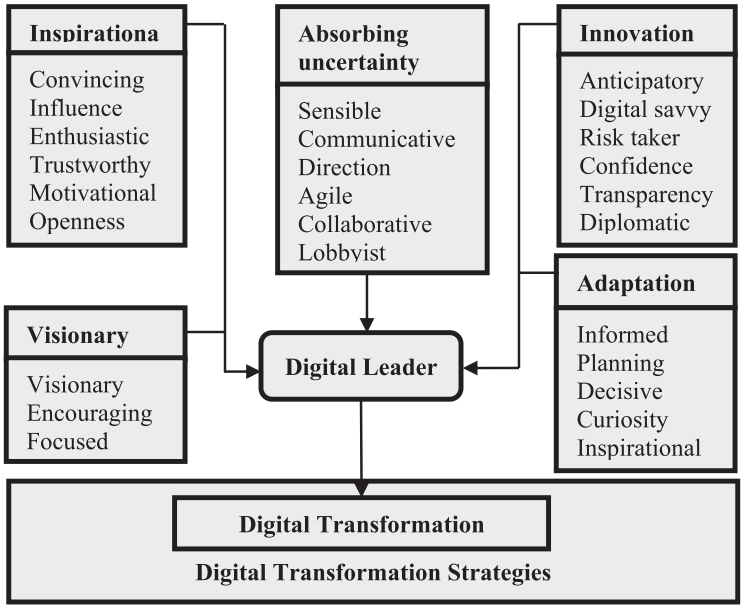

Figure 1. Digital leadership conceptual framework

digital leader is expected to execute different roles to which we can associate his/her skills, characteristics, and behaviors. The framework signals that an effective digital leader requires a new way of operating, where conscious choices need to be made based on priorities and areas of focus. Based on the conceptual framework proposed, this research will study the attributes (i.e. characteristics and behaviors) of digital leaders that can facilitate DT within an organization.

4. Hypotheses

Leaders motivate and inspire people around them in order to create attractive visions of future states, boosting follower goals, and inspiring enthusiasm and optimism (Afshari et al., 2012). According to Afshari et al. (2012), leadership involves intellectual stimulation which aims at developing followers' capacities to higher levels and the practices of this process stimulate effort to become more innovative and creative (Afshari et al., 2012). Bass et al. (2003) point out that a leader must influence, inspire, motivate and mentally stimulate others. Innovation enables a firm to create new digital products and services and enhance and expand them into new domains (Mihardjo & Sasmoko, 2020).

Leaders should adapt approaches to strategize for new digitization challenges and enable their firms adapt and change markets through creating innovative business-models via DT. Uncertainty means unclear situations or lack of predictability (Petry, 2018) and leaders must develop the individual capacity and competence to better manage uncertainties and create organizations with strong dynamic capabilities with which to adapt to change i.e. leaders should define a vision and develop growth for the future (Mihardjo et al., 2019). A visionary leader is required to quickly adapt and provide the direction and to become a mastermind in transforming the digital businesses (Mihardjo & Sasmoko, 2020). Thus, the characteristics of the five roles in Table 1 can be considered as factors that represent the attributes of a digital leader necessary for DT. This leads us to the following five hypotheses:

Hypothesis 1: Different characteristics of inspirational role have positive influence on the ability of a digital leader to lead DT;

Hypothesis 2: Different characteristics of the innovation role have positive influence on the ability of a digital leader to lead DT;

Hypothesis 3: Different characteristics of absorption uncertainty role have positive influence on the ability of a digital leader to lead DT;

Hypothesis 4: Different characteristics of adaptation role have positive influence on the ability of a digital leader to lead DT; and

Hypothesis 5: Different characteristics of a visionary role have positive influence on the ability of a digital leader to lead DT.

To test the above five hypotheses, the next two sections will describe the research methodology adopted and discuss the results.

5. Methodology

This research employed a quantitative research design in studying the constructs that define the characteristics and behaviors of a digital leader. This involved a self-reported questionnaire completed by respondents drawn from some organizations in Tanzania. Survey questions were composed based on the items presented in Figure 1 and described in Table 1. Questions were categorized based on the roles of a digital leader. Targeted organizations were those with a high degree of digitalization, both public and private and have more than 20 employees, and were founded five years prior to the survey. The respondents were the management teams, senior staff, and other employees. Digital leaders and their followers in their sections were also requested to volunteer in completing the questionnaire. The completed surveys were collected through physical visits and contacts through telephone calls, email, professional social media (Facebook and WhatsApp), and personal networking.

