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MAKING SENSE OF AFRICA'S EMERGING DIGITAL TRANSFORMATION AND ITS MANY FUTURES

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Digital technologies have spread across the African continent at an inexorable pace. Widely cited data on adoption rates suggest that digital technologies are making their way into every facet of life in African societies — a broader change process cast in this paper as digital transformation seems to be underway. We look beyond adoption rates and examine actions that bring about favorable economic, organizational, political, social, and cultural environments which digital technologies depend on to realize their transformative potentiality. In our view, pure adoption does not indicate any broader change or transformation but rather indicates a potentiality for change — a latent power to catalyze broader societal change processes. In this paper, we develop a framework to make sense of Africa's emerging digital transformation. In so doing, we elaborate on the multiple environments that digital technologies are embedded in and, by extension, the multidimensional change processes they need to ignite. The goal is to provide a better understanding — and new avenues for research — why actions and changes in some environments tend to more readily embrace the new possibilities offered by digital technologies while others seem disconnected and are lagging behind.

Keywords: socio-economic development; digital technologies; information and communications technologies; entrepreneurship; change

The ability to harness the power of technology and engineering to solve social problems must be accompanied by complementary adaptations in social institutions. These advances will in turn demand the emergence of more scientifically and technologically enlightened societies guided by democratic principles in the social, political, and cultural arenas.

Calestous Juma (2016: 315)

SETTING THE SCENE: AFRICA AND DIGITAL TECHNOLOGIES

We have all seen them, the images of Masaai elders who expertly use their mobile phones while standing in the middle of Kenya's grasslands, the stories about busy 'techies' who work out of co-working spaces from all over the African continent fully immersed in the global startup culture and the changing skylines of Africa's

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major cities which feel their way towards new heights. These poster children serve as inspirational sources for articles and reports titled 'Africa rising,' 'Lions on the move' and 'Aspiring Africa' (Mahajan, 2008; McKinsey Global Institute, 2010; The Economist, 2013a). They nourish a narrative about a broader change process said to have a firm grip on the African continent and its citizens.

More recent attention resides specifically with Africa's digital development opportunities as the 'lions go digital' (McKinsey Global Institute, 2013). It is the potentiality that lies in the implementation of digital information and communications technologies¹ to optimize market interactions and organizational processes and, as a result, tackle endemic socio-economic issues which create widespread enthusiasm (see, for example, Bright & Hruby, 2015). As Africa enters the digital age, the hope is that vibrant digital economies will adopt and adapt as well as create and disperse technological innovations across societies. The imagined outcome? Digital technologies will ignite new change processes in society that without technological interventions — oftentimes known as disruptions — would either falter or seem unimaginable. As digital technologies become a part of the social structure, it is imagined that they will not only alter in fundamental ways how society operates (Castells, 2004a) but also alter the solution approaches to socio-economic problems (Juma, 2016). Digital technologies have thus become an indispensable pillar of contemporary global poverty alleviation strategies (see, for example, Goal 9 of the Sustainable Development Goals) and powerful means for African economies to reach the much sought-after middle-income status (see, for example, Kenya's vision 2030 [GoK, 2007; ICT Authority, 2014]).

To be sure, the rapidity and growth with which the digital age is making its way into all facets of life in Africa — perhaps more radically than anywhere else on the globe (The Economist, 2013b) — is a phenomenon that has taken many by surprise. Frequently cited indicators in support of this contagious diffusion are the adoption rates of mobile phones, figures on mobile data usage, new apps brought to market and mobile money transaction data that depict exponential growth curves (GSMA, 2017). Another indicator comes from the ascendancy of entrepreneurial hubs across the continent — a testimony for a startup movement in the making (Bright, 2016). From Ghana to Kenya, and from Zimbabwe to Ethiopia, domestic and continental resources are bundled and channeled to these central nodes as are pivotal resources from overseas in support of technology entrepreneurs (Friederici, 2016; GSMA, 2014). Something novel is in the works.

As digital technologies spread at a seemingly inexorable pace — a development that is linked to what we understand as an emerging digital transformation of African societies — we seek to provide a framework that attempts to make sense of what is set to turn into a pan-African phenomenon. The goal is to provide a set of sense-making tools to interpret the role digital technologies currently play and potentially can play on the African continent. By doing so, we seek to go beyond debates on adoption rates and hub counts to reveal a more nuanced picture. This is particularly important as the spread of digital technologies alone will not unlock any development opportunities (Donner, 2015). Digital technologies are, rather, dependent on a series of change processes in society that they can ignite or catalyze (World Bank, 2016).

The introduction of digital technologies doesn't happen in a vacuum but is rather contingent on sets of institutions. Drawing on existing academic work that focuses primarily on macro-level changes (e.g., Castells, 2004b; Donner, 2015; Kleine, 2013), we adopt in this article a micro-level view that puts particular emphasis on the actions

(or the lack thereof) of a diverse set of actors on which digital technologies depend to realize their transformative potentiality. This focus seems particularly relevant in order to understand the early stages of the ascendancy of digital technologies in African societies where technological innovations are oftentimes imported and adapted to fit context-specific peculiarities (Juma, 2017).

