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Industry Performance and Digital Disruption: Unleashing Possibilities for the African Farmer

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Abstract. This study investigated digital maturity elements and possible disruptive technology platforms to test whether these elements contain the "secret recipe" for African farmers to gain access to markets and unleash their performance possibilities to alleviate poverty and increase the African farmer's income. To empirically test four research hypotheses, data was collected from a sample of registered farmers and co-ops in databases from ProAgri, PanGlobal and TLU, and analysed using SPSS and the Smart PLS statistical software. It became evident that the most important antecedents of digital maturity in the industry are cultural aspects as well as the technology capabilities and digital platform capabilities positively influenced digital organisational performance. Managerial implications of the research findings are discussed, and limitations and future research directions are indicated.

Keywords: Digitisation, digital disruption, African farmer, global markets, poverty alleviation, developing countries, organisational performance.

1 Introduction and Background of the Study

The nature of business has changed over the past decade and is changing at an accelerated pace. This is due to the rise in global markets, regulatory shifts, economic uncertainty, varying demographics, savvy customers and disruptive innovative technologies, (Karimi & Walter., 2015). In a digitally disrupted world, traditional channels and the control organisations have on these channels are becoming irrelevant. The internet has removed barriers to entry and niche markets are set to flourish (McKinsey, 2015) and organisations are prone to lag behind the innovation curve.

The organisation faces the dilemma of legacy processes, stability issues and low organisational performance, where customers are no longer loyal to their institution, but demand faster and better service at the click of a button (Standard Bank CEO, 2015).

Organisations must reinvent themselves to remain relevant and increase performance in the new digital era. The disruptive innovation strategies of organisations could be used as a trigger for new business ideas, especially in the developing world where entrepreneurship is a key enabler for such economies. Studies of organisational performance issues have shown that a research gap exists mainly in the management practice area, since they do not recognize the technology gap. Although the concept of "digitisation" and being 'digitally mature' (DQ™) are used interchangeably in this study, there is however a clear distinction between "digitisation" and "digitalisation" (Brennen and Kreiss, 2014). This study follows the general definition and broad concept of digitisation, which includes the concept of digitalisation and not explicitly only the conversion from analogue (Brennen & Kreiss, 2014).

Research interest has been growing about the digital dilemma organisations find themselves in. Organisations across the globe face the same dilemma of re-inventing themselves to fulfill the evermore demanding customer needs in the digital era, to become and remain more relevant in this context and deliver better and more sustainable results (Soat, 2015).

Statistics shows that companies with a higher Digital Maturity in the First Order Dynamic Capabilities (FODCAP), also called management capabilities, closely relate to better and sustainable financial success (Geigher, le Roux & Bothma, 2014; McKinsey and company, 2014).

In light of the above, this study focuses on ascertaining what factors will be impactful in the building of a digital platform towards a better performing organisation in the developing world and what will accelerate digitisation in the industry, to positively impact the performance of the African farmer

(Karimi & Walter, 2015). The customer or consumer universe is constantly changing to become more mobile and electronically social, they demand online and immediate access to information as well as fast and immediate responses to their needs (Milliot, 2015). Organisations must produce better results under challenging economic conditions and must be able to sustain the good performance, once achieved (McKinsey and company, 2014).

Disruptive Innovation Theory (DIT) is used to explain why organisations thrive or die in the digital era, in their response to disruptive innovations (Karimi & Walter, 2015).

This study aims to enhance the dimensions of DIT, with specific focus on the maturity required for first order dynamic capabilities (FODCAP), as defined for organisations in the developing world (McKinsey and Company, 2015). Digital Platform Capabilities (DPC) are also adapted as a core dimension that impacts organisational performance and revenue (Karimi & Walter, 2015, p.66).

Research suggests that first order dynamic capabilities of an organisation are positively associated with the building of digital platform capabilities which impact the performance of the organization in response to digital disruption (Karimi & Walter, 2015, p.39). The Internet and digitisation have changed industries and disruptive forces are powerful drivers "fuelling" this forceful and dramatic change (Wang, 2013). Like the morphogenesis paradigm, described by researchers such as Lakoff (1987) and Dockens (1979), where prediction of future outcomes is mathematically calculated, the genome theory clarifies the "genetic code" that already determines the digital disruptive outcome, five to ten years from now (Dockens, 1979). The innovative disruptive forces, fueled by cloud and mobile computing, changes in capabilities and workforce, digitised supply chain, digital consumers and compliance to global regulations, are determining the 2020 vision of running on 5G networks, zero distance connectivity, cloud enterprise infrastructure, with a potential of five billion mobile enabled users.