After the data collection exercise, incomplete and wrongly filled questionnaires were discarded. Questionnaires which were well filled out were included in data analysis. The reliability of the questionnaire was tested and found to be adequate.

6. Research findings

6.1. Respondents and characteristics

A total of 212 respondents were involved in this study and were drawn from 4 universities, 2 respondents from media companies, 1 respondent from the ministry, 1 respondent from the insurance company, 2 respondents from the examinations council, and 4 respondents from regulatory authorities. These organizations had a minimum of 50 employees each and some had more than 500 employees. Table 2 summarizes the characteristics of the respondents.

Table 2 shows that the majority of the respondents were males 155 (73.1%) while females were 57 (26.9%). A large section of the respondents were drawn from universities – 99 (46.8%) respondents had masters degrees and 85 (40.3%) had doctorate degrees. In terms of age, 155 (73.3%) respondents were of the ages between 30 and 50. The data also show that the majority of respondents

Table 2. Characteristics of respondents

Gender			Education level			Age			Work experience		
Sex	*T*	*T*%	Education	*T*	*T*%	Range	*T*	*T*%	Years	*T*	*T*%
Female	57	26.9	Bachelor	26	12.2	20–30	20	9.40	<3	29	13.7
Male	155	73.1	Doctorate	85	40.3	31–40	73	34.5	<6	29	13.7
Total	212	100	Form Six	1	0.70	41–50	82	38.8	<10	37	17.3
			Masters	99	46.8	50–70	37	17.3	>10	117	55.4
			Total	212	100	Total	212	100	Total	212	100

117 (55.4%) had worked for 10 years in the same organizations. The respondents were as well categorized in terms of leadership skills as illustrated in Table 3.

The study involved respondents in leadership positions and others not in leadership positions. Table 3 shows that 116 (54.7%) of the respondents were leaders while others i.e. 124 (58.3%) of respondents had attended leadership training at some point. The table also shows that 84 (72.3%) of the leaders have assumed leadership positions for 3–10 years.

In terms of the education levels, the study involved people with different educational backgrounds. The majority of the respondents had a minimum of a bachelor's degree; these are expected to have good knowledge of leadership and also can provide a valid assessment of the quality of leaders. Most of the respondents were aged above 30 years, thus were considered matured enough to rank leadership attributes in their institutions. Also, as most of the respondents were leaders, their leadership knowledge and experience could have facilitated the correct assessment of leadership attributes.

The respondents rated 26 attributes which were used to describe constructs of DL as depicted in Table 1. Attributes were ranked on a seven-point scale from 1 to 7 where *1 = greatly inhibits*, *2 = somewhat inhibits*, *3 = slightly inhibits*, *4 = has no impact*, *5 = contributes slightly*, *6 = contributes somewhat*, and *7 = contributes greatly*.

6.2. Analysis of the results

The preliminary analysis involved examining the inter-correlation among leadership attributes to identify and remove variables which did not correlate with any other variables or correlated highly with other variables ($r > .90$). The correlation analysis of variables in Table 1 resulted in dropping three (3) variables (*Transparency*; *Curiosity*; and *Focused*) due to poor correlation. Table 4 shows the structure and loadings of DL items.

Hence, a single item was dropped for each role to be tested by Hypotheses 2, 4, and 5 respectively. Analyses of the remaining 23 variables were followed by Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The objective of using EFA was to reduce the factors to a smaller set of summary factors, to assess multicollinearity among factors which are correlated, to evaluate the construct validity, and to examine factors or relationship structure. The use of CFA was meant to verify the factor structure of a set of observed variables and; hence, to test the hypothesis that a relationship between the observed variables and their underlying latent construct exists.