Adapting, creating, and dispersing digital technologies, whether deliberately or accidentally (Olopade, 2014), is in this view contingent on actions that bring about favorable economic, organizational, political, social, and cultural environments. Pure adoption does not indicate any broader change or transformation but rather indicates a potentiality for change — a latent power to catalyze broader societal change processes. Through particular actions — the focus of this paper — digital technologies can realize their potentiality in a given society by becoming a catalyst for change and, in the process, blend into the altered social structure by becoming a taken-for-granted element. Thereafter, interactions seem unimaginable without it.

The conception of multiple environmental dimensions in which digital technologies are embedded and the actions that broader change is contingent on draws attention to the comprehensiveness of action patterns needed to alter social structures. By doing so, we develop an analytical prism through which the digital transformation of African societies can be gauged — a multifaceted picture. This conception comes in handy to capture the variance with which African societies become part of the digital age displaying the broad spectrum across which some more so than others foster and seek to reap its benefits.

What we show in the following pages is a descriptive account of Africa's emerging digital transformation as it has unfolded thus far. We complement this with an interpretive account by examining the environmental dimensions mentioned above and briefly discuss the opportunities for and barriers to the digital transformation in order to then discuss fields of research ripe for academic inquiry. Our hope is that by developing a framework to analyze the digital transformation of African societies, the multidimensionality of change processes on which the impact of digital technologies hinges becomes apparent. In other words, while digital technologies can certainly unlock development effects, they can also risk seeding false hope, if the possession of smartphones alone becomes the symbol of societal progress.

AFRICA'S BEGINNING DIGITAL TRANSFORMATION

Digital transformation has become a term mostly employed by evangelists and the popular media to describe the impact and change digital technologies can or already have realized in, for example, individuals' daily lives or on firms' strategies. The concept captures the imagination, as it creates awareness for an ascribed power that can effect broader change. It is as if a latent power comes alongside with the introduction and use of digital technologies in a given context — connoting a potentiality for transformation. The perceived reality of realizing such a latent power is, however, up for debate and described by some as a socially-constructed myth glorifying a better future (Mosco, 1998, 2005) or cast as a vastly complex, but possible, endeavor (Juma, 2016).

We favor the term digital transformation here, not to compete but to complement existing scholarship in domains such as information and communications technologies for development (ICT4D); mobile for development (M4D) or data for development (D4D), as it encapsulates some of the changes we have witnessed. In particular,

digital transformation brings to the surface six notions. First, it portrays a sense of inevitability with which digital technologies permeate society — as long as there is ‘signal’ the impact can be felt. Second, it represents uncertainty as to its outcome. Socio-economic development is foregrounded and desired by many but represents only one possible trajectory — the future is not pre-determined but one of many futures. Third, it emphasizes the ascendancy of the digital age with its many innovations that reach well into the physical domain (e.g., Internet of Things) and are not confined to just cyberspace. Fourth, it captures the *potentiality* — the latent power — of digital technologies precipitating a series of change processes in society which, in the process, may alter the inner workings of society. Fifth, while representing a broader societal shift in a given context, it also creates awareness for the micro-level actions that broader change and thus any transformation is contingent on. And sixth, in our view, the term is actor agnostic but emphasizes that potentiality for change is negotiated in *interactions* and *within actors*. In other words, digital transformation allows for the study of a diverse set of actors enrolled directly or indirectly in a digital project on different levels of analysis (i.e., individual, group, collective, organization and society) examining the change that is produced through individual or collective (inter)action as well as the change that happens within social units. The term digital transformation thus affords is making connections from micro-level actions to meso-level environments and macro-level societal outcomes.

With this conception in mind, the transformative or disruptive power commonly associated with the introduction of digital technologies is, by definition, hidden. For its activation, digital technologies are reliant on modifications to a given societal context, that is, actions that alter or generate favorable economic, organizational, political, social and cultural environments. By igniting and catalyzing a co-evolutionary process in which alterations to digital technologies prompt alterations in the societal context and vice versa (Juma, 2016), digital technologies fuse with the social structure and become a constitutive element in social life.

The actions driving the alteration and genesis of environments are themselves driven by a broad variety of individual actors or groups of actors and denote micro-level actions that resemble other concepts, such as institutional work (Lawrence, Suddaby, & Leca, 2009), strategizing (Vaara & Whittington, 2012) or entrepreneuring (Rindova, Barry, & Ketchen, 2009), and are intimately intertwined with technology entrepreneurship (Beckman, Eisenhardt, Kotha, Meyer, & Rajagopalan, 2012). Put differently, by designing and commercializing digital technologies (Avle & Lindtner, 2016), creating firms and anchoring new industry sectors on the African continent (Weiss & Weber, 2017a) more is at work than substantively meets the eye (Ndemo & Weiss, 2017). Direct or indirect, deliberate or accidental (Olopade, 2014) actions alter and form the societal context which hinders or impedes the realization of a digitally mediated society and the manifestation of new beliefs and values. In fact, few actors are directly part of a deliberate digital transformation agenda; many rather by virtue of pragmatically accomplishing day-to-day tasks integrate or fail to integrate digital technologies into the social structure.

