DATA-DRIVEN ENTERPRISES IN AFRICA

- An Evaluation of Winners and Losers

CSEA
CENTRE FOR THE STUDY OF
THE ECONOMIES OF AFRICA

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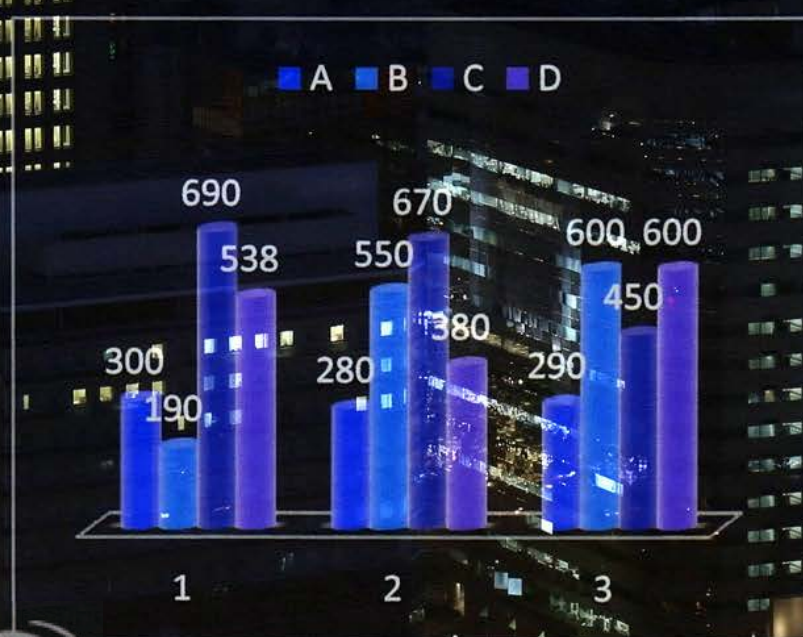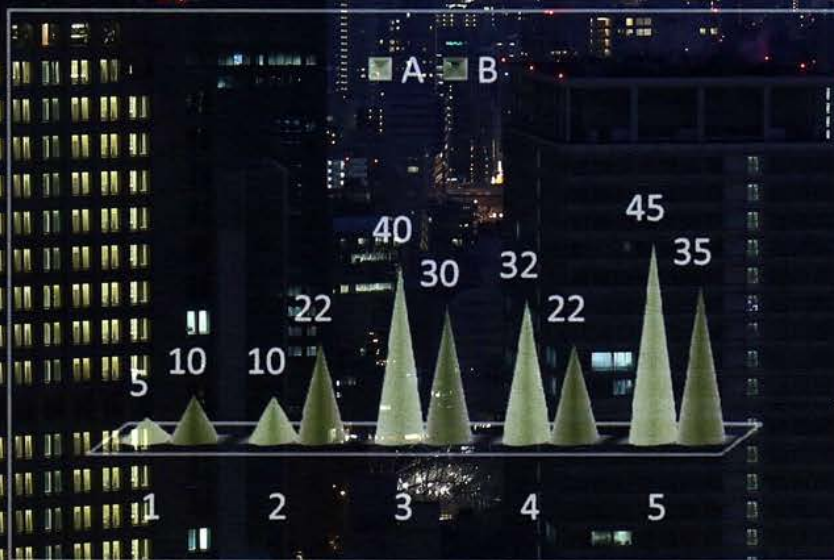
EXECUTIVE SUMMARY

This report provides insights on the status quo of data analytics in data-driven enterprises in Africa's digital economy. Data-Driven enterprises refer to, broadly speaking, firms that adopt a business approach of using insights from data analysis to create business value or improve processes. In this regard, the focus of this report is the indigenous businesses in the private sector in Africa.

This report identified that data analytics in indigenous firms in Africa is in its nascent stages. Hence, it would be far-fetched to say that one industry or sector has taken a differential leadership. It looks promising in sectors like manufacturing (distribution), health, agriculture, and online platforms like social media, with enterprises deriving economic and symbolic value from data analytics. Likewise, the growing need to innovate around data in these industries and the proliferation of automated tools and applications have made data analytics more friendly to indigenous firms. Technically, a combination of proprietary (e.g. Salesforce), open-source applications (Open Data ToolKit), bespoke applications (Rx Insurance), and social media analytic applications are used in data-driven activities among indigenous firms in Africa. These data-driven activities among indigenous firms tend to be often directly or indirectly enabled by the quest of multinational companies, who seek to mutually maximise their value-generating activities as their business partners or collaborators. Thus, these multinational companies or institutions play a key role in creating awareness of the value of data and providing the motivation, and sometimes the technical and human resources, to enable indigenous firms to develop data analytics capabilities.

However, despite the promise, this growth is stifled by the scarcity of skilled personnel and expertise, coupled with a missing link in collaboration between industry and academia, limited formal educational training opportunities, lack of a proper enabling environment for the practice of data analytics, lack of awareness or limited knowledge on the value of data analytics in these firms and the government, weaknesses in our data governance institutions (not much done in monitoring and advocacy), generally limited resources to IT investment in indigenous firms, and lack of a national drive for data analytics in many countries of the Africa Sub-region.

As a result, the convenience and way data are collected and handled leaves room for possible exploitation. Additionally, while national data governance strategy and regulatory frameworks are increasingly developing across Africa, they have primarily been slow due to considerable policy gaps.

Executive Summary...continued

The fact is that indigenous firms are still struggling to manage resources to invest in basic IT infrastructure. Hence data analytics adoption, which requires both human personnel and technical infrastructure, is often yet to be strategically considered, shelved for the future, or even when outsourced, it is often poorly managed and under-resourced. Others are also driven by the visibility and immediacy of results or value, which is not a characteristic of data analytics. Data analytics often requires a more intentional strategic alignment to business processes, and otherwise, its value may not be realised.

Further, for innovation to occur, data analytics processes must be sustainable. It is often a long-term value realisation activity, which many indigenous firms tend to shy away from due to limited resources and understanding.

The report argues for the need to enhance data analytics use at the national and regional levels. It proposes fifteen recommendations for creating an all-inclusive enabling environment for indigenous businesses. These recommendations are categorised into three:
- Awareness (educational curriculum development, academia and industry collaboration, and enhancing women's participation in the data economy);
- Accessibility (incentivising stakeholders to collaborate and integrate efforts and establishing common open data banks within countries and across countries);
- Adoption (institutionalising a data culture).

We also advocate that for Africa to realise the value of data analytics, data stakeholders (governments, the private sector, and the international development institutions) need to set an agenda to strengthen institutions that regulate data enterprises and create the right or appropriate technical model for channelling and sharing data within agreed ethical principles and legal mechanisms. Likewise, it is necessary to increase the readiness of indigenous businesses (awareness and enabling resources) for data analytics in order to drive uptake and expansion of the digital economy. Notably, significant data policy gaps exist across countries in the sub-region, coupled with Africa's lack of institutional capacity to enable a well-functioning data analytics adoption and usage environment. Therefore, regional efforts and multi-stakeholder participation are required to address these relatively persistent constraints. However, though regional efforts are prime, these constraints tend to send a caution that African governments, the private sector, and development agencies have to be realistic and measured in seeking a data-driven agenda. It could take more time and more effort to achieve substantial gains across the entire continent.

TABLE OF CONTENTS

DEFINITIONS

Data — refers to numbers, words, or images that have yet to be organised or analysed to answer a specific question. Depending on the nature of data, the format and method in which it is presented or collected may differ [i].

Data Analytics — refers to techniques and processes used on large volumes of data/or high-velocity data to draw insights from it over time [ii].

Data Governance — rules and policies on how data production and flow are governed locally and when interacting with the rest of the world. It also includes processes that enable, guide, and make market participants accountable for how data is collected and used to generate insights, stored, shared and protected, and establishing regulators to enforce these laws [iii].

Data-Driven Enterprises — refer to firms that adopt a business approach of using insights from data analysis to create business value or improve processes [iv].

Data Policies — refers to a set of broad, high-level principles that form the guiding framework for managing data assets — the management includes data interoperability and standards, data quality, data protection, and information security [v].

Digital Economy — refers to an economy where economic activities, commercial transactions, and professional interactions are enabled by data using digital technologies [vi].

[i] Introduction to Data Analysis Handbook
[ii] Data Analytics - An Information Resource for IFAC Members
[iii] Strengthening Data Governance in Africa
[iv] The Data-driven Enterprise of 2025
[v] The Principles of Good Data Management
[vi] Defining, Conceptualising and Measuring the Digital Economy

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PART 1

Data-Driven Enterprises in Africa – Where We Are

1.1 INTRODUCTION

Developing trends in the twenty-first century have shaped data production, analysis, and management for significant and long-term corporate growth [1]. These have been underpinned by the tremendous diffusion rate of digital tools and technologies, coupled with the increased speed in internet connection and penetration across the African sub-region [2]. Meanwhile, an assessment of the status-quo of enterprises in Africa in terms of efforts to ensure proper data governance whiles deriving value from it has largely been ignored by focusing solely on value outcomes. We define data governance as the standards and rules that regulate data collection and consumption to manage data availability, accessibility, integrity, and security in an organisation's information systems [3]. Thus, data governance sets the rules of engagement that management will follow as the organisation uses data [4].

Arguably, only a few developing countries in the African sub-region have made a conscious effort to monitor and regulate the huge amount of data that firms harvest, leaving room for the possible exploitation of such data [5]. National efforts and domestic legal frameworks on data governance are gradually increasing in Africa, although rather slowly as there are still significant policy gaps [5]. While the magnitude of the data policy gaps varies across different member countries, African countries have so far largely been unable to match the pace of change in the new data-driven global economy [5]. There is also a lack of uniformity in policy approaches being adopted by member states [5]. An equally disturbing observation is the inadequacy of implementation strategies in place; there is a general deficit in institutional capacity to support a well-functioning data governance environment in Africa [5]. Countries such as Nigeria, Kenya, Cote d'Ivoire, and Ghana are among the countries in this group with scarce data on which to gauge development. Governments in these countries are also burdened with IT regulation, especially with new digital technologies (4G, 5G, and the Internet of Things), post-COVID-19 challenges, and cybercrime, while still working to narrow the digital divide and ensure digital inclusion.

As the world moves inexorably towards the Fourth Industrial Revolution and a knowledge society based on the data economy, Africa cannot afford to fall behind. Continuing with business-as-usual means that Africa's economy will miss the wave, and the gap with economies that effectively use the value of data will widen [6].

In view of the above, the objectives of the study are to:
1. Identify the sectors that are gaining or 'winners' in the data-driven agenda and the value being obtained by the 'winners';
2. Determine critical enablers of the 'winners';
3. Determine the factors hindering data-driven transformation of African businesses;
4. Determine data-related regulations and processes that support indigenous business expansion in the digital;
5. Identify how better data governance can help to resolve any identified digital and data inequalities; and
6. Make recommendations for the future regarding the constraints.

This report shows how far firms in the African sub-region have come in terms of deriving value from data analytics and the current gaps in harnessing the full potential for the data that these firms produce. Based on our findings, we propose recommendations to support the uptake of data analytics among indigenous businesses in Africa.

Notwithstanding, it is evident in Figure 1 that, though firms in the fintech sector by far lead technology companies that generate and use data, there is also evidence of an appreciable uptake by firms in health and biotech, logistics, education, cleantech, and agrictech. With this level of penetration, this report is, therefore, opportune to generate an understanding of how indigenous businesses (non-tech firms) in some of these sectors are leveraging data.

Hence, the findings in this report make two significant contributions. First, to establish examples of the sectoral efforts towards data analytics in Africa while detailing enablers and constraining factors. Second, to propose recommendations for creating the enabling environment for the uptake of data analytics among indigenous firms in Africa. Concerning data governance, the need for such recommendations has been proposed in recent research to deal with the possible exploitation of data [7].