The vision is that the Internet of things (IoT) will automatically integrate machines, data and people. The digitisation of market access could also open the industry to international trade globally from anywhere on the continent, therefore alleviating poverty through online trade, according to Barrenechea (2002) and Jenkins (2006). An internal perspective on the organisation and readiness to respond to disruptive forces required more rigorous and focused research. A culture of innovation and technologies to support the changing workforce will be required (Wang, 2014). Growing regulatory and compliance pressures from the regulators in industries will require a new approach to information security, governance and strategies for enterprise information, all driven by the new internet users in the digital era (Karimi & Walter, 2015).

Industries such as agriculture are highly reliant on information and cannot survive without it in the new digital era. Continents where digitisation is immature will suffer a great deal to progress in an already digitised world and struggle to compete on an international scale. It was in India that Information Communications Technology (ICT) grew significantly to enable the farmers to gain access to information and improved significantly through an applied "management process framework", (Glendenning and Ficarelli, 2011).

The financial service industry and specifically the mobile banking functions are key factors in the supply chain of the agriculture industry. Foreign Direct Investment (FDI) flows into Africa with Angola being the largest recipient of more than $8.7bn in 2015 (World Investment Report, 2016). Predictions are that the FDI into Africa will increase by six percent per annum in the next year, from $55bn to $60bn (African Business, 2016). Another factor that is critical in the supply chain of the African agri-business is the training and education required to use technology and to transform small, medium and micro farmers' businesses (MSMEs) into commercially viable units. The Skills, Employability and Entrepreneurship Programme was launched in Rwanda with the African Development Bank and government, to address the countries skills requirements. The focus from the UN is to double the income of the women farmers and to create employable youth (African Business; 2016)

Organisations are competing against time and technology to be more competitive and to connect better and faster with the new digital customer for online and mobile banking (Potgieter, 2015). The banks in Africa also compete to gain access to the "unbanked" markets, such as the Micro and Small farmers on the continent. Information Communications Technology (ICT) and internet access grew significantly in developing countries such as India where farmers are receiving and sharing information, aiming to become more informed and productive, according to Glendenning and Ficarelli (2011). Mobile

banking on the African continent is an indication of connectivity and internet accessibility that positively impacts farmers.

1.1 Problem Statement

African farmers remain poor in a highly digitised age. The cultural aspects of the African farmer reflect the same traditional ways of working with similar outcomes as it seemed to have been the case in the iron age, 2000 years ago (SA History, 2017). These indigenous societies had great capacity for change and were politically, strategically, economically and technologically innovative, even before the colonial period (SAHO, 2017). Not a lot has changed since the Iron Age and farmers remain mostly poor, even in the digital age. The research problem this study intends to address is to find the "recipe" for African farmers to gain global market access in the digital era, to unleash possibilities to alleviate poverty on the African continent. The main problem is to understand the synergistic relationships between first order dynamic factors that will positively influence digital leadership capability and the digital platform capabilities that impact industry performance in developing countries, where farmers need to find innovative methods to survive and thrive.

2 Literature Review

The agriculture industry in Africa is responsive to the digital disruption and this is further investigated in terms of the digital platform capabilities (DPC) (Karimi & Walter, 2015). Through an increase in digital performance, organizations will grow their businesses through allocation of resources to innovation projects. These projects increase the company's competitive positioning through using the digital products (DP) for example mobile banking in the banking industry (Anthony, Johnson and Sinfield, 2007). Dynamic Capabilities are meant to establish new competitive advantage for a firm, these capabilities would change the production process, the scale, the product and the market. These new product developments are an illustration of first order dynamic capabilities (FODCAP) which are referring to the firm's capacity to renew competences such as innovation (Zaidi & Othman, 2011). Digital capabilities have an overall positive effect on the overall total revenue returns to shareholders of a company due to its increase in product development and innovations relied on to plan, make decisions, draft strategies for the future and control the operations of the supply chain in such a way that profit will be unleashed. (Lee & Wang, 2016). Relevant information from suppliers, such as accurate information on demand levels, organisation will be able to project how much is desired, produce in time, making it possible to deliver on time and eliminate the bullwhip effect and create a good supply chain with good performance.