The reason to investigate the early stages of African societies’ digital transformation lies in the widely publicized data that primarily reflect surface-level adoption processes but prompt vivid imaginations of change. The data² reveal that unique mobile phone subscriber numbers stood at 420 million in 2016 and are set to reach 535 million in 2020 which signifies a reach of mobile phones to 50% of Africa’s

population (GSMA, 2017). During the period from the end of 2000 to mid-2017 internet penetration rates increased 8,500% to connect 31% of the population³ to cyberspace (Internet World Stats, 2017), a figure that is set to reach 50% in less than a decade from 2017. Smartphone adoption has doubled in sub-Saharan Africa in the past two years (2015 to 2017), reaching 200 million and is projected to further increase exponentially due to the increased availability of low-cost smartphones. As a result, mobile data traffic is projected to increase by a factor of twelve over the next five years. The reported effect? Total revenue generation for mobile operators in 2016 was estimated at US\$110-billion with a contribution of the mobile economy to the GDP of 7.7%. Jobs directly attributed to the mobile economy lay at 1.1 million and are projected to reach 1.3 million in 2020, with an additional 2 million indirect jobs (GSMA, 2017).

Zooming in on the financial technology space—in particular mobile money services—shows that 143 services are active in sub-Saharan Africa which accounts for about half of the services deployed worldwide. The high density of services is often-times attributed to the success of Safaricom's MPESA (Omwansa & Sullivan, 2012) and the perceived opportunity to develop new products in order to extend financial services to the unbanked. The new generation of mobile money services, however, has moved beyond peer-to-peer transactions and seeks to embrace, with the help of new technologies, the full scope of financial instruments (Chironga, Grandis, & Zouaoui, 2017).

Another frequently used indicator of activity is the mushrooming effect that the establishment of entrepreneurial hubs across the African continent has demonstrated. The last count in mid-2016 noted that 314 technology hubs in 93 cities and 42 countries are operational (Du Bocher, 2016). Efforts to compile data on announced investment activity show that about US\$185-million in 2015 (Disrupt Africa, 2015) and US\$120-million in 2016 (Disrupt Africa, 2016) has been invested (alternative figures suggest that US\$366-million was raised in 2016 [GSMA, 2017]), revealing the nascence of entrepreneurial activity in Africa's digital economies. Similar to the hubs, investments tend to come in geographic clusters of which Egypt, Ghana, Kenya, Morocco, Nigeria and South Africa are the benefactors demonstrating an uneven distribution across Africa. Nevertheless, the access to pertinent information from dispersed locations in conjunction with national and international conferences creates a sense of belonging to global communities and provides the seeds for the importation, further adaptation and creation of advanced technologies and their corresponding business models.

DIGITAL TECHNOLOGIES IN ACTION

The deployment of digital technologies, which are of interest to this paper, can be broadly grouped into two substantive categories, namely the optimization of organizational processes and the optimization of market transactions in African societies.

On the one hand, the basic task — the groundwork, so to speak — of digital technologies is the formalization and subsequent digitization of intra- and inter-organizational processes (i.e., enterprise resource planning software, accounting software, inventory management, cloud computing, etc.). Technology is at work in turning physical activities and records into mapped-out process flows and digital archives that seek to ease operations and increase efficiencies. These technological solutions are

oftentimes localized monikers of off-the-shelf products from overseas and thus tend to face fierce legitimacy constraints and global competition pressures.

On the other hand, optimizing market transactions requires a different set of innovations. The concept institutional voids⁴ is a helpful guide in classifying what type of institutions perform key market functions that are essential in enhancing trust, leveling information asymmetry across diverse market actors and increasing vibrancy (Khanna & Palepu, 1997). In particular, digital technologies are modeled after these key market institutions (Drouillard, 2016) of which Dhanaraj and Khanna (2011) differentiate between six: (1) credibility enhancers introduce certifications and standards; (2) information analyzers and advisers collect and analyze market information for decision-making; (3) aggregators and distributors pool and match resources; (4) transaction facilitators introduce platforms that channel resources and facilitate exchange; (5) regulators set the rules of the game and police market behavior; and (6) adjudicators arbitrate between market participants.

Digital technologies are in action and perform market functions in a wide array of sectors in African economies. For example, during its formative years, the mobile banking innovation MPESA functioned primarily as a transaction facilitator. MPESA unlocked reliable and cost-effective peer-to-peer transfers enabled by supplementary service data (USSD) or SIM-toolkits outperforming pre-existing offline solution (Omwansa & Sullivan, 2012). Newer generations of firms and innovations extended the service by broadening the spectrum of market actors that are enrolled in mobile banking solutions, integrating with a wide variety of international financial service providers such as Visa, Mastercard and PayPal (Nsehe, 2014), and enhancing the portfolio to include credit and insurance products (Chironga et al., 2017). Similarly, block chain technologies⁵ were primarily engineered to facilitate instant cross-border financial transaction flows across the globe to and from African economies seeking to minimize possible value loss that could arise from exchange rate volatilities (Bithub.Africa, 2017; Tozzi, 2015). Enabled by machine learning algorithms, data aggregation from a variety of seemingly disparate information sources extended the market function of financial innovations into the digital age and well beyond transaction facilitators to also become information aggregators and distributors as well as credibility enhancers. Nowadays, digital technologies in finance channel information and capital from all over the world into domestic markets for the banked and unbanked individual or firm by virtue of manufacturing previously unavailable credit scores that are based on sources such as weather data, consumer spending and income flows (Chironga et al., 2017).

Artificial intelligence in the form of bots or machine learning algorithms come into play as information analyzers and advisers in finance, health, recruiting, fast-moving consumer goods, logistics, insurance, land registration in government and agriculture with the intent of aggregating and making sense of big data repositories to introduce market efficiencies (Ndemo, 2017b). For example, predictive data analytics in agriculture can provide location-specific forecasts on crop productivity and failure that function as input variables in the decision-making process of insurers, investors, traders, supply chain manager and lenders (see Ekekwe, 2017; Ndemo, 2017).