Figure 1. Technology Companies by Sectors on How They Generate Data and Use Data
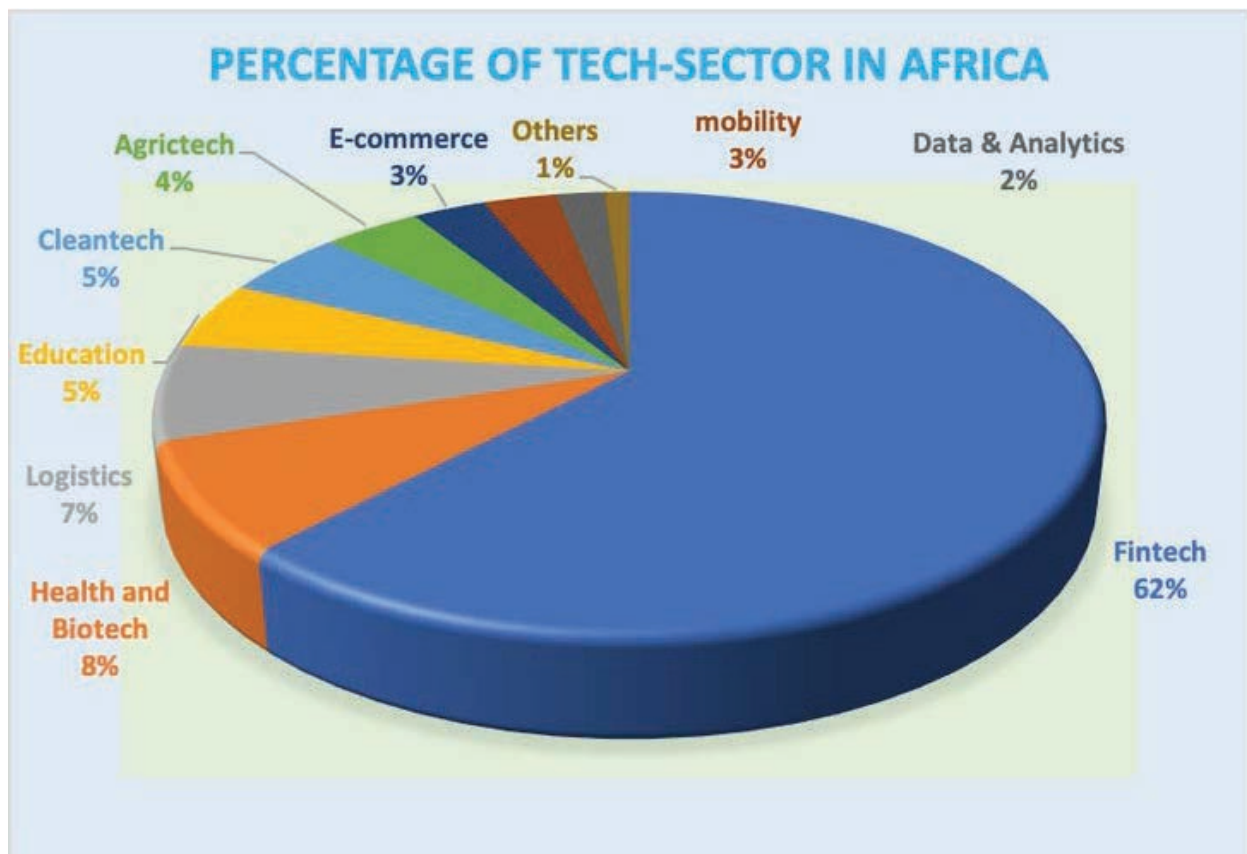
This report comprises three parts, beginning with the first part, which highlights the progress of data-driven enterprises in a cross-section of economic sectors in Africa. The second part unearths the existing gaps and how they affect the business landscape and stakeholders' expectations of data governance and regulations. The third and final part provides directions for the next steps, focusing on the regional agenda for building and governing data-driven enterprises in Africa. This concluding section also suggests a set of recommendations to create an enabling environment for a data-driven agenda in Africa's digital economy.

1.2 CASE STUDIES FROM SELECTED ECONOMIC SECTORS IN THE AFRICAN SUB-REGION

This section presents the experiences and views of experts from four economic sectors in the African sub-region regarding the status of data usage and governance among data enterprises in Africa, the gaps that exist and how it affects the business landscape, and their expectations on data governance and data regulations.

Emerging technology is having a significant impact on Africa's security and stability. However, the final legacy of the digital revolution would be determined not by technology, but by how it is used. African countries that capitalise on rising technology's benefits and mitigate its threats may attain greater peace and prosperity. According to the Centre for the Study of the Economies of Africa (CSEA)'s Digital Preparedness Index in Africa (Figure 2), only 36 (out of 54) countries are reported. Mauritius is the best prepared in digitalisation in Africa, followed by Seychelles with a digital preparedness index of 0.66 and 0.63 respectively. However, Chad followed by Mozambique are the least prepared countries digitally in Africa with the index at 0.32 and 0.35 respectively. If Africa is going to benefit substantially from the digital economy and thus, the data economy, then significant intentional regional efforts have to be established to improve the preparedness of less prepared countries.

Figure 2. Infographic on the Digital Preparedness Index in Africa
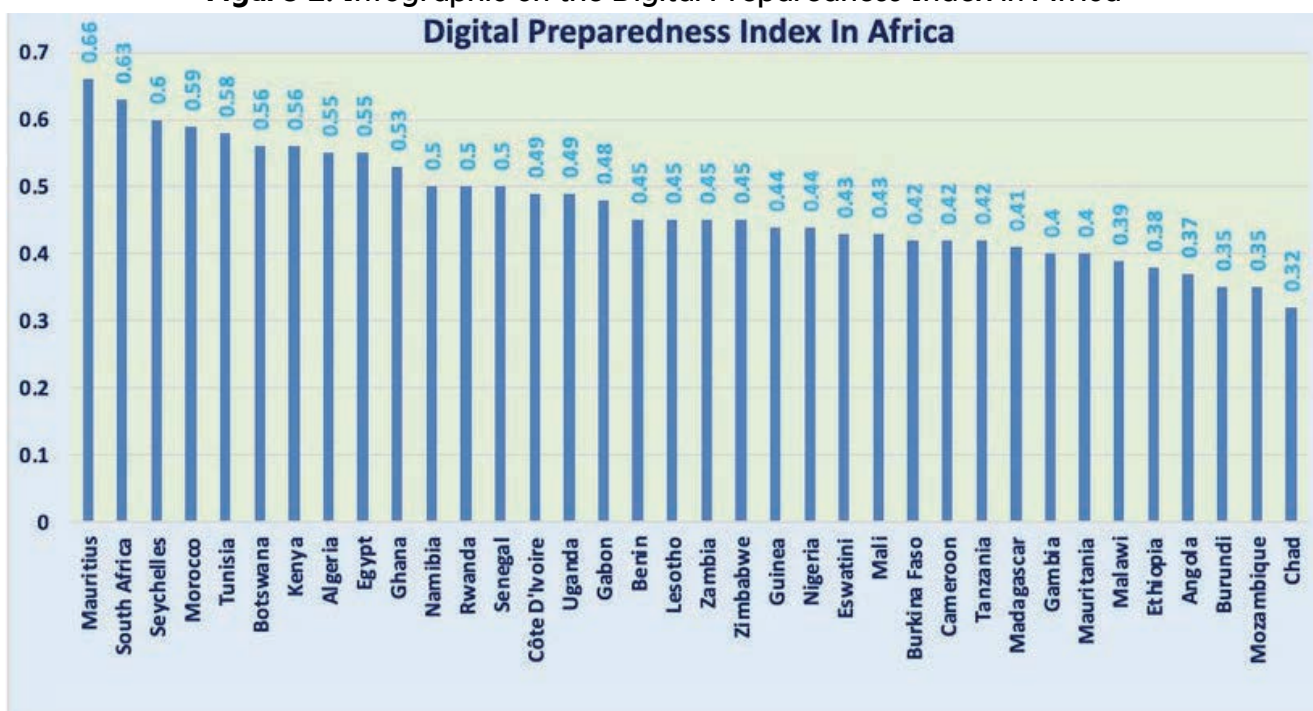
Source: Centre for the Studies of Economics of Africa [9]

The selection criteria for the case businesses for this study were:

1. An indigenous African business which is actively leveraging data analytics to innovate its business processes and create value or a business which is enabling African businesses to do the same;
2. The activities of the African business should span across Africa (at least three countries); and
3. There should be access to evidence which enables the assessment of the objectives of the study — an account of how data analytics is being innovatively used and the challenges in doing so.

As a result, case studies from the economic sectors and digital economy presented in this section include manufacturing (distribution), agriculture, healthcare, and social media. These sectors tend to matter because of the following:

Manufacturing (Distribution) — Wholesale and distribution are important components of many economies worldwide. The movement of goods is a crucial part of the supply chain — and data analytics play a key role in this. It is not worth manufacturing a good product if it cannot get to the right retailer (or other business customers) at the right time. However, the leverage of data analytics to improve profit margins, low sales figures, and high inventory costs are the most common issues businesses face in the wholesale distribution sector in Africa. Many indigenous businesses in this sector rely on traditional approaches that do not assure success. Therefore, a focus on attention in this area in the African Sub-region is worthwhile.

Agriculture — Currently, data analytics is transforming agriculture, one of the oldest human activities. With the world population expected to reach more than nine billion by the year 2050, The Food and Agriculture Organisation (FAO) predicts a 70 per cent growth in agricultural output will be needed to serve the projected demand for food security globally. With this threat of food security knocking on the doors of most regions globally, especially those in low-income earning regions, African countries need to start using non-traditional data sources to make informed decisions to meet the projected demand for food security in the agricultural value chain.

This driving force has greatly increased the interest in and utilisation of data analytics in the agricultural sector through modern digital technologies that continuously monitor the physical environment, producing large quantities of data at an unprecedented pace [10].

Healthcare Insurance — To achieve the Sustainable Development Goal targets of universal health coverage and reducing maternal mortality, many countries in the African Sub-region have implemented health insurance policies over the last two decades [11]. Since the healthcare sector continues to produce large amounts of heterogeneous medical data available in various healthcare organisations (payers, providers, pharmaceuticals), governments' policies focus on universal health coverage, increasing household incomes due to improved economic activity, and favourable demographic trends to drive market growth. However, the proper management of healthcare insurance to avert challenges (e.g. fraud) confronting the sector has been identified as a major hindrance facing health insurance providers in the region. This situation not only depletes the bottom-line performance of most healthcare organisations but also curtails potential growth, making the cost of providing health insurance high and beyond the reach of many [12]. Adopting and applying data analytics solutions would help address the challenge and allow developing countries to progress toward universal health coverage. Notably, there has also been the need to pay critical attention to the regulation of the creation and use of healthcare information as it is a matter of special concern to governments as well as other public bodies involved in the field of healthcare. Countries in the sub-region have thus made moves towards evolving a legal framework that can address the new issues arising from the use of information technology in the healthcare sector.

Social Media — With so much consumer data being posted on social media every day, social analytics tools have become critical in audience analysis, competitive research, and product research. In this sense, businesses can take advantage of the many data generated by social media platforms. However, the lack of awareness of the various capabilities of the social media analytics tools and the unstructured nature of the data generated by social media analytics are the biggest challenges in Africa's social media analytics market. Therefore, a focus on attention in this area in the African Sub-region is worthwhile, as social media activities remain prone to online vices such as digital theft and cybercrime, among others.
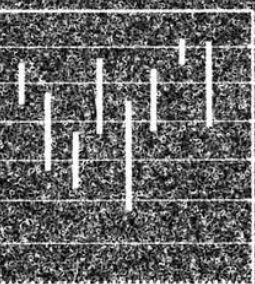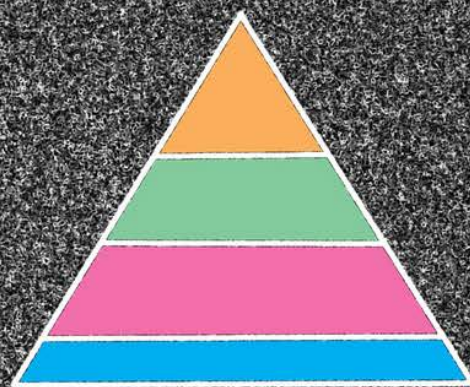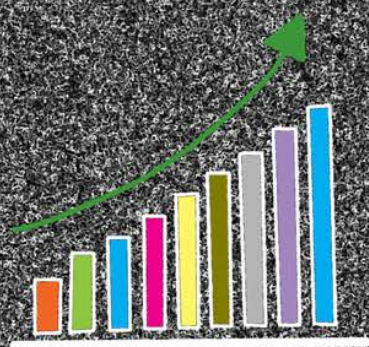
1.2.1
EVIDENCE FROM THE MANUFACTURING (DISTRIBUTION) SECTOR

In this section, we present the case of PZ Cussons. This multinational firm manufactures premium homecare products, personal care, nutrition, and electrical products with locations across Africa. The company works with distributors — indigenous businesses modelled to become data-driven enterprises. In Africa, the data-driven agenda of PZ started over a decade ago (2009), with a focus on Ghana. However, in 2013 and 2014, that agenda became even more central in the firm's operations as it resorted to the automation and digitising of most of its operational processes.

Nature of Analytics and Technologies Deployed

The company started to profile all customer outlets in Africa, starting with Ghana. To that end, there was a need for partnerships with distributors who engage the customer outlets. Over the years, production was done without recourse to market demand because data from distributors was not accurate and sometimes not available. However, to drive demand and sales, every single item sold had to be known, glimpsing the need to create an Insights Department, which has data managers who make informed decisions based on the analytics from the data collected by the distributors from their customer's outlets. PZ deployed technologies and systems to ensure that its aim of building data-driven distributor enterprises became institutionalised and a reality. These include an outreach system — a mobile application-based platform integrated with enterprise resource planning (ERP) software, Salesforce, at the head office of PZ Cussons. In addition, distributors also have an ERP at their offices to track their opening stock, stock in transit, and closing stock. These ERPs have business intelligence capabilities to inform decision-making even for the distributors [13]. The mobile version of the ERP has GPS capability to track the locations of their sales vans as they move around and distribute to wholesalers and retailers. Distributor activities can also be monitored at salesman and distributor levels, while distributors can also know salesman records. This solution provides three levels of systems that have been deployed: (1) The central system at head office, (2) The distributor's interface to monitor the activities of the salesman, and (3) The salesman's application/or interface, which is the mobile App version. The deployment of a mobile App version is not surprising as mobile applications (apps) are increasingly becoming more and more useful for companies in their operations [14] and support a wide range of information services that can be accessed anytime and from (almost) anywhere [15].

Distributors who are the direct customers of PZ Cussons are trained on how to sell and run insights and reporting from these systems. The insights include descriptive analytics of sale transactions and the routes or locations where sales are happening (diagnostic). Based on the outlets on the routes, the system can tell which route is generating the most sales and why it is so. Descriptive and diagnostics analytics happen at the distributor side. In contrast, the Head Office predicts the sales operation process on the demand and supply, and even for specific locations where sales are most profitable for the distributor. In this way, the forecast for income generation is fed.