3 Hypothesis

Based on the literature, a conceptual model (Figure 1) is proposed.
H1: Digital platform capabilities have a positive relationship with digital products
H2: First order dynamic capabilities have a positive relationship with digital platform capabilities
H3: First order dynamic capabilities have a positive relationship with digital products
H4: First order dynamic capabilities have a positive relationship with total revenue returns to shareholders

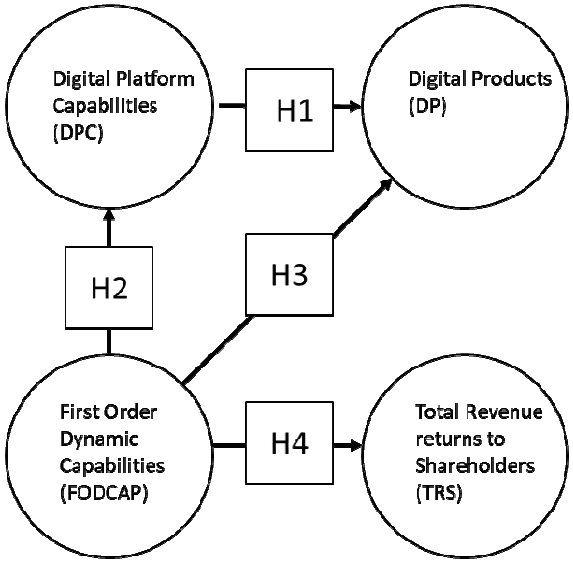

Figure 1. Conceptual model

4 Research Methodology

Using simple random (probability) sampling a sample of 272 managers in the banking and Agriculture industry were selected. All these managers were on the Outlook Address Book in the organisation and could be reached through an online email and link to the online questionnaire, linked to an internal database. The size of the sample was representative and adequate to address the aim of the study (Schumann, Scott and Anderson, 2014).

4.1 Questionnaire Design

The measurement instrument was structured into six sections, five measured the maturity and platform capabilities about digitization, and the other required the respondents to complete information about their business in the context of the industry. Section B measured the culture aspects of digitisation, Section C measured strategy, D measured capabilities and E measured the organisation as a critical dimension of digitisation. The last section, Section F, measured the correlation between maturity and financial performance. Adaptations to the instrument were made according to the principles described about the context of the study, as well as the purpose to measure the digital aspects that could lead to the unleashing of possibilities and a new framework for the African farmer (Fagarasanu & Kumar, 2002, p.356). Section B measured the culture in relation to risk appetite, willingness to learn to use digital methodologies, the execution of digital initiatives collaboration and vision for a high performing culture and partnering to use and develop digital capabilities. Section C measured the strategic aspects of the industry participants, where the link to the digital strategy for the industry is evaluated, if an orientation with the longer-term objectives about digitisation exists and if the participant will be able to service their customer's needs through digital platforms. Section D investigated the capabilities that exist or that are known to the respondents. This section included the measurement of automation capabilities, what content is online and used by the participants, whether decisions are being made from using digital platforms and information from the web, as well as whether data is being analysed and stored electronically, whether digital is used for connecting with customers, and what technologies are used and how digital disruptive technology will be adopted. Section E measured the people, processes in the participating industry, the structure of the industry and the understanding of the participants about the structure. Section F measured the financial performance, and profiles the responding farmer or agri-organisation.

The research instrument design was tested among a convenience sample (Sekaran, 2003) of managers selected from the Global Address List (n-300). The purpose was determining if they could answer the

online questionnaire in full to test the hypothesis H1 to H5 as well as the Digital Quotient, Revised RPV framework, Organisational Performance outcomes and Conceptual Model (Johnson & Onwuegbuzie, 2004).

4.2 Sampling

Random sampling was used and the amended instrument link (Google Docs) was sent to all the members on the Global Address List database. Qualitative purposeful sampling (Johnson and Christen, 2008) was conducted through semi structured interviews (n=5), to test the value of the model with the researched population (Berndt and Petzer, 2013). The instrument was further amended and phase two were repeated to the target population, to conclude the research study as illustrated in the next sections.

The final sample was selected through the profiling of the respondents on Geography (South, Middle, West, East, North Africa) and Industry, Agriculture against other industries. The number of entries profiled in the raw data responses were (n=434). The sample was obtained from WhatsApp Groups (PanGlobal), Agri subscription databases as well as the Agri exchange platform called WTX.world. The researcher also created awareness and interest in the study through a radio interview with ProAgri and the questionnaire link was sent to the ProAgri newsletter and magazine subscribers. The researcher also approached Afgri for distribution of the link to their customer base and agents.