Digital technologies in the form of matching algorithms and rating systems enable the creation of two-sided or multi-sided digital platforms that model and digitize entire market environments. Based on network effects, exponential growth in users and market transactions is the primary goal. These platforms also develop functions of

regulators and adjudicators by setting rules and regulations for economic exchange and creating impromptu arbitration to guarantee smooth and sustained transaction flows (see David-West & Evans, 2016; Parker, Van Alstyne, & Choudary, 2016).

Digital technologies also prompt the extension into offline space and thus foster connections to physical environments. The internet of things has developed a broad range of innovations across multiple industry sectors, amongst which are the testing and selective employment of drones, 3d printers and smart technologies (i.e., advanced sensors, robotics, advanced materials, etc.) to augment manufacturing processes (see Deloitte, 2016; Liquid Telecom, 2017). Consider the Kenyan firm BRCK which has developed a decentralized network of solar powered routers for remote locations that can avail free digital content on their platform and a low-cost channel to internet use (Bright, 2017). This and comparable technological innovations can become the physical gateways that enable access to information from afar, facilitate the formation of new local and international ties, extend the reach of digitally-mediated economic transactions and provide the rails for the supply of further digital technologies.

These accounts of software and hardware importation, adaptation and creation occur across sectors in an effort to digitize and optimize organizations and markets as well as create unprecedented organizations and markets. In fact, by the time this article is published, the overview we provided is likely to already need an update, as new digital technologies will have emerged and become relevant to new domains of life. Nevertheless, in Africa, digital technologies generally remain an emergent phenomenon operating on the fringes of African societies with so far marginal contributions to their economies. The realization of their transformative potentiality requires not only further innovation and widespread adoption of digital technologies but also the reconfiguration of the social structures in which they operate.

ALTERING AND GENERATING ENVIRONMENTS

The societal change processes prompted and catalyzed by the introduction of digital technologies can be understood as a multi-dimensional process — a series of concurrent reconfiguration events across multiple environments. These environments do not exist in isolation from each other. Rather, they are intertwined and feed off of each other, engendering comprehensive dynamism. In this conception, actions that lead to the alteration or the genesis of favorable environments tend to have repercussions, whether substantive or latent, for other environments. The purview of academic inquiry is usually the analysis of one environment or a comparison between two.⁶ The hope is that the framework we develop here provides a broader view of the environments that digital technologies depend on to put into action a digitally-enabled modernization agenda. In the subsequent sections we attempt to sketch out each environment and briefly outline the barriers to their advancement.

Economic Environments: Markets and Commodities for Economic Vibrancy

The introduction of digital technologies is predicated, amongst others, on actions that bring economic activity into the digital realm, build and expand markets and institutionalize new pathways to economic value creation. The financialization of the

economy and the emergence of data-as-a-commodity provide two contemporary phenomena which illustrate how environments can be altered and generated.

The financialization of the economy describes actions aimed at a reconfiguration in economic value creation 'in which profits accrue primarily through financial channels rather than through trade and commodity production' (Krippner 2005: 174, in Davis & Kim 2014). Here, digital technologies become conduits to substantially accelerate the proliferation and, with it, the economic significance of financial markets. In the process, they replace the need for traditional banks and similar service providers. This development is in part already reflected by the particularly high vibrancy of entrepreneurial startups and innovations in the finance sector on the continent that either digitize and optimize pre-existing transactions or manufacture new markets (Chironga et al., 2017). For example, digital technologies designed for financially distressed income population segments and traditionally underserved organizational populations, such as micro-, small- and medium-sized enterprises, enable the production of credit scores and creation of new, oftentimes international channels to distribute financial resources. The goal is to either avail financial services to those that have remained out of reach — the unbanked — or catalyze adjacent market activities by availing financial products for services and products such as solar devices, fast-moving consumer goods and transport.

Financialization also encompasses another component which is the increasing demand for new entrepreneurial finance options. The commercialization of digital technologies depends in large part on angel investments, venture capital or vibrant stock markets representing actors and markets that were previously either non-existent or peripheral but now have to become vibrant spaces of economic transactions populated by new actors. As a result, the proliferation of digital technologies in society is in part dependent on adjacent evolutionary processes that denote the alteration and reconfiguration of existing environments to reflect a focus on economic value creation through financial channels.

Digital technologies are also reliant on the ascendancy of a new commodity — data. Data capitalism describes the production and trade of data bundles by, for example, combining existing data elements in novel ways or manufacturing and mining data from market and non-market behavior (West, 2017). The efforts to broadly legitimize and use data as a new commodity on the African continent produces unprecedented ways for economic value creation and, in consequence, generates new economic environments. This is by no means trivial. In a long history of unsatisfying data sources and data points, economic analyses and forecasts are oftentimes said to be highly flawed and not reflective of actual economic activity (Jerven, 2016). New data sources in conjunction with sophisticated analytical methods are seen as antecedents to a new era of evidenced-based decision-making (Juma, 2016; Waswa & Juma, 2012). In fact, the ascendancy of data commerce may even provide a new angle to think about how economic development can happen. Complementary to reemphasizing the importance of industrial manufacturing for African societies to develop — the idea that societies can't skip a step in modernization (Juma, 2017) — data manufacturing and exchange can provide an additional path to engage in modern, digital value creation (for a contemporary example and as a thought experiment, think of Inner Mongolia's bitcoin mine [Li & March, 2017]).