6.2.1. Exploratory factor analysis

Out of the 23 variables, 7 factors with given values greater than 1.0 were obtained and accounted for 73.75% of the total variance depicted in Table 4. Also, the scree plot indicated that a 7-factor solution should be extracted. The EFA was again conducted on the 23 variables which specified the extraction of 7 factors and interestingly the 7-factor solution explained the same percentage that is 73.75%, of the total variance. The results showed that all variables were correctly correlated in the sense that

Table 3. Leadership characteristics

Whether a leader			Whether attended leadership training			Years of Leadership		
A leader?	*T*	*T*%	Attended?	*T*	*T*%	Years	*T*	*T*%
No	96	45.3	No	88	41.7	<2	17	14.5
Yes	116	54.7	Yes	124	58.3	3–5	52	44.7
Total	212	100	Total	212	100	6–10	32	27.6
						11–20	12	10.5
						21–30	2	1.3
						>31	2	1.3
						Total	116	100

Table 4. Factor structure and loadings of DL items

NO	Roles and variables	Factors						
		1	2	3	4	5	6	7
1	Inspirational role							
	Convincing	0.64						
	Influence	0.57						
	Enthusiastic	0.65						
	Trustworthy	0.68						
	Motivational	0.68						
	Openness	0.43						
2	Innovation role							
	Anticipatory		0.72					
	Digital savvy		0.71					
	Risk taker		0.70					
	Confidence		0.40					
3*								
	Diplomatic			0.55				
4	Absorbing uncertainty role							
	Sensible				−0.53			
	Communicative				−0.51			
	Direction				−0.51			
	Agile				0.40			
	Collaborative				0.63			
	Lobbyist				0.63			
5	Adaptation role							
	Informed					0.64		
	Planning					0.73		
	Decisive					0.38		
6*								
	Inspirational						−0.48	
7	Visionary role							
	Visionary							−0.62
	Encouraging							−0.63

*Role has a single variable hence cannot be grouped.

there was no variable with low correlation or correlation > 0.9. Sampling adequacy was examined using the Kaiser-Meyer-Olkin (KMO) measure to assess the suitability of the data for EFA. The suitability of the data for EFA was found to be 0.69 and KMO values for individual variables was > 0.50, confirming that EFA was appropriate for the sample data. Item communalities (except for one item) were greater than 0.50 indicating that the sample size was adequate. The EFA produced 7 factors for loading items, but two factors were loaded with one item each. We first checked how the model fitted the data using six fit indices: the comparative fit index (CFI), the root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), the standardized root mean square residual (SRMR), the relative chi-square test, and Coefficient of determination (CD). As per Hu and Bentler (1999), CFI, and TLI are expected to be greater than or close to .95 to indicate acceptable fit, and SRMR should be less than .08 for acceptable fit. Browne and Cudeck (1992) argued that the RMSEA value of .05 or less is considered a good fit and .08 indicates an acceptable fit. Table 4 shows the EFA results indicating how attributes were grouped into DL roles based on the factor loading. All items loaded appropriately as the minimum loading value was 0.3. Based on the loading factors, items were grouped into five roles. Items in the first factor appear to represent the inspirational role of a digital leader, items in the second factor represent the innovation role of a digital leader, items in the fourth factor represent the ability of a digital leader to absorb uncertainties, items in the fifth factor represent the adaption role of a digital leader while items in the seventh factor represent the visionary role of a digital leader. The third and sixth factors were each loaded with one item, hence were not grouped into roles. Again, another single item was dropped for each role to be tested by Hypotheses 2 and 4 respectively.

6.2.2. Confirmatory factor analysis

To conduct the CFA based on the factors in Table 4, only items with loading factor >0.5 were selected. All items; that is 2, of the seventh factor, the first 5 items of the first factor, the first 3 items of the second factor, and the items with negative correlation, that is 3, in the fourth factor were included in the CFA test. Items in the fifth factor were not included after ignoring one item with loading <0.5. Thus, a total of 4 factors and 13 items formed a model to be tested by CFA after dropping some items while fitting the model. This means that the inspirational role remained with 5 items, the innovation role and absorbing uncertainty role remained with 3 items each, and the visionary role remained with 2 items when the adaptation role was dropped. Thus, Hypothesis 1 was tested with 5 items after rejecting 1 item; Hypothesis 2 was tested with 3 items after rejecting 3 items; Hypothesis 3 was tested with 3 items after rejecting 3 items; Hypothesis 4 was rejected, and Hypothesis 5 was tested with 2 items after rejecting 1 item.