4.3 Data Analysis

Structural equation modeling (SEM) approach using Smart (PLS) statistical software was used to test the posited hypotheses in the conceptual research model (Ringle, Wende & Will, 2005). According to Liljander, Polsa and van Riel (2009), PLS is a prediction-oriented, variance-based approach to SEM, premised on very few assumptions about the distribution of the variables. Furthermore, Smart PLS requires relatively few observations, unlike the more traditional Maximum Likelihood (ML) SEM techniques such as LISREL (Joreskog & Sorbom, 1989) and AMOS (Byrne, 2013).

5 Measurement Model

Reliability was mainly checked using Composite Reliability (CR) and Cronbach's alpha value. To ensure convergent validity, items loaded on their respective (a priori) constructs were checked if their loadings were greater than 0.5, while discriminant validity was checked by Average Variance Extracted (AVE) value and ensuring that there was no significant inter-research variables cross-loadings (Chin, 1998). Smart PLS performed a Confirmatory Factor Analysis (CFA) while estimating the structural equation model (SEM). The CFA results are reported in Table 1 and Figure 2, while the SEM results are presented in Table 2 and Figure 2.

Proceeding from the discussion of Cronbach's Alpha, the literature asserts that a higher level of Cronbach's coefficient alpha indicates a higher reliability of the measurement scale (Chinomona 2011). It is evident from the results in Table 1 that the Cronbach's Alpha value for each research constructs ranges from 0.651 to 0.823, so reliability is indicated. Furthermore, the item to total values ranged from 0.566 to 0.762, which are above the cut-off point of 0.5 as advised by Dunn, Seaker and Waller (1994). Since a Composite Reliability index that is greater than 0.7 signifies sufficient internal consistency of the construct (Nunnally 1967), the results in Table 1 (0.746 to 0.871), confirm the existence of internal reliability for all constructs of the study. Apart from assessing the convergent validity of items through checking correlations in the item-total index (Nusair et al. 2010), factor loadings were also examined in order to identify convergent validity of measurement items as recommended by Sarstedt et al. (2014). The literature maintains that a loading that is above 0.5 signifies convergent validity (Anderson et al. 1988). Table 1 shows that the final items loaded well on their respective constructs with the values ranging from 0.585- 0.893, thus confirming good convergent validity where the items are explaining more than 59% of their respective constructs. The results of AVE in Table1 range from 0.424 to 0.687, which authenticate good representation of the latent construct by the items (Sarstedt et al. 2014; Fornell et al. 1981; Fraering & Minor 2006).

Table 1. Summary of measurement accuracy statistics

Research constructs	PLS code item	Test Item-Total correlation values	Cronbach's α value	CR value	AVE value	HS V	Factor loadings
Digital platform capabilities	DPC1	0.566	0.651	0.746	0.424	0.218	0.585
	DPC2	0.694					0.657
	DPC4	0.660					0.699
	DPC6	0.731					0.659
Digital products	DP4	0.762	0.673	0.803	0.506	0.288	0.712
	DP5	0.671					0.657
	DP6	0.648					0.715
	DP7	0.660					0.756
First order dynamic capabilities	FODCAP6	0.731	0.656	0.813	0.687	0.224	0.758
	FODCAP7	0.762					0.893
Total revenue returns to shareholders	TRS1	0.771	0.823	0.871	0.531	0.224	0.686
	TRS2	0.745					0.757
	TRS3	0.723					0.671
	TRS5	0.717					0.731
	TRS6	0.606					0.770
	TRS7	0.694					0.751

Note: DPC = Digital platform capabilities; DP = Digital products; FODCAP = First order dynamic capabilities; TRS = Total revenue returns to shareholders
SD= Standard Deviation; CR= Composite Reliability; AVE= Average Variance Extracted; HSV= Highest Shared Variance

Table 2 also reflects that the inter-correlation values for all paired latent variables are less than 1.0, therefore indicating the existence of discriminant validity (Brown & Cudeck, 1993).