Critical Drivers and Enablers for Deriving Value

To realise the data value to the enterprise, the firm capitalises on assets, capabilities, and partnerships. Regarding assets, the company sells to distributors on credit which was one of the enabling factors used by PZ to get not just existing enterprises to accept the data-driven business model but also got them to enrol more distributors into their customer base. Through credit buying, the businesses can manage their credits and indirectly learn about their stock and data, including finances. They found the knowledge addition from data analytics essential for joining PZ. Other gamification activities also attract distributors — these include rewards schemes from using the business analytics system. In the expert's parlance during the interview, "This system opened the eyes of the distributors."

To be a data-driven enterprise, a distributor needs to acquire the assets to enable the enterprise to use the solution. As pre-conditions of becoming a PZ distributor affiliate, these assets included having a warehouse, sales vans, and the minimum IT infrastructure (minimum two laptops and good internet connection). For enterprises that did not have the minimum IT infrastructure, there was an agreement between the enterprise and PZ to supply these assets to them on credit and pay through rebates.
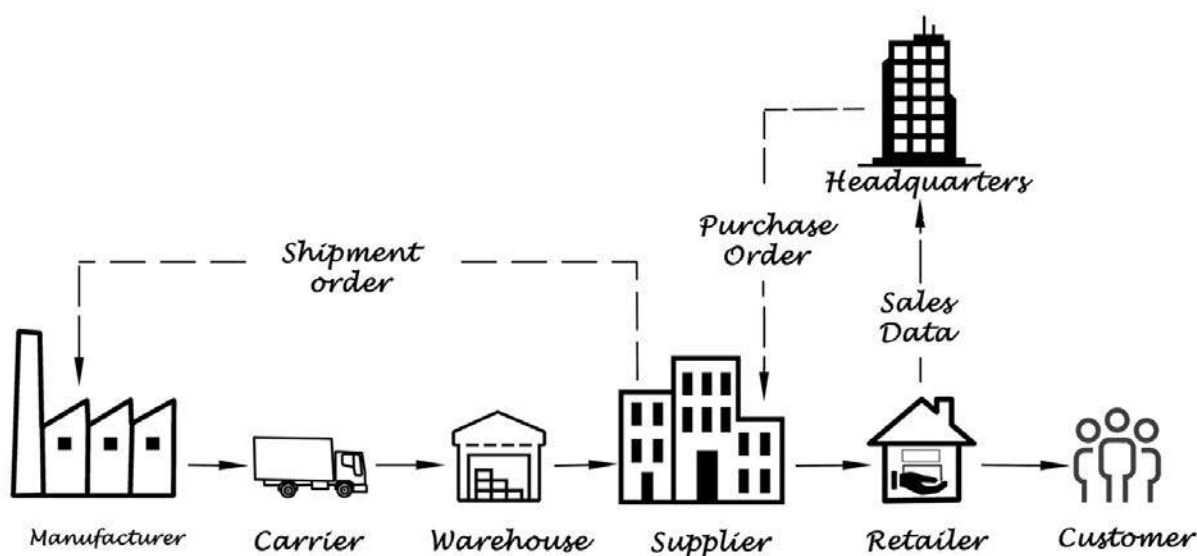
Concerning capabilities, a training scheme to build the human resource capabilities of distributors, aside from the assets, is necessary. As such, distributors were taken through a training process that includes basic ICTs skills training and data analytics training. Special training was organised for the business owners to get them acquainted with the system and the process, including financial statements. There is a criterion for training the user who would manage the system and analytics component of the system — this is a minimum of a Senior high school certificate and basic IT knowledge. After signing up with the distributor, the relationship between PZ and the distributor became a partnership, and PZ assigned territory sales managers to manage the relationship.

The aspects of partnerships are created through the customer-relationship team of PZ Cussons seeking distributors with a focus on partnerships (both tend to lose if not managed well). Incentives employed by the firm included commission on selling through their digital platform (salesforce) and selling on credit. Soon, these distributors became known as the 'intelligent ones' in the industry, which attracted other distributors. Distributors were enthused because they had access to data and tools that enhanced the management of their enterprises — hence, it was a deciding factor to join PZ Cussons Distributor Programme. Over time, the relationship became a partnership.

Forms of Value being Generated

The analytics platforms' affordances were the key drivers to enterprises' participation. These include the ability of the enterprises to track their stock and finances more efficiently and to monitor their sales and distribution activities. The analytics platform also allows for tracking and monitoring corruption, stealing, and fraud in the enterprise. Authors such as Wang [16], in their study on business analytics affordances, identified that as data becomes increasingly available, business analytics technology allows firms to monitor and make proper decisions. These forms of value are largely economic (enhanced revenue monitoring and generation, and efficiency in stock management) and symbolic (enhanced reputation and empowerment through informed decision-making, fraud monitoring and corruption intelligence).

1.2.2
EVIDENCE FROM THE AGRICULTURAL SECTOR

This section provides perspectives from two cases on data-driven enterprises' activities in Africa's agricultural sector. The first is the case of Solidaridad Network, an international civil society organisation with over 50 years of experience in developing solutions to make communities more resilient. The firm operates in over 40 countries, on five continents, through eight independently supervised regional offices. This case focuses on its activities in Africa. The second presents a case on data analytics in the agricultural sector in Morocco.

The Solidaridad Network

The Case of West Africa: The organisation works with farmers in the agricultural sector. Data is collected on smallholder farmers regarding their activities in using best farming practices that can sustain the environment while maximising yields. In Nigeria, for example, the organisation collects farmers' data under a project dubbed the "National Initiatives for Sustainable and Climate-Smart Oil Palm Smallholders (NISCOPS)" programme. The farmer data is collected from project communities using the Open Data Toolkit (ODK) by the Programme Monitoring, Evaluation and Learning (PMEL) team. A number of enumerators are selected based on certain professional and academic qualifications for the field data collection with the support of the PMEL team. A form is designed and programmed on an android mobile device using the ODK tool for input by the enumerators on the field offline. The data collected by the individual enumerators are aggregated on the ODK aggregate server for analysis, reporting and decision-making purposes. At present, four states, namely, Akwa Ibom, Cross River, Enugu, and Kogi, are benefiting from the programme. The project is a climate-smart programme targeted toward oil palm farmers in Nigeria. The programme seeks to contribute to self-sufficiency in oil palm production through climate-smart agricultural practices and sustainable intensification of present farms and improve smallholders' productivity and livelihood. In past years, there has been an increase in deforestation and forest destruction to expand oil palm production. The data is collected primarily in two parts. Foremost, the bio-data of farmers (first name, surname, farm location, etc) are necessary to uniquely identify a farmer. Second, the programme intervention data on the farmer (how often fertilizer is applied, how timely harvesting is done, etc) are relevant to identify the gaps in the farmer's activities so as to create a workplan for improvement in oil palm practices subsequently resulting in an increase in productivity and sustainability of the farming business.

The firm also operates in Ghana and Côte d'Ivoire. An example of the Côte d'Ivoire project is the COCOLIFE project, and that of Ghana is the Sustainable West Africa Oil Palm Programme (SWAPP II). These projects intend to improve the farming practice of smallholder farmers in the sub-region. Hence, just like in the case of Nigeria, baseline surveys are carried out to collect data from targeted smallholder farmers in communities within these countries and recommend best practices for sustainable farming. The data collection is done through Open Data Toolkit (ODK) by the Programme Monitoring, Evaluation and Learning (PMEL) team. This is freeware on android Playstore.

The Case of East African Countries: In Eastern African Countries such as Kenya, Uganda, and Tanzania, coffee is the predominately produced commodity of trade. Using data analytics, programme teams can collect data from the programme beneficiaries using the ODK, a third-party software used to collect data on a mobile device and send it to an aggregate server [17]. The data collected enables programme teams to identify the unique needs of the programme beneficiaries and tailor-make solutions to meet their needs.

The Case of Southern African Countries: In the Southern African region, South Africa, Malawi, and Zimbabwe are among countries in the region known for producing cotton in large quantities. Data analytics has been used to collect data from cotton farmers since the inception of the cotton programme. The data collected has been key in insight generation and making informed decisions by the cotton programme teams, enhancing training, provision of logistics, and other assistance to the cotton farmers.

Nature of Analytics and Technologies Deployed
Solidaridad uses the data collected to provide descriptive analytics on farmers and their activities. The descriptive analysis is provided based on the basic profile describing the farmer, type of farm, and farm size. There is also some predictive analytics — where data collected on the interventions offered to farmers to ensure they use best farming practices are analysed — this dataset prescribes what should be done next in terms of farming practices observed by the farmer. Based on this information, the farmer, for example, can be advised on the types of fertilizer to use. Diagnostics analytics is also evident as farmers, through the data collected by Solidaridad, can diagnose issues with poor yield (e.g. poor soil fertilizers). Based on this diagnostic, prescriptive measures are made to farmers on what to do to improve their yields. Solidaridad relies heavily on open-source platforms for sourcing and aggregating data. These platforms, however, undergo certain integrations to make them fully functional within the context of application to serve their intended purpose for the project. These open-source platforms used include the ODK and the Kobo toolkit, which serve as the medium through which farmers are profiled.

According to Ofoeda [18], application programming interfaces (APIs) are software interfaces that allow one computer programme to make its data and functionality available for other programmes to use across a network. APIs have become a key component of the software ecosystems as they provide an ideal way of constructing large software solutions on top of a common technology platform [19]. The data is stored in an aggregate server using an API or retrieved amongst other file types in CSV format and then imported into a data analytics software for analysis.

Critical Drivers and Enablers of Data-Driven Enterprises

The critical drivers for the project include partnerships with other firms, as they further add value to the data generated from the project. For example, partner organisations such as Advanced Savings and Loans and Pan-African Savings and Loans can use the data to process loan facilities for farmers and determine their ability to repay the loans. Another example of a partner organisation is Esoko which offers communication services through SMS to farmers. Further, in the non-governmental sector, as the case is for the operations of Solidaridad, skillsets in field data gathering and data analytics are needed at the consortia level — i.e., among these institutions that collect data from the farmers. Solidaridad addresses the skills challenge through constant data gathering and analysis training in a controlled group. For instance, in an aquaculture project in Nigeria, training for the three partners who lack knowledge in data collection and analytics is being provided by Solidaridad (a consortia partner) to harness the consortia skillsets.

Forms of Value being Generated

Regarding the value derived, the findings reveal value in the interest of other parties aside from farmers. These include government institutions associated with the project and other organisations in the agricultural sectors who are partners in the project. The data collected from farmers by Solidaridad enables these partners to create insights in reporting that create symbolic and economic value for the partners and farmers, respectively.

For example, these organisations can use the data to generate insights on the ability of farmers to access and pay back loans, among others. Another instance is the design of digital platforms by the Grameen Foundation, a partner to Solidaridad to help farmers in developing countries save for the future, invest in their businesses, and improve their farms. These forms of value are primarily economic (enhanced revenue monitoring and generation and access to new resources and partners) and symbolic (efficiency in processes and empowerment through informed decision-making).

1.2.2
Evidence from the Agricultural Sector... continued

The second case presents a case on data analytics in the agricultural sector in Morocco.

The Moroccan Story of Data Analytics in the Agricultural Sector

In Morocco, agriculture is considered one of the most important economic sectors as it generates around 15% of the gross domestic product (GDP). The government's vision in the Generation Green strategy stressed digital transformation to connect no less than 2 million farmers to digital service platforms to improve crop production. Structured farming companies in Morocco (such as ZNIBER Domains, DOMAINES AGRICOLES, AFRICAN BLUE) tend to leverage data analytics because modern farming generates enormous quantities of data from its sensors such as soil-related, crop-related, weather-related, and crop trends data. These data are used by recommendation systems, data mining, and time-series analytics applications, which transform them into useful information and advice.

Nature of Analytics and Technologies Deployed

The benefits of introducing data analytics into the farming sector include making price forecasts, managing risks, rationalising costs, and increasing yield and productivity. For example, the use of agricultural drones in grain farms can rationalise costs and increase yields by collecting key data on the condition of plots. An agricultural drone can perform treatment of 50 hectares per day at 12 $/hectare, and it saves considerable time and limits production losses. They provide more precise information to the farmer by drawing maps showing him the fertile areas. The raw data collected by drones during the flyby is analysed and interpreted through insightful metrics in schemas, dashboards, and analytical reports for decision-making. Farming companies increasingly use these drones for treatment, diagnostic, or crop control missions to facilitate the analysis of a whole series of data: nitrogen level, chlorophyll, biomass, and water stress [20].

Precision agriculture helps farmers manage their operations more precisely and accurately using a sensor system and data to highlight the various nutrients in soils [21]. Analysis of these data, stored in the cloud, can optimise the management of inputs to crops (seeds, irrigation water, fertilisers, and phytosanitary products), improve yields, and reduce harmful effects on the environment (can lead to a reduction in the use of contaminants by more than 80%). Using a platform that leverages data collected, the farming companies make future predictions such as forecast yields essential for sales of standing crops. Daily activities improve the data accessibility, storage, and cost benefits to the companies.

One illustrative example used by AFRICAN BLUE is precision irrigation. This technique provides an automated system of irrigation, whether drip irrigation or sprinkler misting. The firm does not irrigate all day, but only 10-15 min per day, depending on the needs of the plants. This company uses groundwater with advanced filtration techniques such as sand and screen filters. The firm must be careful with the irrigation parameter of pH and Electro conductivity (EC). For irrigation management, they use Netajet 4G (4th generation). This equipment offers irrigation flexibility. In addition, this firm uses Netafirm CoolNet Pro™ to soften the environment around the plant. CoolNet Pro™ is a super-fine static mister hardware specifically designed for cooling and humidifying greenhouses and livestock and irrigation. It has an anti-draining mechanism, opens at accessible pressures, and offers a very effective misting that does not negatively affect the crop.