The activation of the transformative power of digital technologies thus becomes in part dependent on the realization and elaboration of data as a key commodity in economic activity.

Organizational Environments: Affecting Organizational Change and Populating New Organizational Forms

Reconfiguring existing organizational environments can entail actions that foster the adoption of digital technologies within and across organizations. The genesis of new organizational environments is reliant in part on actions that import and legitimize new organizational forms and lead to the formation of vibrant, interdependent organizational populations that support digital technologies.

The diffusion of digital technologies beyond the epicenter of their development and incubation, in which not only like-minded technology startups become the adopters but rather a broader diffusion process across sectors is realized, becomes a contingency for the transformative power digital technologies can develop. The adoption of digital technologies, however, does not only entail formalizing, digitizing and optimizing organizational processes but rather entails broader organizational change processes in which organizations develop new capabilities and augmented business models to seize business opportunities in the digital realm (Andal-Ancion, Cartwright, & Yip, 2003; Pigni, Piccoli, & Watson, 2016). It impacts how organizations operate and interact with their environments.

The commercialization and diffusion of digital technologies is in part also contingent on distinct organizational populations (Aldrich & Ruef, 2006; Ferrary & Granovetter, 2009). Mostly through importation processes, new organizational forms become introduced to African societies and populated by de-novo or de-alio firms (Weiss, 2017). Examples are technology startups that drive forward entrepreneurial opportunity recognition and exploitation (Beckman et al., 2012); venture capitalists that finance promising entrepreneurial endeavors (Kenney & Patton, 2006); specialized law firms that function as authoritative intermediaries in the pursuit of community norms (Suchman, 1995); specialized media outlets that distribute crucial industry information; and recruitment agencies that seek to increase efficiency in the labor market. In its current stage, considerable organizational resources and competences are designated to adapting and legitimizing imported organizational forms to new settings that lack the vital resources (Bruton & Ahlstrom, 2003; Aldrich & Fiol, 1994) and developing interdependent networks between new and pre-existing organizations (Aldrich & Ruef, 2006).

The diffusion of organizational forms that comprise nascent digital economies is well underway and has progressed in Egypt, Ghana, Kenya, Nigeria and South Africa leading to the genesis of favorable organizational environments and the increased entanglement with similar and unrelated organizational populations in the respective economies. The size of organizational populations, however, is small and tends to be skewed reflecting high vibrancy in the formation of entrepreneurial hubs, accelerators (Dutt et al., 2015), training facilities and startups but low counts amongst venture capitalists or specialized law firms (Du Bocher, 2016; GSMA, 2014). The latter are particularly important in developing community norms and a standardized organizing template (Suchman, 1995; Weiss & Weber, 2017b).

NGOs and international donor agencies are prominent but oftentimes counterintuitive actors in shaping the organizational environment for digital technologies. The role and impact of the sought-after innovation grants in the wider tech sector remains underexplored.

Universities' progress in producing specialized human resources and innovative technologies as well as technology ventures' evolution into multi-sided platform organizations so far remain in their constitutive stages. Similarly, the involvement of large high-tech firms that function as investors, possible acquirers of startups and providers of skilled human resources is nascent. The digital transformation, however, is in part contingent on the genesis of new organizational environments in which new patterns of cooperation and competition between new and pre-existing organizations arise.

Political Environments: Mediating Tensions and Promoting Inclusive Innovations

The creation, adoption and diffusion of digital technologies in society is in part contingent on the political environment in which it occurs. Altering political environments can refer to the actions that create and maintain a favorable political climate. Think of a willingness to mediate and not just tolerate social tensions that can arise from the turbulence novel digital technologies bring along (Juma, 2016) and an openness to embrace digital technologies as a reform opportunity towards digitally-mediated political processes. Actions relating to the genesis of new political environments can refer to, for example, the creation of proactive political institutions in which digital technologies are from the outset part of devising novel ways to solve longstanding societal ills.

Innovations are oftentimes met with skepticism and doubt leading to the endorsement of cautionary tales and policies (Juma, 2016). Technological advancements and the use of digital technologies, however, have emerged as an integral part of many policy agendas — be the adoption symbolic in nature or tightly coupled to action — on the African continent as well as of overarching policy agendas such as the African Union Science, Technology and Innovation Strategy or the Sustainable Development Goals. In the same vein, digital technologies are not only regarded as an engine for economic growth and comparative advantage that resides primarily in the private sector but also as a reform mechanism to introduce transparency, accountability and efficiency into government processes. It is here where unlocking the transformative potentiality of basic digitization can reform how the government acts and interacts with its citizen. Consider the recent digitization of Kenya's land registry (Ndemo, 2017b) as an exemplar or consider the reform potential in big data analytics (Ndemo, 2017c) and anti-corruption policies (Srivastava, Teo, & Devaraj, 2016).