The CFA model was tested using maximum-likelihood estimation with robust standard errors (MLR) conducted in Stata and AMOS. MLR was used because it produces standard errors and chi-square test statistics that are robust to deviations from normality. We first checked how the model fitted the data using six fit indices: the comparative fit index (CFI), the root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), the standardized root mean square residual (SRMR), the relative chi-square test, and Coefficient of determination (CD). As per Hu and Bentler (1999), CFI and TLI are expected to be greater than or close to .95 to indicate acceptable fit, and SRMR should be less than .08 for acceptable fit. Browne and Cudeck (1992) argued that the RMSEA value of .05 or less is considered a good fit, .08 indicates acceptable fit, and .10 or more a poor fit. Relative chi-square values of less than or equal to 2 are considered a good fit and values between 2 and 3 are considered acceptable fit (Schermelleh-Engel et al., 2003). CD is represented as a value between 0.0 and 1.0 (Schermelleh-Engel et al., 2003). A value of 1.0 indicates a perfect fit, and is thus a highly reliable model for future forecasts, while a value of 0.0 would indicate that the calculation fails to accurately model the data at all (Schermelleh-Engel et al., 2003).

The six fit indices for the CFA model are illustrated in Table 5. All indices indicate acceptable fit. The CD value indicates a perfect fit while the relative χ^2 value indicates a good fit. Also, the value of RMSEA indicates a good fit. Based on the fit indices, we can conclude that the CFA model provides a better fit for the data.

Based on the CFA test results in Table 5, the following Hypotheses can be acceptable:

Hypothesis 1: The inspirational characteristics of a digital leader that have positive influence on her/his ability to lead DT include the ability to convince, influence and motivate; enthusiastic; and trustworthy;

Hypothesis 2: The innovation characteristics of a digital leader that have positive influence on her/his ability to lead DT include anticipatory; digital savvy; and risk taker;

Hypothesis 3: The absorption uncertainty characteristics of a digital leader that have positive influence on her/his ability to lead DT include sensible communicative rapport and direction;

Hypothesis 4: The adaptation characteristics of a digital leader have no influence on her/his ability to lead DT; and

Hypothesis 5: The visionary characteristics of a digital leader that have positive influence on her/his ability to lead DT include visionary and encouraging.

Table 5. Fit indices for the three CFA models

CFI	TLI	RMSEA [90% CI]	SRMR	CD	Relative χ^2 (χ^2/df)	χ^2 (df)
0.979	0.971	0.052[0.029, 0.072]	0.041	1	1.57	87.893(56)

6.2.3. Exploring the CFA model output

The output of the CFA model is presented in Table 6 and basically, the columns are the same as those presented for regression models. The rows present the standardized factor loadings and intercepts. The last row lists the chi-squared values for the model, which are explained while fitting the model to the data. The standardized factor loadings listed in the Coef. column and the corresponding p-values listed in the P>|z| column are the most important information that can be explored. The p-values for all the factor loadings are below the typical cut-off of .05, leading to the rejection of the null hypotheses that the factor loadings are equal to 0; hence, the factor loadings are statistically significant.

We get standardized factor loadings because the variances for some factors were set to 1 to scale the latent variable and for model identification. The standardized factor loading for the Communicative variable is 0.826; meaning that one standard deviation increase in ABSORB leads to a 0.826 standard deviation increase in the response to the Communicative question. The strongest factor loading of the thirteen items is Encouraging with a value of 1.251, which is the measure of VISIONARIES. Each factor has its strongest factor which is its best measure and Motivational is the weakest factor loading with a value of 0.405.