Critical Drivers and Enablers for Deriving Value

The critical resources that are driving or enabling the use of leveraging data analytics for business value and innovation for Moroccan farmers fall into three categories:

- The first category of resources stands for company size and the volume of its transactions, such as turnover. The farming company's integration and diversification degree are among the most determining factors that impact leveraging data analytics for business value. Once the farm size increases, the farmer adopts digital technologies and leverages data analytics. Small firms tend to have fewer resources to take advantage of the benefits of data analytics.

- The second category is related to the activity and the structure of the company, namely the nature of the products (grain, modern fruit cultivation, and products with higher value-added), ownership structure (family, major shareholders), farmer's education and his innovation capacity, age and risk aversion attitude, and the employee's knowledge. Older farmers who are risk-averse and have received little-to-no education have a lower tendency to accept and leverage data analytics for business value. Further resources enabling the adoption of leveraging data analytics are the complementarity among agricultural data technology components and the crucial role of farmers' knowledge.

- The third and last category comes to the financial characteristics of companies. These characteristics include the operators' debt ratio (financial debts to equity), financial expense ratio (financial charges on profits before taxes and interest), and the level of cash flow.

In precis, in the agriculture sector, the innovative use of data analytics requires adequate financial investment in the requisite technical infrastructure and human resource skills to deliver data-driven farming solutions.
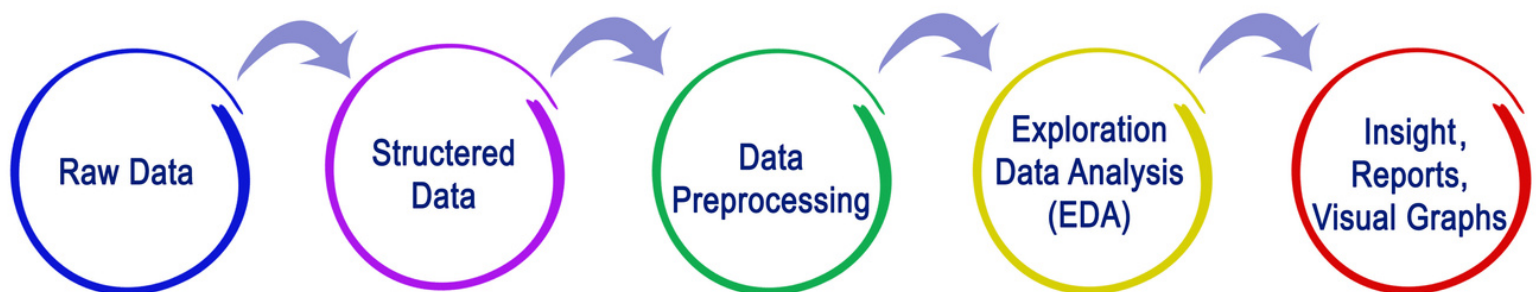
1.2.3
EVIDENCE FROM THE HEALTH INSURANCE SECTOR

This section examines the use of data analytics in the health insurance sector. The enterprise (Rx Health Information Systems) is a Ghanaian firm born out of an engagement to collect health-related data for an international organisation, IQVIA. It currently provides health analytics services to organisations in the healthcare and health insurance sectors in three African countries, namely, Ghana, Nigeria, and Angola — with plans to expand to 15 other African countries. The enterprise's core business entails reducing health insurance fraud by providing tools for processing health insurance claims.

IQVIA engaged Rx Health Information Systems (Rx Health) to collect and collate health insurance data. However, the data was difficult to collect since they were primarily available on paper and embedded informal processes in health care institutions. Rx Health developed Rx Claims Solutions to streamline health insurance claims at health care institutions and pharmacies.
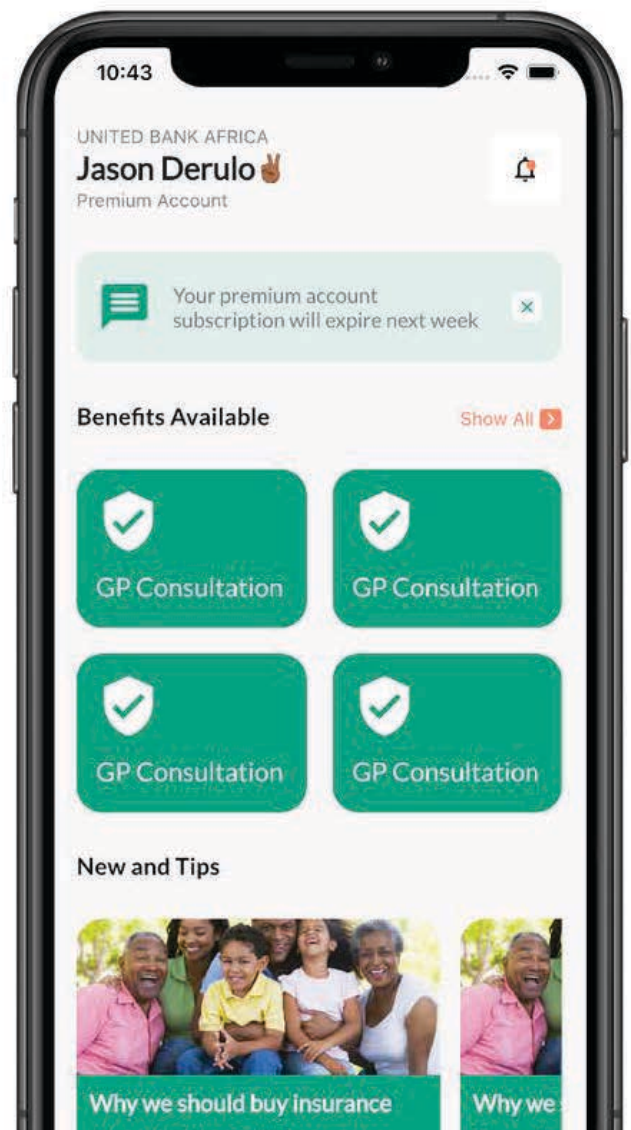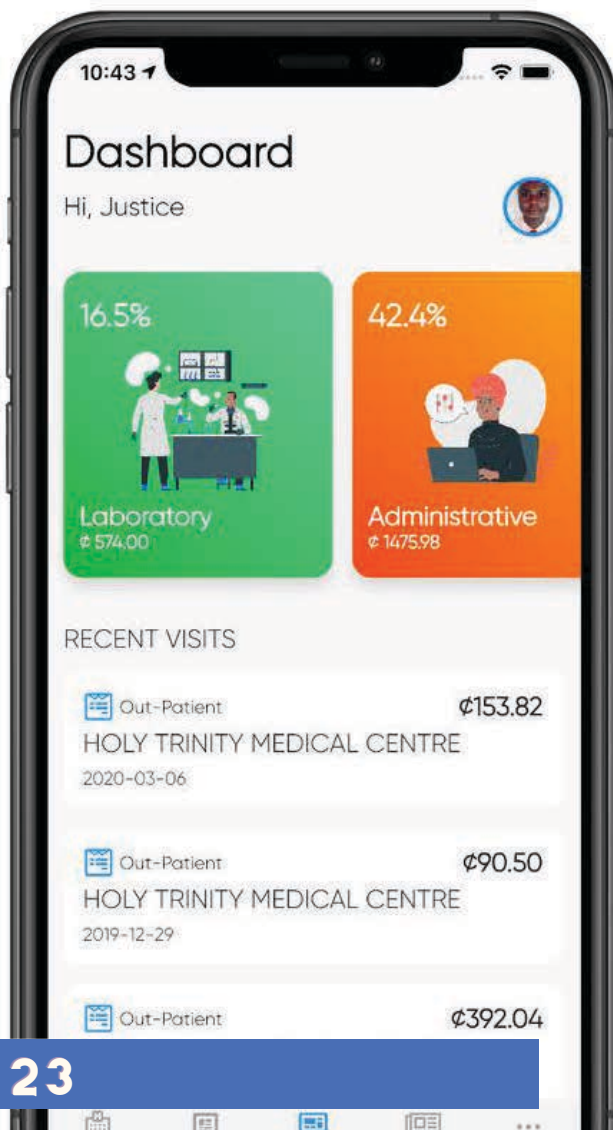
Nature of Analytics and Technologies Deployed

RX Claims Solutions has four modules. First, there is an application for medical insurance providers (Payer solution). This application enables claim data to be collected from health facilities that participate in the scheme of an insurer. Second, health facilities can use a hospital management system (HMS) to manage all operations. These applications collect health-related information such as data on drug prescriptions, drug consumption, medical diagnosis, disease patterns, and laboratory reports. Third, a mobile application (patient solution) enables patients to manage their health insurance and book appointments with health facilities. Fourth, a data warehouse is updated once a day with information from all the health facilities and insurance companies. The data warehouse had been modelled based on the analytics needs of the company and requests made by their clients (health facilities and insurance companies). The data warehouse is used to develop descriptive and prescriptive analytics for insurance companies and health facilities. For example, there is the capability to determine (descriptive analytics) the top 10 diseases that cause patients to report to the hospital in healthcare facilities. Similarly, insurance companies can choose how to price their packages based on historical data and trends in treatment data. Also, patients can get descriptive analytics concerning their usage of insurance policies.

Multiple technologies are used in implementing data analytics for hospitals, pharmacies, and insurance companies. A proprietary application (Microsoft Power BI) provides robust reports for insurance companies that enable the organisations to view existing reports and design their ad-hoc reports. The Hypertext Preprocessor (PHP) language provides descriptive analytics for health facilities, while TensorFlow (a deep learning library) offers predictive analytics.

Critical Drivers and Enablers for Deriving Value

Assets — For the health facilities, the main driving force for adoption is the dependence on revenue from private insurance companies. Due to the reliance on revenue from private insurance organisations, the company must comply with these companies' requirements (technical and otherwise). Also, some local champions at the health facilities are enthusiastic about analytics and drive the system's use. For instance, these champions can drive the request for Rx Health to provide predictive analytics in addition to descriptive analytics provided by default as part of their Rx Claims Solutions. However, due to the differences in the organisational structure and culture at various health facilities, the nature of these local champions varies. *"In some facilities, the founder and his family are the champions who can ensure success, and in other facilities, it is an employee (the IT person) whom the director most trusts"* (Rx Health). The information technology (IT) infrastructure needed to use the system varies depending on the health care facility. However, all the key personnel who would use the Rx Claims solution has to have a computer, at least an i3 computer. Similarly, doctors can use a tablet-based solution during ward visits.

Capabilities — The most critical capability is the human resources needed to run the systems. There is the need to have hospital staff educated enough, and with Rx Health, a minimum of a Higher National Diploma (HND) is required. However, it is recommended that the health care facility hires someone with formal IT training for larger healthcare institutions. In all instances, the service provider is the central entity behind the enterprise data and provides training to enable staff to use the system.

Partnership — Clients become partners once they make payments and sign-up to the data enterprise systems. A tech support assigned to the health care facility monitors data transactions from the client to ensure smooth system operations. Rx Health also organises periodic training sessions and workshops to brainstorm how to serve them better. Such workshops have often led to new features deployed in their solutions.