Beyond that, actions that undergird a proactive policy agenda which seeks to tackle societal ills in novel ways in conjunction with digital technology generates new political environments. By virtue of decisive executive action previously unimaginable solutions can arise. Consider, for example, the actions taken by one of the authors who enrolled in political entrepreneurship and changed, while in office, how Kenya got connected to the global fiber grid. Under his supervision, a previously stalled, decade-long negotiating process was expedited. He also functioned as an important facilitator in shifting the regulatory conversations around the mobile banking solution, MPESA, from a precautionary tale to that of one with

transformative potentiality, if enabled, soliciting regulators' approval in the process (Ndemo, 2016). Taking that a step further, think of broader scientific discoveries that require new political environments to power national or continental space programs and satellites in space in order to, for example, use remote sensing technology for developmental efforts (see Waswa & Juma, 2012). What this tries to show is that the developmental progress digital technologies can unlock is intimately connected to the extent to which individual or collective actions can create a favorable and proactive political environment.

Social Environments: Building Local Ties and Transnational Communities

The broader change that digital technologies can engender is contingent in part on actions that form new markets and establish favorable social environments — an altered relational fabric and network configurations in which its development, adoption and diffusion take place. Further, the creation, adaptation and commercialization of digital technologies also require unique relational actions to create new social environments that can reliably cross national boundaries and form exchange relationships in transnational communities of practice.

As digital technologies and with them new market practices seek to extend their reach to encompass new social groups, adoption and market vibrancy becomes a central issue. Yenkey's work (2015) on market formation reveals invaluable insights that highlight the significance of altering social environments. In particular, the role of marketing and the distribution of ethnically neutral advertising messages can play a key role in ethnically fractionalized societies. By virtue of creating a shared social identity around a particular market, adoption of new market practices can be greatly facilitated. Analogously, the transformative potentiality of digital technologies is in part contingent on reconfiguring existing social environments into favorable social environments that prompt the broad adoption of new digital technologies and facilitate the entanglement with new markets.

Similarly, actions that seek to create new social environments matter. For example, hubs, incubators and accelerators which have been characterized by scholars as open-system intermediaries (Dutt et al., 2015) that actively engage in the creation of common goods to facilitate social exchange in emerging economies or as assemblers that tie together disparate actors (Friederici, 2016) have shown to morph into central nodes in domestic technology entrepreneurship sectors. These actors engender unprecedented local and international resource flows. Similarly, actions to create transnational communities of practice by disparate actors weave together nets of collaboration locally and globally creating new network configurations and allowing the flow of knowledge. Digitally-mediated communities of practice regularly manifest in physical locations, for example, at international conferences of which the Global Entrepreneurship Summit (2015 in Nairobi, Kenya), Demo Africa (2017 in Johannesburg, South Africa), TED (2017 in Arousha, Tanzania) and RE:publica (in Berlin, Germany) are some of the more prominent connectors. Another example, comes from founders' unique relational work and strategizing. Prompted by resource scarcity, founders seek to create and maintain a diverse set of international ties in order to access resources from afar such as talent and finances making the commercialization of digital technologies and its wider impact on society in part reliant on creating cross-border social environments.

Cultural Environments: Adding New Possibilities and Producing Local-Global Blends

Altering cultural environments can entail actions that craft new narratives and bring in new cultural elements to pre-existing environments, in the form of importing action options, norms and values. These actions seek to broaden the scope of what seems possible in African societies and allow the imagination and implementation of new ways of doing things that were previously unknown or thought incompatible with established lines of action. Beyond that, actions that, for example, manifest in backlashes against powerful ideals or paradigms and seek to challenge seemingly durable conventions in radical ways can lead to the creation of new cultural environments and thus the imaginations of entirely new futures for African societies.

A symptom of what is cast as 'techno-optimism' is the perceived need to include digital technologies into every facet of social life, whether functionally needed or not. With it new narratives of possibility and hope accompany the efforts of adoption and legitimation. In what resembles varieties of cultural entrepreneurship (Lounsbury & Glynn, 2001), some craft 'grand visions' in policy statements which seem, after closer examination, largely decoupled from economic realities and policy action (Friederici, Ojanperä, & Graham, 2017) and others feel instigated to manufacture stories and images of a 'new' Africa without, however, being able to shake off persistent old tropes about the idea of Africa (Nothias, 2014). These efforts are instances that are bringing in new cultural elements to pre-existing cultural environments, unlocking the imagination of new futures and creating new, putatively modern realities.

Further examples come from designing digital technologies which entail a form of cultural work and meaning-making. In the process of designing, the past, present and imagined future of a particular locale are fused by the creator into the final product — becoming a cultural artifact that embodies aspirations and a sense of imagined reputation vis-à-vis the global economic pecking order (Avle & Lindtner, 2016). Yet another example surfaces the importation of guidelines on how to perform technology entrepreneurship in African economies which prescribe new ideals and a new recipe for success. These new ways of doing things interact with established guidelines of how to become successful and can give rise to intriguing tensions. Consider for a moment opposing guidelines — or templates — in venture creation and growth which co-exist in Kenya's technology entrepreneurship sector. The one, an imported template, prompts entrepreneurs to form investor friendly ventures that are in pursuit of an exponential growth path as is typical for technology ventures (Thornton, 1999), while the other, a domestic template, instigates entrepreneurs to create ventures which follow an organic, revenue based growth model as it is more common in African economies. Both, the imported and the pre-existing templates are legitimized by a variety of actors; they, however, create tensions at the practice level. These tensions then have to be reconciled by industry participants and severely complicate technology entrepreneurship (Weiss & Weber, 2017b). The concept Africapitalism (Elumelu, 2011), provides another example. It motivates actions to reimagine capitalism and by doing so infuse imported concepts of capitalism with a set of moral principles that are tied to identity and values in African societies (Amaeshi & Idemudia, 2015). The emphasis lies on creating local-global blends.