Table 6. Measurement model output

Standardized		Coef.	OIM Std. Err.	*Z*	*P > z*	[95% Conf.	Interval]
Sensible <-							
	Absorb	1	(constrained)				
	_cons	5.797	0.063	92.05	0.000	5.674	5.921
Communicative <-							
	Absorb	0.826	0.073	11.3	0.000	0.683	0.969
	_cons	5.943	0.052	115.35	0.000	5.842	6.044
Direction <-							
	Absorb	0.723	0.069	10.52	0.000	0.588	0.858
	_cons	5.887	0.051	116.23	0.000	5.788	5.986
Convincing <-							
	Inspire	1	(constrained)				
	_cons	6.028	0.083	72.84	0.000	5.866	6.191
Influence <-							
	Inspire	0.710	0.055	12.85	0.000	0.602	0.818
	_cons	5.929	0.078	76.23	0.000	5.777	6.082
Enthusiastic <-							
	Inspire	1.035	0.099	10.47	0.000	0.841	1.228
	_cons	5.759	0.086	66.74	0.000	5.590	5.929
Trustworthy <-							
	Inspire	0.629	0.068	9.26	0.000	0.496	0.762
	_cons	6.061	0.068	89.06	0.000	5.928	6.195
Motivational <-							
	Inspire	0.405	0.078	5.18	0.000	0.252	0.558
	_cons	5.939	0.072	81.93	0.000	5.797	6.081
Anticipatory <-							
	Innovation	1	(constrained)				
	_cons	6.321	0.109	58.09	0.000	6.107	6.534
Digitalsavvy <-							
	Innovation	1.021	0.046	22.35	0.000	0.932	1.111
	_cons	5.920	0.118	50.34	0.000	5.689	6.150
Risktaker <-							
	Innovation	0.980	0.040	24.53	0.000	0.902	1.058
	_cons	6.241	0.109	57.21	0.000	6.027	6.454
Visionary <-							
	Visionaries	1	(constrained)				
	_cons	5.863	0.052	112.98	0.000	5.761	5.965
Encouraging <-							
	Visionaries	1.251	0.269	4.65	0.000	0.724	1.778
	_cons	5.816	0.050	115.57	0.000	5.717	5.915

Notes: LR test of model vs. saturated: $chi^2(56) = 87.89$, Prob > $chi^2 = 0.0042$.

The intercept for each item labeled _cons appears below each factor loading in the Coef. column. The intercepts are the predicted values of the items when their respective factors are 0 or its mean. The intercept for Communicative is 5.943; which means that when ABSORB is at its mean, the Communicative is predicted to be 5.943 on its scale from 1–7.

6.2.4. Validity of DL model

The validity of the model under study is obtained using two types of validity; namely, Convergent validity and Discriminant validity. Convergent validity is concerned with whether or not a set of items share a high proportion of common variance. According to Hair et al. (1998), the criteria suggested for convergent validity include factor loadings should be above 0.5; average variance extracted (AVE) should reach 0.5 as a minimum, and composite reliability (CR) should be above 0.6–0.7. Table 7 presents the results of both Convergent validity and Discriminant validity.

All the items have factor loadings above 0.6 except for one item which has factor loading at 0.393. All the four factors have an AVE value that is above 0.5 except one item which has an AVE value at 0.484 (which is still above the cut-off point of 0.5), thus they all show good levels of internal consistency. Three values of CR are above 0.6 while one is less than 0.5. Based on these facts, it can be said that the measurement model satisfied the criteria of convergent validity.

The discriminant validity, on the other hand, is the extent to which a construct is distinctive from others. Based on Fornell and Larcker (1981), we assess whether or not the four factors are different from one another by testing to see if the square root of the AVE for any given two factors is greater than the correlation between these two factors. The results presented in Table 7 show such facts, and it can be said that the four factors have distinctive properties that capture different aspects of the roles of DL.

In summary, based on the EFA model, it can be argued that the EFA model better explains the data. However, the CFA indicates that the model converges somewhat when the factors were different from each other. The convergent validity of the model was satisfied and the discriminant validity was also met. Despite the lower number of items included, the CFA model fitted well the data. Though it was not included in the results, the one factor, two, and three factors CFA model, fitted well the data. It can be generalized that the CFA model fitted well the data. To improve the validity, especially the convergent validity, more items can be included in the CFA model with large sample size.