Forms of Value being Generated

The value obtained includes the ability of hospitals, pharmacies, and insurance companies to collate data and analyse to inform their performance and, monitor their sales of insurance packages, claims, and generate insights on patient behaviour, prescriptions issued, and drug availability and disbursement. Moreover, the mobile version of the platforms enables individual patients to monitor their health activities at their convenience and comfort, and they can equally generate reports from the system. These forms of value are primarily economic (revenue monitoring and generation, claims reconciliation and reporting, and health insurance subscription management) and symbolic (efficiency in processes, improved service quality and customer experience, and empowerment through informed decision-making and fraud management).
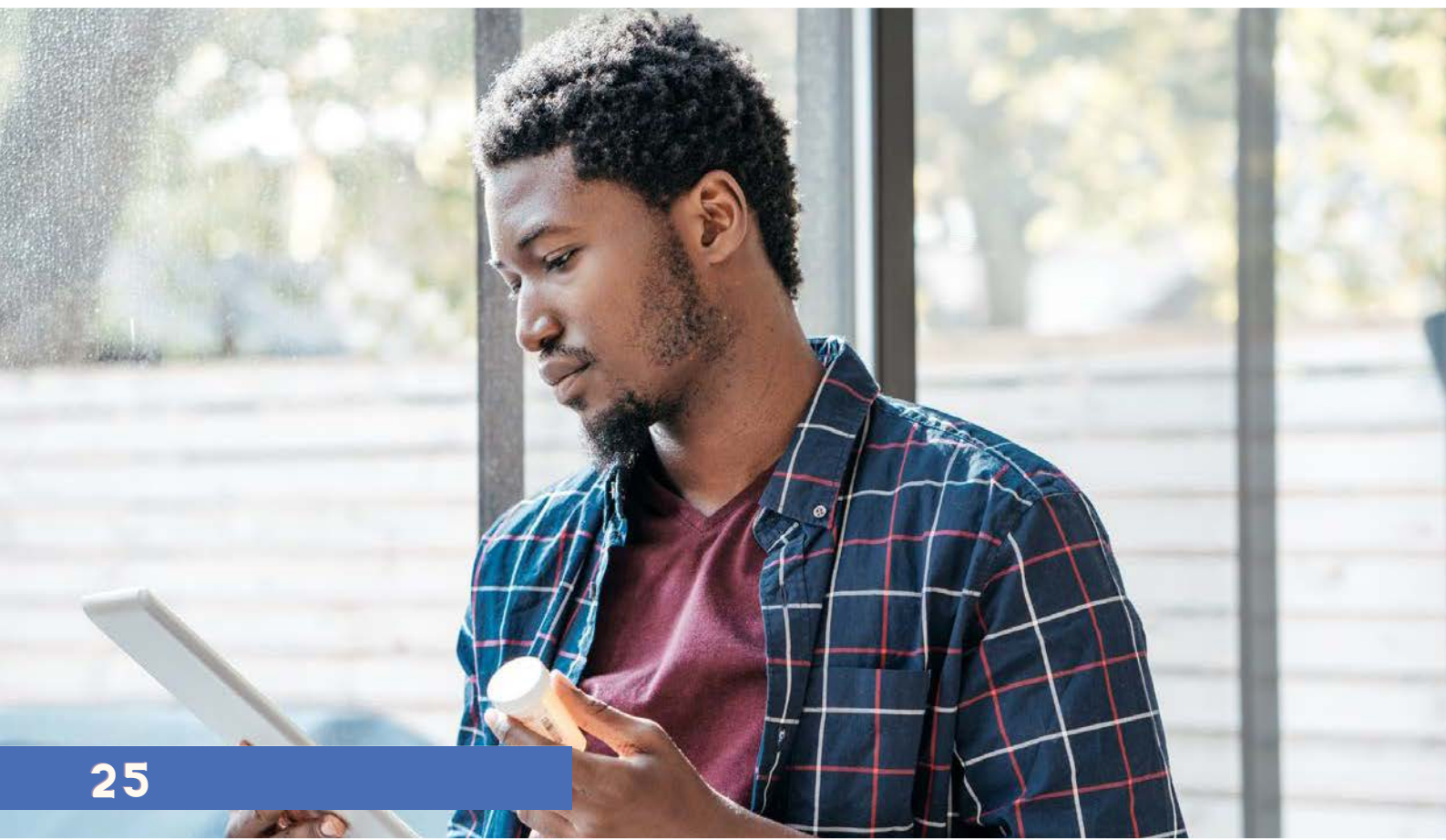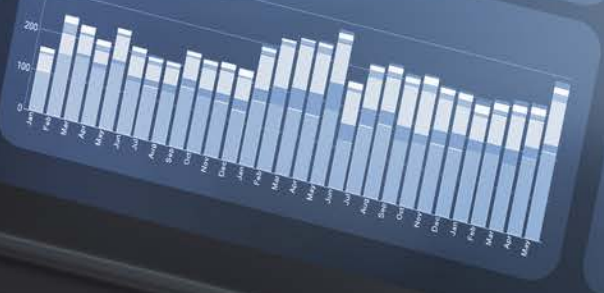
1.2.4
EVIDENCE FROM THE SOCIAL MEDIA ECONOMY

Social media analytics could be defined as gathering audience data from social media platforms and networks and analysing it to help decision-makers address specific problems [22]. With the increase in the adoption of social media platforms, Social Media Analytics is fast becoming an integral aspect of most firms' business processes, especially in the developed world. This phenomenon is gradually gaining popularity in developing countries, particularly among indigenous firms. In this section, we present the case of Digital Marshals Institute, a digital marketing services firm that provides digital marketing analytics solutions for firms in the Sub-region.

Nature of Analytics and Technologies Deployed

The services rendered by Digital Marshals Institute were initially on the basic rudiments of managing social media, search engine marketing, and display advertisement. These are services rendered in the early years of the organisation's life, which involved utilising the platform's insights and demographics to undertake a scientific targeting. Surprisingly, businesses who signed up to Digital Marshals Institute's services as clients found reasons to upscale their subscriptions. They witnessed significant growth in their businesses while other new clients joined. The firm served several clients across different industries from Hospitality, Banking, Education, Aviation, and Media. Several recommendations from their clients trickled in because they met their objectives, leading to the firm's growth during the first three years. With the increase in subscription of clientele, the firm penetrated other analytics spaces, including data extraction process, data cleaning, text mining, descriptive analytics, prescriptive analytics, and sentiment analysis to provide meaningful intelligence to decision-makers when mining social media data. Social media analytical tools used include Hootsuite Social Dashboard, Brand24, and Google Analytics.
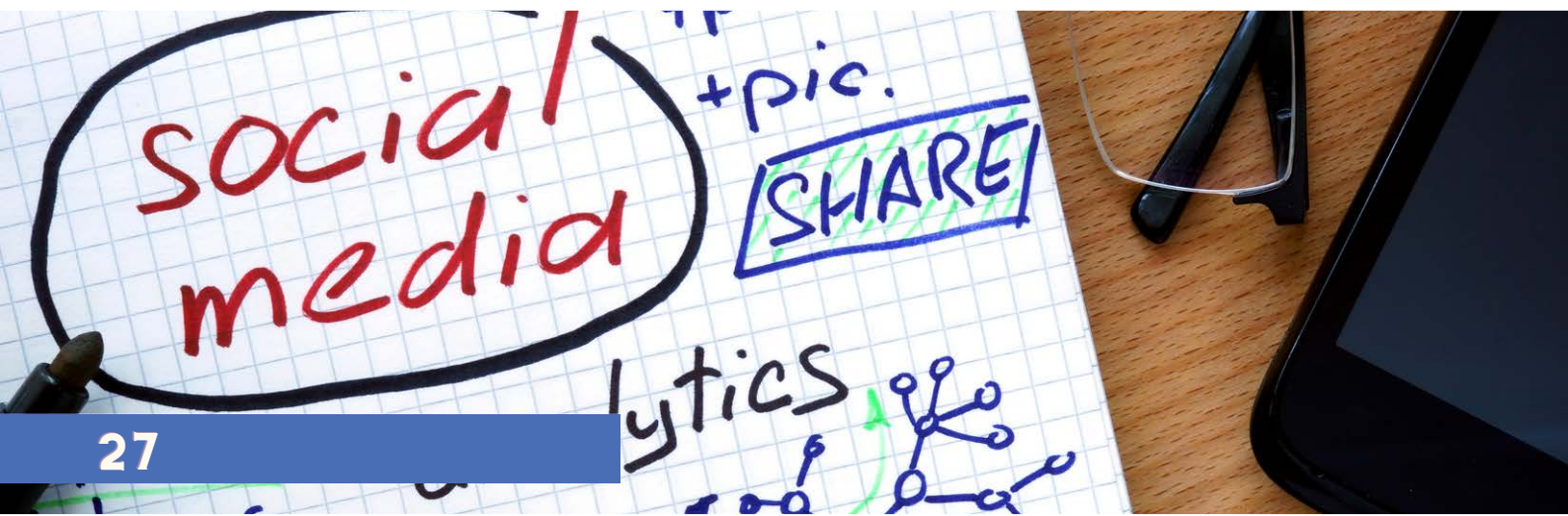
Critical Drivers and Enablers for Deriving Value

Value for money for advertising/marketing — For most businesses who found value in the analytics services offered by Digital Marshals Institute, analytics offered better value for money than traditional forms of advertising that yielded fewer results. Some clients complained about high advertising budgets for traditional media (print and radio) but ended up receiving fewer numbers as subscribers. They complained of increased costs as they had a wrong impression that one requires a meagre budget with social media ads, and the firm's proposal was usually a quarter of that. *At the end of the campaign, these firms were overwhelmed by their results, as about 85% of their total leads came from the campaign. This led them to abandon advertising on traditional media and fully dedicate all their marketing budget to Digital Marshals Institute.*

Increase in awareness and demand for social media analytics — After 2016, as social media started gaining visibility in West Africa, most businesses in countries like Nigeria and Ghana began to move from just harnessing likes and followers to how social media could transcend real value. Though indigenous businesses in the sub-region had not found a reason to adopt social media analytics, some identified tremendous value creation opportunities on their social media platforms. Such interests were triggered by their exposure to their large audience (as followers). However, they were unable to translate the data into monetary value. To sell advertising space on their social media to clients, they required deep analytical know-how, which was internally scarce. As such, businesses deliberately pursued the services of social media analysts (i.e. Digital Marshals Institute).

Forms of Value being Generated

Firms that engaged the services of Digital Marshal Institute observed or gained significant improvements in followership and patronage of products and services. In addition, these firms also made cost savings in terms of their advertising budget and revised market entry strategies for some of their products. In precis, the value obtained is both economic (revenue generation and cost-savings in marketing and advertising budgets) and symbolic (perceived brand image and reputation and discovery of new customers).

Table 1 (overleaf) summarises the above discussion on data analytics and Africa's indigenous businesses.

Table 1. Matrix on Data Analytics and Africa's Indigenous Businesses — Where We Are

Sector	Nature of Data Analytics	Data Technologies Deployed	Critical Drivers and Enablers for Deriving Value	Value being Generated

Healthcare:
 	
• **Enabling firm** (RX Health)
- Indigenous businesses (Hospitals & Pharmacies)
 	
• **Third-party benefactor organisations** (IQVIA and other health insurance companies)
	• Descriptive analytics
	• Predictive analytics
	• Diagnostics analytics
		• Proprietary software (Microsoft Power BI)
		• Open-Source Software (Hypertext Preprocessor and TensorFlow)
		• Bespoke Applications (Rx Claim Solutions)
		• Mobile Apps
			• Assets
			  - IT Logistics
			  - Non-IT logistics
			• Capabilities
			  • Skills sets/training
			  • Partnerships
			  • Customer relationships
			• Partnerships
				• Economic and symbolic
				  • Revenue monitoring and generation
				  • Efficient claims reconciliation and reporting
				  • Improved service quality and customer experience
				  • Empowerment through informed decision-making and fraud management

Social Media:
 	
• **Enabling firm** (Digital Marshals Institute)
- **Indigenous businesses** (Companies and Organisations in media, finance, and retail sectors)
	• Data extraction
	• Data cleaning
	• Text mining
	• Descriptive analytics
	• Prescriptive analytics
	• Sentiment analysis
		• Social media analytical tools (Hootsuite Social Dashboard, Brand24, and Google Analytics)
		• Social-media integrated applications
			• Value for money advertising/marketing
			• Increase in awareness and demand for social media analytics
				• Economic and symbolic
				  • Revenue Generation and cost savings - Value for money over traditional (TV & radio) forms of advertising and marketing
				  • Perceived brand image and reputation and discovery of new customers

Manufacturing:
 	
• **Enabling firm** (PZ Cussons)
- **Indigenous business** (Distributors)
	• Descriptive analytics
	• Predictive analytics
	• Diagnostics analytics
		• Enterprise Resource Planning Software (Salesforce)
		• Mobile Apps
		• Third-party applications (bespoke)
			• Assets
			  - IT Logistics
			  - Non-IT logistics
			• Capabilities
			  • Skills sets/training
			  • Knowledge addition
			• Partnerships
			  • Customer relationships
			  • Incentives
				• Economic and symbolic value
				  • Enhanced revenue monitoring and generation
				  • Efficient tracking and monitoring of stock
				  • Fraud monitoring and corruption intelligence
				  • Enhanced reputation and empowerment through informed decision-making

Agriculture:
 	
• **Case 1 - Enabling firm** (Solidaridad)
- **Indigenous businesses** (Farming Enterprises)
 	
• **Case 2 - Enabling Champion** (Moroccan's Government Vision)
- **Indigenous businesses** (Moroccan Farming Enterprises)
	• Descriptive analytics
	• Predictive/forecast analytics
	• Diagnostics analytics
		• Client-server systems
		• Open-Source Software (Open data tool kit and the Kobo tool kit)
		• Mobile Apps
		• Drones
		• Specialised Technologies (Netajet 4G and CoolNet)
			• Capabilities
			  • Firm size
			  • Skills sets/training
			• Finances
			• Partnership (of Solidaridad)
			• Government Vision/Agenda (Morocco)
				• Economic and symbolic
				  • Enhanced revenue monitoring and generation and access to new resources and partners
				  • Efficiency in processes and empowerment through informed decision-making

PART 2

Data-Driven Enterprises in Africa – Where We Need to Be

2.1 GAPS THAT CONSTRAIN DATA-DRIVEN ENTERPRISES

This report identified six interrelated factors that tend to constrain data-driven activities among indigenous firms in Africa, namely

Table 2. Gaps in Data-Driven Enterprise Uptake in Africa

Sector	Critical Drivers and Enablers for Deriving Value	Existing Gaps

Manufacturing:
 	
• **Enabling firm** (PZ Cussons)
- **Indigenous business** (Distributors)
	• Assets
	  - IT Logistics
	  - Non-IT logistics
	• Capabilities
	  • Skills sets/training
	  • Knowledge addition
	• Partnerships
	  • Customer relationships
	  • Incentives
		• Lack of proper data governance and regulation
		• Lack of expertise/skills
		• Lack of infrastructure
		• Low awareness
		• Lack of funding

Agriculture:
 	
• **Case 1 - Enabling firm** (Solidaridad)
- **Indigenous businesses** (Farming Enterprises)
 	
• **Case 2 - Enabling Champion** (Moroccan's Government Vision)
- **Indigenous businesses** (Moroccan Farming Enterprises)
	• Capabilities
	  • Firm size
	  • Skills sets/training
	• Finances
	• Partnership (of Solidaridad)
	• Government Vision/Agenda (Morocco)
		• Lack of proper data governance and regulation
		• Lack of expertise/skills
		• Lack of infrastructure
		• Low awareness
		• Lack of funding
		• Size of firms in the sub-region

Healthcare:
 	
• **Enabling firm** (RX Health)
• **Indigenous businesses** (Hospitals & Pharmacies)
• **Third-party benefactor organisations** (IQVIA and other health insurance companies)
	• Assets
	  - IT Logistics
	  - Non-IT logistics
	• Capabilities
	  • Skills sets/training
	  • Partnerships
	  • Customer relationships
	• Partnerships
		• Lack of proper data governance and regulation
		• Lack of expertise/skills
		• Lack of infrastructure
		• Lack of funding

Social Media: • **Enabling firm** (Digital Marshals Institute) • **Indigenous businesses** (Companies and Organisations in media, finance, and retail sectors)	• Value for money advertising/marketing • Increase in awareness and demand for social media analytics	• Lack of proper data governance and regulation • Lack of awareness • Lack of expertise/skills • Lack of proper enabling environment

2.1.1
LACK OF PROPER DATA GOVERNANCE AND REGULATION

One of the key gaps realised is the absence or lack of proper data governance regarding the data collected across the economic sectors in African data-driven enterprises. These data governance gaps are necessitated by the concerns on security and privacy issues, as many data-driven enterprises do not know how their data is handled and managed. This lack of proper data governance and practices is compounded by the lack of regulatory conditions regarding data governance (i.e., data handling and protection) in most developing countries. Thus, these gaps do not create a conducive environment for investments in data-driven enterprises in the African Sub-region. For example, Ghana and Nigeria, where Solidaridad operates, are among the countries that have state-recognised institutions (Data Protection Commission) for regulating data enterprise. However, experts interviewed in this study argue that these institutions are often challenged with resources (e.g. finance and logistics) to monitor, regulate, and ensure compliance in data-driven enterprises. Further, some donor agencies and partners require data protection certificates and cyber security certificates to be produced before grants and partnerships can be sealed with countries. Hence, the weakness or lack of these state institutions becomes a stumbling block for innovation and opportunity for data-driven enterprises.