Actions that seek to alter cultural environments thus enable the imagination of new possibilities and open up new pathways to actions. These can be compatible with or

stand in drastic contrast to previously legitimized ways of doing business (Weiss & Weber, 2017b).

New cultural environments can be generated by, for example, pushing back against local or imported ideals. These actions of backlash can give rise to hypermodern domains of societal life (e.g. the excessive attention to the self as the locus for both problem and solution) that champion universal cultural ideals and are buffered from distinctive, local cultural material (see Boli & Elliott, 2008). In contrast, unique actions can endorse the reactivation of ostensibly hidden, local tropes. A prominent example is the growing movement that seeks to activate the dismembered cultural memory of Africans by infusing societal life more prominently with local languages (Thiong'o, 2016), a sense of history and belonging (Mazrui, 1993) as well as developing an Afrocentric epistemology (Asante, 2015).

Taken together, the transformative power of the digital agenda is in part contingent on the actions that alter and create cultural environments and thus unlock new, location-specific imaginations of how digital technologies can bring about developmental effects.

RESEARCH OPPORTUNITIES IN AFRICA'S EMERGING DIGITAL TRANSFORMATION

We focused in this paper on the ascribed transformative potentiality of digital technologies whose realization, we argue, is contingent on actions that bring about multi-dimensional, societal change processes. In particular, we were concerned with the actions that alter and generate favorable economic, organizational, political, social and cultural environments, without which Africa's emerging digital transformation is likely to falter. Using digital technologies as an entry point to academic inquiry opens up a number of research opportunities to further unpack the dynamism. We hope that the framework provided here can serve as an interpretative foil to make sense of the ongoing change processes and help to answer why some particular instances of change continue to remain unrealized.

For a potential research agenda, we elaborate on three overarching categories: (a) enabling and impeding conditions of change; (b) actions and strategies at play for individual and collective change processes; and (c) translation of change across environments.

The consequence of overriding conditions and environmental shocks on change processes are in need of inspection. For example, asymmetric distributions of power across actors in influencing change processes can skew the impact of certain actions over others, rendering advances made by some actors negligible. Similarly, shocks such as unexpected regulatory jolts can have both intended and unintended consequences for the progress in digital transformation efforts. Consider internet shutdowns by governments that significantly stifle economic vibrancy across sectors, leading to unexpected externalities (CIPESA 2017). In contrast, one can imagine that announcements such as hosting the Global Entrepreneurship Summit in Nairobi (Africa Research Bulletin, 2015), introducing low cost smartphones, increasing investment sizes in startups across Africa and visits by national and international leaders to technology entrepreneurship spaces significantly increase legitimacy, enroll more actors into the support of digital technologies and further fuel the advancement of change processes. Understanding the dynamism overriding conditions and shocks on

change precipitate — be they enabling or impeding to change processes — will shed additional light on the evolutionary trajectory each society is on.

The actions that fuel change processes require distinct analysis. For example, shedding light on entrepreneurial practices and strategies (see Ott, Eisenhardt, & Bingham, 2017) that detail the emergence of routines and industry-wide blueprints are crucial such as how founders or organizations construct national and international networks to enable pivotal resource flows. In the same vein, we lack a thorough understanding of the political processes that make change happen and endorse policies in favor of digital transformation or what political entrepreneurship needs to look like to affect broader change within and outside of government. From our understanding, the analysis of policy documents alone does not suffice; rather an examination of the work behind the scenes — how does policy-making happen — is what is needed. In addition, working towards altering and creating favorable environments tends to be a messy rather than linear process and leads to the emergence of new problems and management issues that are in need of analysis. What are the intended and unintended consequences that arise in bringing about favorable environments?

Advances made in altering or creating favorable environments may not readily translate into other environments as extant research shows. A particular instance is cultural entrepreneurship. New future imaginaries often do not align with economic realities that govern life on the African continent (see Beresford, 2016; Friederici, Ojanperä, & Graham, 2017; Taylor, 2015). These observed disconnects between progress in some environments and the lack of progress in others requires further systematic investigations. Some may argue that mythologies imbued in digital technologies carry the contradictions between societal expectation and perceived reality alongside them as they become adopted elsewhere (Mosco, 2005) and yet others may argue that local resistances against the introduction of digital technologies is what constrains the unfolding of broader change (Juma, 2016). Of particular interest is how rhetoric does or does not translate into action and the consequences it triggers for the 'digital haves' and 'digital have-nots.' The emerging digital transformation across African societies provides an optimal research ground to investigate these phenomena in more detail.

CONCLUSION: WHICH DIGITAL FUTURE?

In order to better understand how digital technologies can help transform societies into a nobler version of themselves, we have shown the importance that actions in multiple environments play to set off and catalyze broader change. We have placed our focus on multi-dimensional societal change processes that are prompted by actions that we located in economic, organizational, political, social and cultural environments. This conception, we believe provides a framework to analyze the evolutionary processes digital technologies prompt or fail to trigger in African societies. While the narratives accompanying digital technologies are indeed polarizing and almost dogmatic in nature, creating camps of techno-optimists and techno-pessimists — each placing emphasis on different realities — our hope is to motivate research that takes a closer look at the broader evolutionary dynamics that have been spurred by digital technologies and the particular lines of action, be they existing or absent, on the micro-level.