Table 2. Inter-construct correlation matrix

	Digital platform capabilities	Digital products	First order dynamic capabilities	Total revenue returns to shareholders
Digital platform capabilities	1.000			
Digital products	**0.373**	1.000		
First order dynamic capabilities	0.418	0.537	1.000	
Total revenue returns to shareholders	0.467	**0.430**	**0.473**	1.000

5.1 Model Fit

Assessment of the goodness of fit (GoF)

The overall R^2 for digital platform capabilities, digital products, and total revenue returns to shareholders in Figure 2, indicate that the research model explains 18%, 39%, and 26% respectively of the variance in the endogenous variables. Following formulae provided by Tenenhaus, Vinzi, Chatelin & Lauro, (2005), the global goodness-of-fit (GoF) statistic for the research model was calculated using the equation:

$$\begin{aligned}\text{Goodness of Fit} &= 2\sqrt{\text{average of all AVEs values} \times \text{average of all R2}} \\ &= 2\sqrt{0.537 \times 0.275} \\ &= 0.38\end{aligned}$$

where AVE represent the average of all AVE values for the research variables while R^2 represents the average of all R^2 values in the full path model the calculated global goodness of fit (GoF) is 0.57, which exceed the threshold of GoF > 0.36 suggested by Wetzels, Odekerken-Schröder & van Oppen (2009). Therefore, it could be concluded that the research model has a good overall fit.

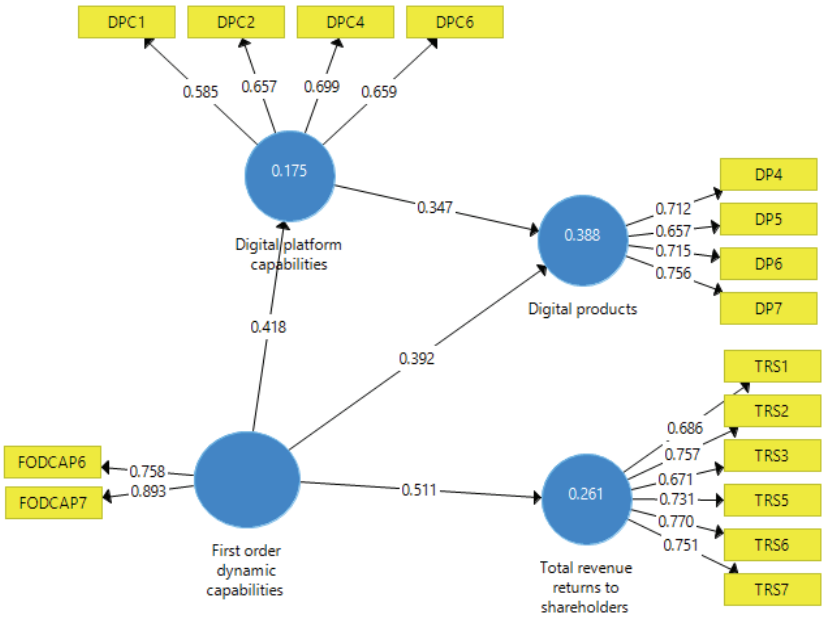

Figure 2. Structural model

Table 3. Results of structural equation model analysis

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Digital platform capabilities -> Digital products	0.347	0.350	0.048	7.213	0.000
First order dynamic capabilities -> Digital platform capabilities	0.418	0.422	0.040	10.375	0.000
First order dynamic capabilities -> Digital products	0.392	0.393	0.047	8.332	0.000
First order dynamic capabilities -> Total revenue returns to shareholders	0.511	0.514	0.036	14.152	0.000

5.2 Outcome of Hypotheses Testing

The outcome of hypotheses tests was determined by the path coefficient values as well as the t-values for the structural model obtained from the bootstrapping algorithm. Two-tailed t-tests were conducted at the five percent significance level (Beneke and Blampied, 2012).

Hypotheses 1: ***The relationship between Digital Platform Capabilities and Digital Products***

Figure 2 and Table 3 above, indicate that H1, is supported (β = 0.347) and the relationship is significant at t -statistics 7.213. This implies that digital platform capabilities are positively related to digital products in a significant way. Literature about Digital Platform Capabilities revealed that the foundation for new Digital Products lies in the Platform Capabilities of the organisation which provide new standards, rules and new value networks, where products and services of the organisation are used across networks and no longer only within the organisation's eco system (Meyer and Lehnerd, 1997; Gimpel and Westerman, 2012; Mantena and Saha, 2012). Here was where the Digital Strategy played a significant role where different digital platforms may render different Digital Products (Kichner, 2005, 2011; Karimi et al, 2015).