Casting an eye on the healthcare sector, Rx Health shares that, while regulation exists in all of the markets they operate in, none of the regulations or regulatory bodies (e.g. Data Protection Commissions) poses a considerable threat to their operations. After fulfilling the necessary mandates (registration and payment of fees), the firm is usually free to operate. Rather, Rx Health is informally regulated by their clients and the agreements they sign with them. For example, in Angola, Rx Health had to conform to the American constitution's Health Insurance Portability and Accountability (HIPAA) Act because an American organisation sponsored the project. Also, beyond the national regulatory agencies, firms such as Rx Health are unaccountable to other professional regulatory bodies (such as the medical and dental council) because they do not work directly as a medical service provider but rather with insurance providers and health facilities.

In effect, data regulation institutions are either yet to catch up in regulating data-driven enterprises or are severely resource-constrained to monitor and ensure compliance concerning their mandate. There is also a need for collaboration between these regulatory institutions and professional associations or bodies to respond to the operations of data-driven enterprises in the professional body sector.

2.1.2
LACK OF THE REQUISITE EXPERTISE/SKILLS

Further, the lack of skills and expertise in data analytics constrains firms, especially in the agricultural sector and firms seeking to leverage social media analytics. In the case of Solidaridad, the firm often struggles to find the right and suitable candidates to fill in data analytics positions.

"There is a scarcity of expertise in data analytics skills at the strategic and operational levels, coupled with the lack of support from top managers at the strategic levels towards the adoption and use of data analytics in organisations" (Solidaridad).

This lack of skill is also evident in social media analytics.

"There are quite a significant number of people who parade themselves as social media managers for businesses in the developing world, but most lack the requisite expertise to undertake Social Media Analytics that provide value to their clients" (Digital Marshals Institute).

This makes it challenging to convince indigenous firms to invest in social media analytics as prior experiences with unskilled personnel led to financial losses and no brand growth.

Then again, this could also be attributed to the limited number of African educational institutions that offer social media analytics for business training. More recently, educational institutions (post-2019) in Africa are developing or deploying programmes about data analytics. Experts interviewed intimated that most data analysts in Africa tend to learn on their own through online courses on Coursera, YouTube, and IBM's Digital Nation Africa, among others.
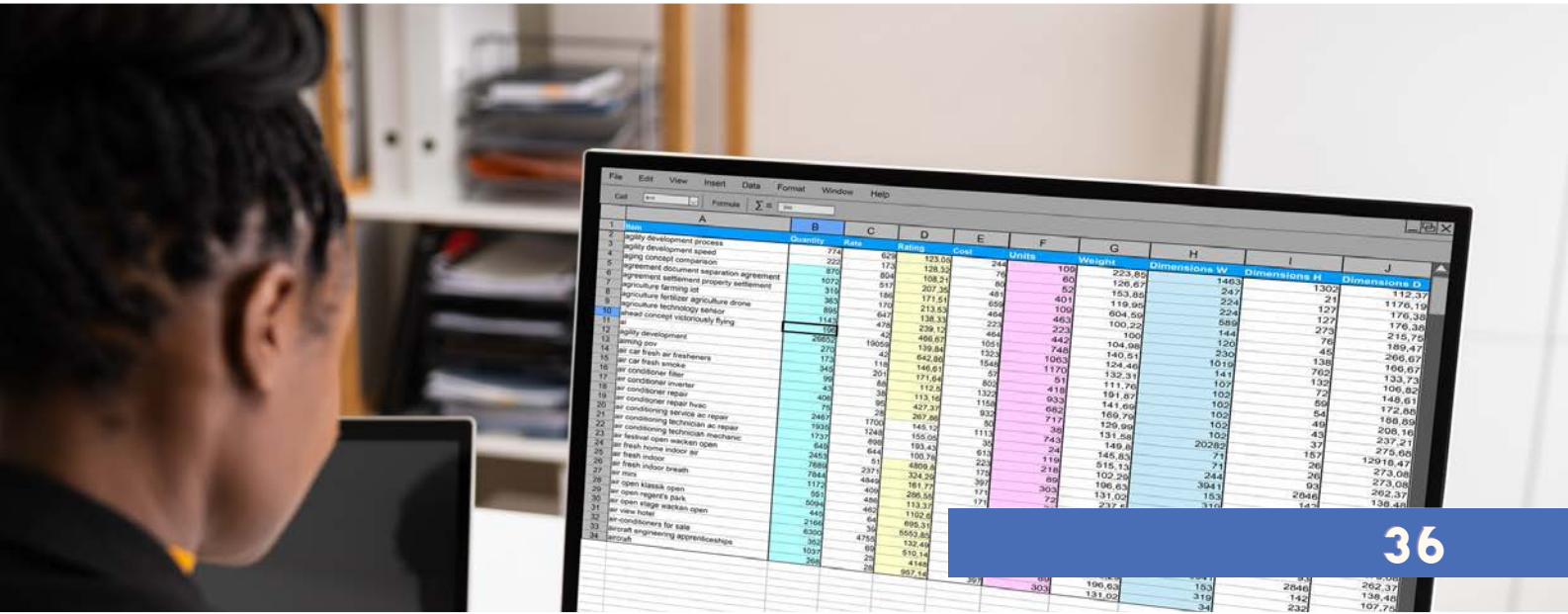
2.1.3
LACK OF INFASTRUCTURE

Infrastructural issues also continue to constrain indigenous firms from becoming data-driven. There is a lack of IT infrastructure to support data analysis applications. For example, poor access to Internet connectivity and a stable power supply remains infrastructure challenges. This is not surprising as currently; Africa's ICT infrastructure are inadequate to fulfil its aspirations [36]. The International Telecommunication Union (ITU) for example found that in 2018, only 26.3% of Africans were Internet users. This represented an almost threefold increase over 2010 (9.9%), and a tenfold increase over 2005 (2.7%). There is considerable diversity among Africa's societies in terms of Internet usage [36].

In PZ Cussons, the analytics software relies heavily on the Internet to communicate and synchronise data from sales managers' mobile computers (outreach systems) to the central database. However, in many parts of developing countries in Africa, Internet access and connectivity are poor or limited, making this a challenge to receive updates from sales and distribution points in real-time. Peculiar situations on constraining factors also exist for countries that have experience conflicts as the insecurities in these countries result in the lack of willingness of international organisations to invest and support local enterprises to become data-driven. Potential Data-driven enterprises in rural areas, like farming enterprises, often have difficulties gaining access to specialised resources to implement, configure, and support IT systems. All these reasons put these enterprises in uncertainty about the uptake of data analytics. Further, there is a need to create global platforms that provide technological infrastructure-as-a-service, primarily for least developed countries and rural areas, to facilitate access to global data sets and state-of-the-art tools and services [23].

2.1.4
LACK OF AWARENESS, POOR INFORMATION SHARING CULTURE AND DIFFICULTY IN ACCESSING DATA

Generally, the awareness of data analytics and artificial intelligence (AI) benefits to businesses is low. Some business owners only create social media pages because their competitors use them, or there is perceived information that social media may help their business. This is, however, not surprising as the lack of basic digital skills concerns a large share of the African population. In 2019 for example, the adoption rate of digital skills stood at only 10 per cent in Mozambique and 23 per cent in Côte d'Ivoire, suggesting that these citizens were largely unable to use digital devices and applications, or access the Internet [37].

Most leaders lack appreciation of it due to their limited knowledge, and they, therefore, relegate it to the background by tasking interns or temporal staff to handle it. Most people do not understand why funds should be allocated to it.

There is an instance where managers of an indigenous firm in the hospitality sector were fixated on the purchase of likes because, in their view, their competitors had more likes and followers than them. Although the firm achieved the set objectives through more sales, the management was still fixated on increasing likes.

There is also an issue of poor information sharing culture, which impedes the uptake of data analytics. Across the markets they operate in, Rx Health finds that clients' employees are usually hesitant when analytics is initially deployed. This fear is motivated by fear that the application would "intrude into their territory" of operation and lack of readiness to share information. However, clients get used to the application over time and start requesting more insights and reports.

Further, access to data is typically difficult across the healthcare insurance, agriculture, and manufacturing (distribution) sectors. In some cases, critical data needed to drive specific insights is non-existent. Some institutions still depend on manual processes to collect and store data.

Hence, the data generated within these processes are generally not stored or stored in complex formats, making it difficult to perform a robust analysis of enterprise-wide data. The results obtained are often limited.

2.1.5
LACK OF FUNDING AND SIZE OF BUSINESS

A primary constraining factor in the growth of data enterprises is the lack of funds. Funds are needed to invest in the business and get more employees on the ground to gather data and provide support to their clients. In the absence of readily available funds, indigenous firms like Rx Health are applying for venture capital (VC) funding.

Funding is critical for small enterprises like farming enterprises because data analytics adoption becomes a far-fetched dream for enterprises with limited resources. In Morocco, for example, farming companies are generally family-owned and characterised by the absence of rigorous management, sometimes preferring liquidity over profit in the long term. Then again, these farming enterprises have small agricultural lands that do not exceed 5 hectares and are hesitant to take on new technologies due to limited resources.

Further, where there is the possibility of innovation, the incompatibility among tools for digital agriculture technology in situations where integrated pieces of the equipment do not work together (sensors, computers, and GPS) are among the factors that constrain businesses to become data enterprises.

2.1.6
# LACK OF AN ENABLING ENVIRONMENT TO UTILISE DATA ANALYTICAL SKILLS

The data analytics industry is gradually growing as there is no proper regulation guarding the space in most African countries. There is often a mismatch where the fewer personnel trained do not find work that matches their qualification because of a lack of appreciation from indigenous firms. There are also several instances where firms search for skilled personnel but are unsuccessful and, therefore, resort to sublet it to international experts outside the region. There seems to be no conducive environment to push the industry. For example,

"most indigenous firms lack the right culture to permeate the data's intelligence for the business. When data analysts propose solutions concerning business needs, implementation becomes a great barrier. Largely, most indigenous firms' culture does not adapt to change whenever there is an innovation. This leads to poor implementation and ultimately causes the top-level executives to halt it as they do not witness the growth envisaged" (Digital Marshals Institute).

Worryingly, the lack of a proper enabling environment is compounded by the seeming lack of training data to practice and master the art of data analytics. Experts who have developed skills in analytics are often faced with the challenges of the lack of high cost in soliciting data, uncollated data structures (data in silos), and mixed data (online and offline data). *"Additionally, whiles the expertise and skills in analytics continue to evolve, persons who are interested in learning the art of data analytics have faced ownerships, right and permissions issues which constraints their offer access and train with organisational data"* (Rx Health Info Systems).

There is also a scarcity of contextual data for learners to use to practice or experiment with the development of contextual solutions. Many learn analytics using data from developed countries, with little or no hands-on experience with African data. As intimated by Kelvin Wellington, a data scientist, *"African businesses risk being left behind if they do not have people with the right skills needed to build big data products."*

Therefore, persons seeking to develop competencies in the area must utilise data to make vital choices, predict and prevent disaster before it occurs, and uncover growth opportunities.
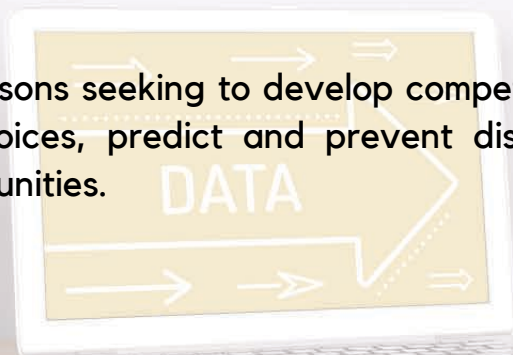
2.2
EXPECTATIONS OF STAKEHOLDERS ON DATA GOVERNANCE AND DATA-DRIVEN ENTERPRISES

There is a need for African development institutions, governments, and international donor agencies to push the agenda for data-driven enterprises in Africa. This gap can be solved by investing funds to develop skills and infrastructure in data analytics. For example, governments creating freely accessible training platforms for data analytics, data governance and the digital economy for small businesses, data regulators, and the youth (as independent workers in digital economy). Governments can also develop open data platforms that provide access to open data relevant to specific sectors to encourage innovation and subsequent creation of other digital products. As in Bangladesh, local innovation hubs can become important enablers for building local talent and provide ongoing support to digital public infrastructure systems.