Table 7. Validity of the DL construct

	Latent variables	SL	SSL	SQL	NI	AVE	SVE	CR	Discriminant validity 1	2	3	4
1	Inspire	0.849	0.721									
	Inspire	0.642	0.412									
	Inspire	0.843	0.711									
	Inspire	0.649	0.421									
	Inspire	0.393	0.154	2.419	5	0.484	0.696	0.421	0.696			
2	Innov	0.947	0.897									
	Innov	0.895	0.801									
	Innov	0.926	0.857	2.555	3	0.852	0.923	0.852	−0.066	0.923		
3	Absorb	0.836	0.699									
	Absorb	0.844	0.712									
	Absorb	0.752	0.566	1.977	3	0.659	0.812	0.659	0.042	0.059	0.812	
4	Vision	0.678	0.460									
	Vision	0.875	0.766	1.225	2	0.613	0.783	0.613	0.057	−0.016	0.423	**0.783**

Notes: Innov – Innovation, Vision – Visionary, SL – Standardized Loading, SSL – Square of Standardized Loadings, NI – Number of Indicators, AVE – Average Variance Extracted. SVE – Square Root of AVE, CR – Composite Reliability, SQL – Sum of Squared Standardized Loading.

7. Implications for digital leadership in digital development

This study presented the conceptualization of DL and analysis of its characteristics necessary for DT of the firm. The literature has indicated that leadership is an important quality in firms as it introduces changes and innovation. In the context of digital technologies, scholars differ in describing, conceptualizing, and even designating the roles and characteristics of DL. This may be attributed to the challenging processes of DT and the challenging environment in which digital leaders work which Bennett and Lemoine (2014) describe as VUCA to reflect the volatility, uncertainty, complexity, and ambiguity of general conditions and situations. Very briefly, volatility means nature and dynamics of change; uncertainty means lack of predictability; complexity means the multiplex of forces; and ambiguity means the haziness of reality (Bennett & Lemoine, 2014).

The study informs firms, researchers, and policymakers of the importance of planning DTS, implementing DT, and eventually DL leading such a transformation. Initially, the study proposed a framework with five dimensions and a total of 26 characteristics. Other scholars also made attempts to explore or conceptualize the DL. Zupanzic et al. (2016) considered knowledge (consolidated from organizational members, shared within the team to develop understanding, brought internally from the external organization) as a benefit accrued from DL. In the present study, the informed characteristics of the adaptation role have been described as the ability, knowledge, and awareness of a digital leader in issues related to digital technologies and DT.

In his DL framework, Hensellek (2020) argued that a digital leader must possess a digital mindset; that is, attitude towards digital technologies in general and their uses, and digital skill-set; that is, understand digital technologies, use them sensibly, recognize opportunities, and assess risks associated with DT. Another scholar, Prince (2018), proposed digital skills and technologies as constructs of DL comprising the mastering of and ability to use digital technologies. Also, El Sawy et al. (2016) proposed changes in mindset and skill-set of people at all levels of the organization (top management and all employees) to implement a successful DTS. A clear analysis of the five dimensions of the present study and their characteristics reveal that a digital leader should develop both a digital mindset and skill-set to lead the DT, inspire, and help organizational employees to adapt and adopt digital changes.

Prince (2018) added two more constructs for a DL: these constructs are connectivities (a collaborative digital culture to encourage knowledge-sharing) and digital strategies (the ability to transform business value chains into value networks and capabilities in big data analytics). However, going through DL constructs by Prince (2018), one can learn that the model contains some leadership styles (e.g. Transactional, Transformational) and some constructs contain items such as capabilities in big data analytics that can be accomplished by other team members. However, the framework proposed in this study also captures the two constructs: collaborative – to work jointly with others (management and followers) and visionary – to have a vision and imagination for the future.

Based on the above descriptions and frameworks from other scholars, one can conclude that the DL framework developed in this study is more comprehensive and it has grouped characteristics into roles. The framework has also captured more characteristics of DL than other frameworks. This makes the developed framework suitable for adoption while one is dealing with DL in DT.

The implications for researchers, practitioners and policymakers can be drawn from the present study. One of the main implications comes from close relationship between digital technologies and economic development. Economic wealth is a critical prerequisite for ICT diffusion as digital technologies depend on specific infrastructures. Economic wealth can enable a digital leader to transform a firm by establishing digital infrastructure which can support DT. As a result, firms with higher levels of digital infrastructures will be the ones with greater DD. Even in developing countries, firms are increasingly digitally transforming their operations and service delivery. Adeleye and Eboagu (2019) revealed that ICT development in 54 African countries has a statistically significant positive relationship with economic growth. In Kenya, Ndung'u (2018) found that digitization emerged as a driver for inclusive economic growth, thus facilitating the creation of jobs. Mwantimwa's (2019)

assessment of how ICTs enhance business in 182 firms in Tanzania revealed that ICTs are essential for fostering socio-economic development. Analyzing a group of 10 countries from the Middle East and 24 from the OECD, Habibi and Zabardast (2020) showed that ICT has a more positive effect on economic growth, especially in countries with better access to education. Another study by Myovella et al. (2020) examined how the diffusion of digital technologies in 41 Sub-Saharan Africa and 33 OECD countries affects economic growth. The nature of DL is dynamic and central to integrating culture and competence in optimizing digital technology to create value and thus, under good DL these transformations will be successful and will lead to growth.