Hypotheses 2: ***The relationship between First Order Dynamic Capabilities and Digital Platform Capabilities***

H2 is significantly supported since the t-statistics is 10.375. The strength of the relationship is indicated by the path coefficient of 0.418, which suggests that first order dynamic capabilities has a direct strong positive effect on digital platform capabilities. Literature supported that a more mature FODCAP dimension of the framework could positively impact the Digital Platform Capabilities and Organisational Performance (O'Reilly and Pfeffer, 2000). FODCAP consists of four elements measured in this study; Culture, Strategy, Capabilities – Digital Infrastructure and Platforms as well as the access to these and Organisation, consisting of talent and execution (McKinsey, 2015). Digital Maturity as an outcome (DQ™) is well researched by McKinsey and Company across the globe in different industries and at the time of the study, excluded Agriculture. FODCAP is used in the framework to test the impact it had on Digital Platform Capabilities and to investigate the organisations digital readiness. (Digital readiness was compared to the "computer is a clock" theory from Paul Ford, 2015 – to illustrate that FODCAP requires all the elements tested in the framework.

Hypotheses 3: ***The relationship between First Order Dynamic Capabilities and Digital Products***

Figure 2 (and Table 3) reveal that H3 is supported significantly, since the t-statistics is 8.332. The strength of the relationship is indicated by the path coefficient of 0.392. This finding suggests that first order dynamic capabilities have a positive effect on digital products and the significance level is strong. Literature revealed that the foundation for new Digital Products lies in the Platform Capabilities (Meyer et al, 1997). It was also posited by Anthony, Johnson and Sinfield (2007), that that Companies can increase digital performance and grow their business through the allocation of resource to innovate projects. These projects aimed to increase the competitive positioning of the organisation through Digital Products (DP), such as Mobile Banking. Drnevich and Kriauciunas (2011) posited that dynamic capabilities contribute towards better digital performance and returns to shareholders in organisations.

Hypotheses 4: ***The relationship between First order dynamic capabilities and total revenue returns to shareholders***

H4 is also supported significantly, since the t-statistics is 14.152. The strength of the relationship is indicated by the path coefficient of 0.511. This finding suggests that first order dynamic capabilities have a positive and a significant effect on total revenue returns to shareholders. The Literature about TRS (Total Revenue to Shareholders) indicates the push from Shareholders to increase the Total revenue of Shareholders and this this dimension is linked to FODCAP of the organisation as can be seen in the example of the very fast growing and increasing level of digital maturity of Capitec Bank (Blumberg et al., 2015; p. 17; 21). Companies with higher DQ™ perform better as shown in the key financial metrices. The five-year TRS % of 46 publicly listed companies in the McKinsey report of 2015 showed a three-year growth factor of 42% and a five-year growth factor of 18%.

Hypotheses 5: ***FODCAP needs revision and maturity or will deliver poor performance results. A revised RPV(Resources-Process-Values) framework is needed for this industry.***

Disruptive technology is described as a technology that "changes the basis of competition by changing the performance metrics of the competing parties" (Christensen, 2006). A revised framework is needed to lead the farmer or institution into the digital world through simple steps towards digital maturity. The RPV looks at all kinds of companies that can be impacted by technology innovation changes (Neusa Hirota, 2016). The revised RPV framework (FODCAP) is proposed to be named the "Digital Performance Capability" framework for with a focus on the cultural and managerial philosophy and practice improvements (as per the research findings in questions and interviews).

6 Overall Implications and Contributions

An industry such as the agriculture industry can now use the results and strategise the way forward to develop initiatives that can improve the industry and unleash the opportunities in developing countries.

The study also pointed out the areas, on an industrial level, that need attention to unleash opportunities for the business owner. This framework can then be used to focus on areas that need special attention for opportunity growth.

This framework is a significant contribution towards the existing body of knowledge of management practices in digitisation in the agriculture industry, with a consolidation of the elements and frameworks that add to the digital mastery practices. Thus, academics can used the framework to develop and test

models across industries, even though in this study, the framework was developed in the agriculture industry. This contribution should unleash the opportunities for better performance through the accessibility to global markets to possibly double the income of the African farmer.

7 Suggestions for Future Research

This study should be conducted over a longer period and on more industries, and the framework should be refined further. The element that needs further research is the category of data capability. A new study can be conducted about data and the conversion of data and information into knowledge that should lead to better performance.

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