Also, there is the need for data-driven enterprises to develop capabilities and skills in data analytics — this can be achieved by bridging the gap between industry and academia in terms of developing skills and competencies in data analytics.

"Universities in Africa largely lack behind in terms of skills training in the area of data analytics which can feed into the industry to harness the full potential — this suggests that academics have come into the game late" (Digital Marshals Institute).

The void can be patched by partnering with local universities or establishing faculties in local universities that mandate to train people and students in this area of expertise. This goal can be achieved by providing practical digital skills training in analytics for individuals, organisations, and governments. Moreover, *"with the emergence of AI and more sophisticated automated technologies, governments and for that matter universities need to spend some time investing and developing capabilities in such technologies"* (Solidaridad).

In conjunction with all key stakeholders, governments and public data regulatory institutions need to improve awareness and education on data and data analytics, access public data for analytics training, and improve monitoring and ensure compliance in data-driven enterprises.

As learnt in the case of PZ Cussons, African governments should provide financial support, incentives, and programmes that drive a data-driven agenda across all sectors of the economy. Open access data platforms can be created to cover several sectors of the economy, just as it is obtainable in the United States of America, where over 160,000 open government datasets that cut across several sectors of the economy are publicly accessible.

Further, more resources need to be invested in research and development concerning data analytics and artificial intelligence. African governments need to provide appropriate initiatives, incentives, and regulations/policies to encourage educational institutions to make relevant curricula adjustments that would cater to the workforce needed for laying a solid foundation for Africa's data analytics and artificial intelligence capacity. In this light, the African Institute for Mathematical Sciences (AIMS) has gained some mileage in building a critical mass of data scientists equipped with the required skills to understand how to perform complex data tasks for African businesses. As part of its five-year (2021-2026) strategic plan, AIMS has expanded its Data Science Fellowship (DSF) programmes to include professional development for industry and government officials. This initiative is laudable, and more of such is needed for the continent.

However, these educational initiatives need to be all-inclusive, thus targeting potential data-driven enterprises in rural communities and the agricultural sector and providing them with the requisite partners and resources to utilise data-driven innovations that would enhance their productivity.

PART 3

The Next Steps

3.1
REGIONAL FRAMEWORK FOR THE DATA GOVERNANCE AND DATA-DRIVEN ENTERPRISES IN AFRICA

Recommendations from the preceding sections coalesced around three key areas. These can be described as the "3As" — Awareness, Accessibility, and Adoption.

Awareness

1. Educational Curriculum Development
2. Academia and Industry Collaboration
3. Enhancing Women's Participation in the Data Economy

To utilise data through analytics, businesses require human capital with some sense of technical capabilities in data analytics to take up analytics. These technical capabilities include individuals' unique abilities in statistics, extensive data mining, and mastery of visualisation tools that can be acquired through training and learning. Therefore, academic and training institutions have a role to play in making this possible. Existing curriculums and policies in African academic and training institutions need revisions that promote the awareness of data as the "new oil" and the urgent need to uptake skills in the area. Further, as the popular adage goes, "catch them young…" Thus, there is a need for a regional agenda to encourage educational institutions in the sub-region to introduce the youth at the pre-tertiary level to data-related academic programmes.

Importantly, with the appropriate resources, African academia can champion the development of open-source learning platforms for data analytics and data governance to train the African youth, especially unemployed graduates from high school and tertiary institutions. They can partner with indigenous companies to obtain internship opportunities for the youth and also curate and leverage local data to ensure that contextually relevant knowledge and skills are gained by the youth.

Academia and industry collaboration can be extended to the creation of data analytics/science clubs and hubs in local communities; thus, learning from the reading, robotics, sports, and development clubs and centres of learning created through private sector initiatives (see MTN Foundation activities across Africa [26]).

In addition, regional efforts are needed on women's participation in the data economy. This can be done by creating awareness and supporting training programmes for women at the pre-tertiary levels to women-owned businesses. Affirmative action can be modelled as grants or tax incentives for employers and institutions whose female employment or enrolment in the data economy is above a specific rate or comparable ratio to men. These actions can be extended to promote intentional efforts by employers and institutions to upskill women for the data economy.

Accessibility

1. Incentivising Stakeholders to Collaborate and Integrate Efforts
2. Establishing Common Open Data Banks within Countries and across Countries

One of the factors contributing to accessibility issues stems from the apparent political interference in access to data as well as the unavailability of open-source data banks within and without countries in the sub-region.

"Largely when you need data, it's either the data is not available or the data is sitting on someone's computer without any form of aggregation that can make it accessible to others...and even when it is aggregated, some agency will find a crummy excuse not to make it available to you" (Microsoft Certified Azure Data Scientist, Owarikids).

This situation is even compounded by language barriers which hamper the development of common platforms for accessing and analysing data across countries in the sub-region.

"Regional efforts are needed to regulate the data collection and management, especially in our sub-region where we have some countries speaking French and others speaking English...for example, if I speak English, I should be able to still work in a French-speaking country as a data analyst. There should be data banks which can translate languages to allow me to work smoothly" (Data Scientist, University of Ghana).

"Data should be entirely open and not just within specific countries alone so that if I'm an analyst and I need data to work on in another country, it should be open for me to access, whenever I want, provided I have clearance to do so" (Lead Developer, Rx Health Info Systems).

African governments, the private sector, and development agencies need to champion the implementation of policies and initiatives that can make data more open to businesses and organisations that need them. A starting point is to create a common platform where experts from different countries can collaborate and access shared local data from public or government agencies, especially in the sub-region. This could begin with a regional effort to incentivise African research institutions and governments to share data on an African open data platform for government, industry, and academia. African research institutions are already sharing the data on global research data platforms like Mendeley Data (https://data.mendeley.com/). Some governments are also sharing some data through open government data initiatives, which, though public, seem to be idle and lacking engagement with relevant stakeholders (including the media and researchers) whose activities centre on the use of government data [27].

In precis, there is a consensus on the need to share data. Still, there is a lack of integration between stakeholders who produce or share the data and those that can effectively use the data to innovate for society and better inform citizens and 'police' governments. Technology is necessary but not more important than the people and the processes which make it relevant. Without conscious involvement or engagement with stakeholders, open data platforms may remain largely idle and less impactful. The data culture is also at its nascent stages in the continent; hence continuous advocacy to engage stakeholders is prime. The media (as agents of information channel and dissemination), academia and startups (as agents of innovation) should be incentivised on their appropriate use of open national data. Incentives may span national recognition, innovation grants and capacity development scholarships and opportunities.

Regional efforts to circumvent national politics should aim at collaborating with professional networks or associations to establish sector-specific open data platforms that encourage knowledge-sharing, networking, and collaboration to innovate to benefit the entire continent (see data-related lessons from Ebola epidemics [28]). The benefits of an active sector-specific open data platform (targeted at professionals/practitioners) include rapid data sharing, co-creation of value/solutions, visibility of solutions developed through the shared data, the prompt and informed response by regulators and government, understanding of trends and prediction of future occurrences in the industry.

Adoption

There should be a conscious regional effort to create an enabling environment for data uptake by indigenous businesses in the sub-region. Regional efforts can be modelled as grants and tax incentives for employers and indigenous businesses that embrace data governance practices and innovatively use data to transform their business and create value for consumers, government, and society. These actions can be extended to promote intentional efforts by employers and institutions to share data for public good and innovation in industry and society.

Further, data from selected public and government agencies must be considered a "public good" to enable both public and private institutions to address developmental challenges and inform emergency response. However, data sharing across countries requires stakeholders (i.e. African governments, the private sector, and development agencies) to strengthen institutions that regulate data enterprises and to create the right or appropriate technical model for channelling and sharing data within agreed ethical principles and legal mechanisms. Thus, rather than having several non-uniform independent country-level regulations and policies, the standardisation of data governance policies and regulations at the regional levels is prime [29].

The institutionalisation of cross-border trade organisations such as the African Continental Free Trade Agreement (AfCFTA) is, arguably, a good starting point. However, there are emerging questions of concern on AfCFTA - are indigenous businesses aware of these agreements, what are the benefits to African businesses or multinationals (in Africa) who have already gained mileage in trading across Africa pre-AfCFTA, what is the level of big data readiness or digital trade readiness across the African countries, and how appealing is AfCFTA to indigenous business vis-à-vis its resource readiness and idiosyncratic institutional and infrastructural barriers?

Critically, the regulation of digital markets and moreover, data economy, in countries in Africa is still in its infancy. Some countries have general laws not particularly intended for a digital era and some laws or policies are being reviewed [29] or currently being developed for digital transactions for specific sectors (e.g. Ghana National ePharmacy Policy, [30]). Largely, some laws or policies have loopholes engendering opportunities for cybercrime [31, 32]. Some countries are also introducing taxes for digital transactions and social media ([e-levy in Ghana, [33]; internet in Uganda, [34]; Foreign Digital-Services tax in Nigeria, [35]). These barriers and emerging trends collectively tend to limit consumer trust, increase uncertainty for businesses and increase costs for digital businesses.

Regional efforts are prime but presently there are adequate barriers which tend to send a caution that African governments, the private sector, and development agencies have to be realistic and measured in seeking a data-driven agenda. It could take more time and more effort to achieve substantial gains across the entire continent.

Table 3. A Framework of Recommendations for the Data-Driven Agenda among African Indigenous African Businesses

Pillar	Sub-pillar	Recommendations
Awareness	Educational curriculum development	1. Expanding educational curriculum to pre-tertiary education level to include data analytics - the curriculum should have a blend between theory and application. 2. Taking technology and data education to lower levels of the educational ladder
	Academia and industry collaboration	3. Sensitising indigenous businesses (including SMEs) on the value of data. 4. Academia and Industry need to collaborate to advance data analytics research, stimulate innovation in industry and create a skilled and contextually relevant workforce. 5. Development of open-source learning platforms for data analytics and data governance to train the African youth (students, dropouts and employed). 6. Establishing and resourcing community training/learning hubs and ICT centres of learning to include data analytics/science. Thereby, making data awareness and data-led solutions more accessible and closer to the youth and indigenous businesses in inaccessible and deprived communities.
	Enhancing women's participation in the data economy	7. Creating awareness and supporting training programmes for women at the pre-tertiary levels all through to women-owned businesses. 8. Modelling affirmative action as grants or tax incentives for employers and institutions who promote female employment and career development in the data economy.
Accessibility	Incentivising stakeholders to collaborate and integrate efforts	9. Establish mechanisms for continuous and frequent engagement between stakeholders who produce or share the data and those that can effectively use the data. 10. Media (as agents of information channel and dissemination) and academia and startups (as agents of innovation) should be incentivised on their appropriate use of open national data.
	Establishing common open data banks within countries and across countries	11. Avoid political interference in the collation and use of open data for open government initiatives. 12. Collaborate with professional networks or associations to establish sector-specific open data platforms which encourage knowledge-sharing, networking, and collaboration to innovate to the benefit of the entire continent.
Adoption	Institutionalising a data culture	13. Modelling regional efforts as grants tax incentives for employers and indigenous businesses that embrace data governance practices and innovatively use data to transform their business and create value for consumers, government, and society. 14. Regional efforts to encourage governments to institutionalise data from selected public and government agencies as a "public good" to enable both public and private institutions to address development challenges and inform emergency response. 15. Strengthening institutions that regulate data enterprises and establishing the right or appropriate technical model for channelling and sharing data within agreed ethical principles and legal mechanisms.

3.2
SUMMARY AND ADDITIONAL REFLECTIONS

3.2.1. Which sectors are gaining or 'winners' in the data-driven agenda? What value is being experienced or gained by the 'winners'?

Data analytics in indigenous businesses in Africa is in its nascent stages. Hence, it would be far-fetched to say that one industry or sector has taken a differential leadership. The data-driven agenda looks promising in industries like manufacturing (distribution), health, agriculture, and online platforms like social media, with enterprises deriving economic and symbolic value from descriptive, diagnostic, and predictive analytics. Economic value refers to an increase in revenue monitoring and generation, efficiency in managing business processes, and the discovery of new customers/markets. Symbolic value refers to improved service quality and customer experiences and perceived brand image and reputation and empowerment through informed decision-making and reducing revenue leaks. Data analytics in the agricultural sector, for example, provides opportunities for the need to ensure food security globally. A reliance on data from the agricultural sector keeps farmers informed about practices and activities (e.g. rainfall patterns, water cycles, and fertiliser requirements, among other things). This enables them to make informed decisions about which crops to grow and when to harvest for maximum revenue.

While all the sectors explored in the study (i.e., manufacturing, agriculture, healthcare, and social media) suggest some mileage in leveraging data, some specific sectors are subjected to more rigorous compliance processes than others. As established, the healthcare sector appears to be closely monitored by internal and external partners, and regulators within the sector as issues related to patient record confidentiality are paramount.

3.2.2 Key Enablers of Data-Driven Agenda in these Sectors
The growing need to innovate around data in these industries and the proliferation of automated tools and applications have made data analytics more friendly to indigenous firms. Technically, a combination of proprietary (e.g. Salesforce), open-source applications (Open Data ToolKit), bespoke applications (Rx Insurance), and social media analytic applications are used in data-driven activities among indigenous firms in Africa. These data-driven activities among indigenous firms tend to be often directly or indirectly enabled by the quest of multinational companies, who seek to mutually maximise their value-generating activities as their business partners or collaborators.