In developing countries, some actions and inventions of digital leaders with vision and mission can promote DD. Using simpler digital technologies like mobile phones and the Internet, it is possible to design and develop digital applications that can be used by many people including lower-income earners and those living in remote areas. The current widespread use of mobile phones for financial transactions and banking via sim-banking contribute to development in developing countries. Another implication of using digital technologies for economic development can be found in tele-centers or information kiosks. These initiatives were introduced by policy-makers and private organizations to foster the adoption and use of ICT in developing countries. The centers enable poor people to receive information about their governments, market prices, health, and education (Ashraf et al., 2007). In Tanzania, Lwoga and Chigona (2020) found that tele-centers enabled rural women to build social, financial, human, and political capabilities leading to economic development. As the financial capabilities of individuals grow, their digital capabilities improve, their ability to acquire additional and more advanced ICT goods and services equally grow, and their DD increases. Digital leaders and entrepreneurs can exploit such opportunities by developing digital applications relevant to individuals. Again, this DT can lead to DD and development in general.

ICT has been integrated into service delivery in health (e-health), education (e-education), and business (e-commerce) to improve the delivery in both the public and private sectors. ICT has also been integrated into social development to disseminate and share information in agriculture, governance, and human empowerment. All these are DDs which requires leaders with good DL skills to deliver to the public. The ultimate goal of DL is to efficiently deliver the services leading to economic, social, and human development.

DT can be perceived as a threat to employees and the current status quo. We can consider DL as a social influence process mediated by advanced information technology to produce a change in attitudes, feelings, thinking, behavior, and/or performance with individuals, groups, and/or organizations. In this respect, a digital leader has an inspirational role to employees about the benefits of DT with tangible proof of concept, even if the successful experiments are small in scale.

Currently, in most complex networked organizations the traditional hierarchical leadership models do not work properly. Thus, DL requires networking with every employee and the use of influence and knowledge brokering. This requires digital leaders to reshape their leadership roles and functions to adapt to the complex networked organizations. This helps digital leaders to build common understanding and agreement of what can or cannot be accomplished thereby enhancing the effectiveness of these networks. As per Petry (2018), leadership needs to be more networked, open, participative, and agile.

8. Conclusion

The study has shown the influence of DT in managing firms. The study has revealed that leaders with digital mindsets are change agents toward DT. The study has as well presented strategies that digital leaders can employ to manage the transformation process and perform their day-to-day duties. DT of the services can lead to efficient and time management; improve businesses, and even establish a network of participants. The transformation leads to DD, and development in general.

Based on the study results, it is important that firms and organizations develop criteria for assessing the characteristics, behaviors and roles of digital leaders. The essence is to have a leader who can initiate and spearhead DT and also motivate the employees to adopt the digital technologies. The ultimate is to ensure firms embrace digital technologies in service deliveries, leading to development.

With the attributes of digital leaders identified with EFA, the transformational leadership style fits better to be adopted by digital leaders. Digital leaders are expected to inspire positive changes in their followers; are concerned and involved in the DT process; and are also focused on helping every member of the group succeed as well. As the DT process requires team work, adopting transformational leadership style can facilitate and encourage cooperation among digital leaders and their followers for the success of their works. The ultimate is the successful DT with a happy team.

As DT is just more than developing digital technologies, it should be aligned with organization culture for its adoption. Failure to align the DT effort with employee beliefs, values and behaviors can create additional risks to an organization's culture. Effort can be made to shift the culture to understand, embrace, and advance DT. Thus, culture may also influence the way we judge leaders, and a research can be conducted which incorporates a component of culture. A study of this nature may easily generalize its results across sectors, organizations and culture.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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