The motivation to introduce digital technologies in order to alleviate societal ills is indeed a noble agenda. One which we are in support of. Nevertheless, it is also important to consider intended and unintended consequences that their introduction spurs. In essence, digital technologies employed to solve an identified problem will create a host of new problems that, in turn, will be in need of renewed solutions (see, for example, Mann, 2017). These problems can in part be foreshadowed by looking at the pathologies of other societies in which digital transformation has progressed. The continued introduction of digital technologies also evokes the need to continuously observe the impact digital technologies have on prominent societal issues such as inequality and poverty. Just like with any other narrative, so it is, for example, also with the theme of inclusive innovation that suffers from rampant imaginaries — excessive production of visions and stories — as to what it can do for society without considering the other environments it depends on. The consequence? It is set on a path of sparking dissonances that arise from a divergence between societal expectations and actual developmental outcomes. Attention thus needs to be placed on how actions in the cultural environment can be translated into subsequent actions in the alteration and genesis of, for example, the political and economic environments.

What remains left for us in this article is an outlook into the future, a future that is by no means left uncontested and best understood by its variance and multiple, imaginable pathways. The plurality fuels vivid imaginations to historically situate, interpret and evaluate what it means when digital economies in Africa develop not only to national but also international relevance. This debate goes well beyond the issues that we, as management scholars, tend to speak to and feel comfortable making assertions about. It, however, demands attention and prompts us to ponder the broader context in which the excitement and efforts to bring Africa into the digital age play out. In other words, the history and imagined futures in which entrepreneurial activity, organizing and strategizing take place matter.

African philosophers and historians have made us aware of the unique complexities in which the idea of Africa was invented (Mudimbe, 1988) and keeps on existing which inevitably infuses the assessment of any novel economic phenomena with a portion of skepticism as to its consequences for Africa. More concretely, it brings an open question to the surface: What will be the effects of the digital transformation on Africa and its citizens?

The result of embarking on such a hypothetical journey is a set of different scenarios — Africa's digital futures — of which we will tease out three. The first depicts the idea that the emerging digital transformation becomes a pathway to reconnect post-colonial African societies to pre-colonial achievements of break-through scientific discoveries and technological advancements (see Asante, 2015; Van Sertima, 1991). In this scenario, African societies embrace the knowledge society as its ideal, and promote learning and the production of innovations, and thus continue to nourish the narrative that *the (global) future is indeed African*. The second scenario follows the idea that the digital transformation is a mere extension of Africa's colonial past well into the digital age in which African economies will continue to try to catch-up with dominant others. Existing pathological dependencies (Mann, 2017) are reproduced and remain dictated by powerful elites, multinational corporations and transnational agencies. *The future remains much like the past*. The third scenario sees the digital transformation in Africa and beyond as a pathway to work towards leaving

behind seemingly old paradigms to create an entirely new, globally entangled experience and resource pool. Here the use of technology and the democratization of information enables transnational innovation processes targeted at universal, grand challenges. *The future becomes inherently a global one.*

In our opinion, all these scenarios are already playing out — at the same time — and will continue to do so. Innovative technologies are created and adapted by engineers in Africa and deployed to national markets at unprecedented scale (Avle & Lindtner, 2016); simultaneously African startups are being turned into investment-ready vehicles following an imported script that sees success in the acquisition by crowded-in multinational companies and, in the same beat, African creators and users are involved in an emerging global cyber culture that seeks to transcend ideas of developing and developed, of North and South (Kaigwa, 2016). As much as this seeming messiness of interwoven and concurrent developments demonstrates the generativity of Africa's emerging digital transformation and has sets into motion vibrant economic activity in analog and digital markets, it is also an ideological undertaking that is at work on the very idea of Africa.

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Notes

1. Hereafter, we will employ solely the label digital technologies to reflect our focus on information and communications technology in the digital realm.
2. It is important to note that the figures provided here are calculated by the industry association GSMA that represents the interests of mobile operators. The data is descriptive and demonstrates above all a trend of mobile phone adoption and usage as well as internet penetration. The data, however, should not entice the reader to deduce statements on any economic development effects that the adoption of mobile phones may have had.
3. For comparison, the average for the rest of the world during the same time period was estimated at 90% with 56% of the populace having access to the internet.
4. The concept of institutional voids was initially developed to encapsulate the experience of managers at multinational corporations and as a way to discern why certain best practice strategies were rendered ineffective in emerging and frontier markets (Khanna & Palepu, 1997). The framework is grounded in the idea that key market institutions are either absent or operating inefficiently which in turn creates unique management challenges. Future iterations of the concept turned the idea on its head. Rather than thinking of voids as hurdles and problems for doing business, voids morphed into opportunities for growth and comparative advantage (Dhanaraj & Khanna, 2011).
5. Block chain technologies are mostly known for their application in bitcoin. Their use, however, has greatly expanded to transform how businesses operate through, for example, smart contract (see Iansiti and Lakhani (2017) for more information).
6. For example, contemporary academic work that contrasts narratives on Africa's digital transformation with the existence or nonexistence of economic development effects assumes a tight coupling between environments. This means that the 'Africa rising' narrative should produce measurable development outcomes and, therefore, a change event in a focal environment must catalyze a process in other environments. The dynamism inherent in societal change processes, however, permits a broad array of interdependency effects between environments of which time lags, and thus substantial delays, or even

backlashes, and the undoing of advances, are feasible. This should provoke an analysis of the conditions that give rise to the studied decoupling between narrative and economic output.

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