Thus, these multinational companies or institutions play a key role in creating awareness of the value of data and providing the motivation, and sometimes the technical and human resources, to enable indigenous firms to develop data analytics capabilities.

3.2.3 What is hindering the data-driven transformation of African indigenous businesses? What is hindering the 'losers'?

African indigenous businesses are in the early steps of becoming data-driven and innovative through data analytics. The findings in this report reveal the following as being the hindering factors;

- There is generally a lack of awareness with regards to the value that data can offer them;
- Amidst the lack of awareness is the lack of expertise/skills to mine and make meaning from the data these businesses deliberately or in-deliberately collect;
- Within the context of Africa, where technological infrastructure (e.g. data storage, data architecture, reliable internet connectivity) has more room for improvement, indigenous businesses that are willing to scale up and embrace data are often constrained, even if they want to scale to embrace data; and
- Embracing data is also a challenge for many indigenous businesses due to funding challenges in providing auxiliary activities and processes (i.e., recruiting the right skillsets, acquiring logistics, paying for software licenses, and meeting regulatory standards, among others). Thus, these businesses struggle to scale above existing digitalisation barriers amidst new threats and opportunities birthed by the digital economy.

3.2.4 What data-related regulations and processes can support indigenous business expansion in the digital economy?

Calestous Juma, an internationally recognised authority on the role of innovation in economic development argues that "*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*".

Thus, while there is a promise of the digital economy in Africa, data regulation in the sub-region is in its infancy and is increasingly becoming complex. African governments are seeking to strike a balance between the need to allow free movement of their data between jurisdictions and concerns about privacy, cybersecurity, protecting infant industries, and creating shared prosperity from the profits generated by data dominant firms, which typically collect data without regard for consent or compensation when they do so.

To support indigenous business, the 15 recommendations (Table 3) captured as Awareness, Accessibility and Adoption are a good guide for African governments, regional institutions, and development agencies.

3.2.5 How can better data governance help to resolve any identified digital and data inequalities?

Data governance is instrumental in setting up rules, infrastructure policies, technical mechanisms, and laws and regulations for the appropriate and responsible collation and use of data. This is critical in ensuring that public and private data can be used safely and legally to achieve development goals. Further, data governance enforces the social contract around data, by applying the principles of trust, value, and equity to the data that people share.

The following are proposed to resolve any identified digital and data inequalities;

- **Data infrastructure** - policies that promote universal access to internet data services which ensure that countries have adequate infrastructure to exchange, store and process data efficiently over the internet.

- **Legal and regulatory environment** - rules that enable the reuse and sharing of data while safeguarding against their potential abuse and misuse.

- **Economic policies** - normative economic policy issues which affect the ability to harness the economic value of data through competition, trade, and taxation.

- **Institutional ecosystem** - systems that ensure that data can deliver on their potential and that laws, regulations, and policies are effectively enforced.

Table 4. Pointers to Resolve Digital and Data Inequalities

Layer for Ensuring Equity	National	Regional and International
Data Infrastructure Policies	• Universal coverage of broadband networks • Domestic infrastructure to exchange, store, and process data	• Regional/Global technical standards for compatibility of hardware and software • Regional collaboration on data infrastructure to achieve scale
Laws and Regulations Environment	• Safeguards to secure and protect data from the threat of misuse • Enablers to facilitate data sharing among different stakeholders	• Cybersecurity conventions for collaboration on tackling cybercrime • Interoperability standards to facilitate data exchanges across borders
Economic Policies	• Antitrust for data platform businesses • Trade-in data-enabled services • Taxation of data platform businesses	• Regional/International tax treaties to allocate taxation rights across countries • Global trade agreements on cross-border trade in data-enabled services
Institutional Ecosystem	• Government entities to oversee, regulate, and secure data • Other stakeholders to set standards and increase data access and reuse	• International organisations to support collaboration on data governance and promote standardisation • Cooperation on cross-border regulatory spillovers and enforcement issues

Source: World Bank [25]

3.2.6 Recommendations for the Future

Fifteen recommendations have been outlined in this report to create an all-inclusive enabling environment for indigenous businesses. These recommendations are categorised into three
- Awareness (educational curriculum development, academia, and industry collaboration, and enhancing women's participation in the data economy);
- Accessibility (incentivising stakeholders to collaborate and integrate efforts and establishing common open data banks within countries and across countries);
- Adoption (institutionalising a data culture).

REFERENCES

[1]. Umezuruike, C., & Ngugi, H. N. (2020). Imminent Challenges of Adoption of Big Data in Educational Systems in Sub-Saharan Africa Nations. International Journal of Recent Technology and Engineering (IJRTE), 8(5), 4544- 4550

[2]. ElMassah, S., & Mohieldin, M. (2020). Digital transformation and localizing the sustainable development goals (SDGs). Ecological Economics, 169, 106490.

[3]. Cheong, l. K., & Chang, V. (2007). The need for data governance: A case study. In, Proceedings of the 18th Australasian Conference on Information Systems, Toowoomba (Australia), 2007- 12-06, Pp. 999-1008

[4]. Thomas, G. (2006). Alpha males and data disasters: the case for data governance. Brass Cannon Press.

[5]. Osakwe, S., & Adeniran, A. P. (2021). Strengthening Data Governance in Africa. Retrieved from https://tinyurl.com/2p8uk3fx

[6]. Van Belle, J. P. (2018). Africa data revolution report 2018: the status and emerging impact of open data in Africa. Retrieved from https://tinyurl.com/2p82kewr

[7]. Sakr, S., & Elgammal, A. (2016). Towards a comprehensive data analytics framework for smart healthcare services. Big Data Research, 4, 44-58.

[8]. Briter Intelligence (2021). Africa Investment Report. Retrieved from https://tinyurl.com/43dbhftz

[9]. Centre for the Studies of Economics of Africa (nd). Retrieved from https://cseaafrica.org/gism/digital-preparedness-index

[10]. Kamilaris, A., Kartakoullis, A., & Prenafeta-Boldú, F. X. (2017). A review on the practice of big data analysis in agriculture. Computers and Electronics in Agriculture, 143, 23-37.

[11]. Amu, H., Seidu, A. A., Agbaglo, E., Dowou, R. K., Ameyaw, E. K., Ahinkorah, B. O., & Kissah-Korsah, K. (2021). Mixed effects analysis of factors associated with health insurance coverage among women in sub-Saharan Africa. Plos one, 16(3), e0248411.

[12]. Achoki, T. (2019), Leveraging data analytics in the health insurance industry: an imperative towards Universal Health Coverage in Africa, 3rd Kenya National Uhc Conference.

[13]. Nofal, M. I., & Yusof, Z. M. (2013). Integration of business intelligence and enterprise resource planning within organizations. Procedia Technology, 11, 658-665.

[14]. Wohllebe, A., Dirrler, P., & Podruzsik, S. (2020). Mobile Apps in Retail: Determinants of Consumer Acceptance—A Systematic Review. International Journal of Interactive Mobile Technologies,14 (20), 153—164.

[15]. Wang, D., Park, S., & Fesenmaier, D. R. (2012). The role of smartphones in mediating the touristic experience. Journal of Travel Research, 51(4), 371-387.

[16]. Wang, Z., Wang, N., Su, X., & Ge, S. (2020). An empirical study on business analytics affordances enhancing the management of cloud computing data security. International Journal of Information Management, 50, 387-394.

[17]. Ouma, T., Kavoo, A., Wainaina, C., Ogunya, B., Karanja, M., Kumar, P. L., & Shah, T. (2019). Open data kit (ODK) in crop farming: Mobile data collection for seed yam tracking in Ibadan, Nigeria. Journal of Crop Improvement, 33(5), 605-619.

[18]. Ofoeda, J., Boateng, R., & Effah, J. (2019). Application programming interface (API) research: A review of the past to inform the future. International Journal of Enterprise Information Systems (IJEIS), 15(3), 76-95.

REFERENCES

[[19]. Manikas, K., & Hansen, K. M. (2013). Software ecosystems—A systematic literature review. Journal of Systems and Software, 86(5), 1294-1306.

[20]. Sankaran, S., Khot, L. R., Espinoza, C. Z., Jarolmasjed, S., Sathuvalli, V. R., Vandemark, G. J., ... & Pavek, M. J. (2015). Low-altitude, high-resolution aerial imaging systems for row and field crop phenotyping: A review. European Journal of Agronomy, 70, 112-123.

[21]. Monteiro, A., Santos, S., & Gonçalves, P. (2021). Precision Agriculture for Crop and Livestock Farming—Brief Review. Animals, 11(8), 2345.

[22]. Lee, I. (2018). Social media analytics for enterprises: Typology, methods, and processes. Business Horizons, 61(2), 199-210.

[23]. Statistical Commission (March 2020). Report of the Global Working Group on Big Data for Official Statistics. Retrieved from https://tinyurl.com/bdzr6m5k

[24]. Tennakoon, W. D. N. S. M., & Lasanthika, W. J. A. J. M. (2020). A Study on big data awareness among management undergraduates in Sri Lanka. Economic Research, 8, 1.

[25]. World Bank. (2021). Harnessing the value of data for the poor. Retrieved from https://tinyurl.com/2b76r3y7

[26]. MTN Foundation Projects. Retrieved from https://www.mtnonline.com/foundation/projects/

[27]. Bankuoru Egala, S. and Afful-Dadzie, E. (2022). Performance of open government data in a developing economy: a multi-stakeholder case analysis of Ghana, Transforming Government: People, Process and Policy, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/TG-10-2021-0158

[28]. Afolabi, M. O., Folayan, M. O., Munung, N. S., Yakubu, A., Ndow, G., Jegede, A., Ambe, J., & Kombe, F. (2021). Lessons from the Ebola epidemics and their applications for COVID-19 pandemic response in sub-Saharan Africa. Developing world bioethics, 21(1), 25—30. https://doi.org/10.1111/dewb.12275

[29]. Daza Jaller, Lillyana Sophia and Molinuevo, Martín, Digital Trade in MENA: Regulatory Readiness Assessment (March 30, 2020). World Bank Policy Research Working Paper No. 9199, Available at SSRN: https://ssrn.com/abstract=3564742

[30]. The Presidency.gov (2021). VP Bawumia Launches Policy, Guidelines For National E-PharmacyRetrieved from https://presidency.gov.gh/index.php/briefing-room/news-style-2/2110-vp-bawumia-launches-policy-guidelines-for-national-e-pharmacy

[31]. UNEconomic Commission for Africa (2021, 8 September). Cybercrime, A barrier to Africa's thriving digital economy. Retrieved from https://www.uneca.org/stories/cybercrime%2C-a-barrier-to-africa%E2%80%99s-thriving-digital-economy

[32]. CSEA (2021, 1 September). Are African countries doing enough to ensure cybersecurity and Internet safety? Retrieved from https://www.itu.int/hub/2021/09/are-african-countries-doing-enough-to-ensure-cybersecurity-and-internet-safety/

[33]. Oni, O. & Gasparri, A. (2022, 7 April). Ghana Announces Electronic Levy: Possible Scenarios on the Progress of Digital Financial Inclusion. Retrieved from https://www.uncdf.org/article/7408/ghana-electronic-levy

[34]. Kafeero, S. (2021, 3 July). To control speech, Uganda is taxing internet usage by 30%. Retrieved from https://qz.com/africa/2028653/uganda-replaces-ott-social-media-tax-with-tax-on-internet-bundles/

References.... continued

[35]. Oyenyi, A. (2022, 4 March). Nigeria captures foreign tech firms in its tax net. Retrieved from https://qz.com/africa/2137660/google-meta-and-others-raise-nigeria-prices-due-to-digital-tax/

[36]. South African Institute of International Affairs: SAIIA (2020). Africa's ICT infrastructure: Its present and prospects. Retrieved from https://saiia.org.za/research/africas-ict-infrastructure-its-present-and-prospects/

[37]. Saleh, M. (2021). Digital skills adoption rate in Africa 2019-2030, by country. Retrieved from https://www.statista.com/statistics/1255566/digital-skills-adoption-rate-in-african-countries/

ABOUT THE CSEA

The Centre for the Study of the Economies of Africa (CSEA) is an independent non-profit research organization established in April 2008 by Dr. Ngozi Okonjo-Iweala, former Managing Director, World Bank, and also Nigeria's past Coordinating Minister for the Economy and Honourable Minister of Finance.

CSEA was borne out of the need to bridge the gap caused by the paucity of rigorous empirical research that affects the quality of policies implemented in African countries.

The Centre's location in Abuja, the capital city of Nigeria, also provides close proximity to government agencies.

CSEA serves as a forum for quality research analyses, and policy dialogue by stakeholders from the private sector, government, national assembly, and civil society. The policy-oriented research carried out by the Centre, including the articulation of policy choices, tradeoffs and implications, is put forward to the general public and decision-makers to stimulate rigorous debates on the effects of government policies on economic growth and development in Nigeria and Africa.

CSEA is poised to assist in disseminating best practices to enable African governments to improve their public financial management systems. The Centre carries out applied research and presents policy options to enhance macroeconomic stability, fiscal transparency and accountability Similarly, CSEA advocates for greater fiscal transparency and accountability, reduction in leakages of public funds and improvements in governments' delivery of social and public services.

In addition, CSEA engages in capacity building with the goal of fostering rapid economic growth and alleviating poverty on the African continent.

DATA-DRIVEN ENTERPRISES IN AFRICA

- An Evaluation of Winners and Losers

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