

TECHNOLOGY INFRASTRUCTURE OPTIMIZATION AND THE DEVELOPMENT OF AGRO-ALLIED SMEs IN NIGERIA

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Article History: Received: 16 / 07 / 2025. Accepted: 28 / 10 / 2025. Published: 07 / 10 / 2025.

Abstract: This paper examined the role of technology infrastructure optimisation in the development of agro-allied SMEs in Nigeria. Following the related challenges of illiteracy among farmers, poor funding and the lack of collaboration within the Nigerian agricultural sector, the imperatives of technology infrastructure optimization are examined in line with strengthening and reinforcing the competitiveness, change receptivity and innovativeness of agro-allied SMEs. The Technology Acceptance Model (TAM) was also adopted as the theoretical premise and framework for delineating the role of technology infrastructure to organisation efficiency and effectiveness. Literature highlighted related technology infrastructure such as the IoT-based irrigation systems, the Farm Management Information Systems (FMIS) automated machinery such as GPS equipped tractors and others; all of which pose significant advantage and usefulness where optimised. It was concluded that technology infrastructure optimization is useful and serves the developmental goals of Nigerian agro-allied SMEs with regards to competitiveness, innovativeness and survival in the business context of the 21st century.

Keywords: *Technology infrastructure optimization, SMEs, enterprise development, Nigerian agricultural sector, technology acceptance model.*

Cite this article: OLOMI, P. O. (2025). TECHNOLOGY INFRASTRUCTURE OPTIMIZATION AND THE DEVELOPMENT OF AGRO-ALLIED SMEs IN NIGERIA. *MRS Journal of Accounting and Business Management*, 2 (11),1-4.

Introduction

Economies are changing. Competition is today, marked by a surge in technology development and innovation, and an emphasis on value alignment that is structured to not only ensure the survival of business but also its effectiveness (Akinwale et al., 2023; Bharadiya, 2023). More importantly, technology applications have in the current dispensation, facilitated a diversity of business interests, models and frameworks that now support a variety of functions, work systems, and operations across various sectors of the global economy (Ahmed et al., 2023). Most of these include the emergence of FinTech organisations, the growth in hybrid and remote work, the development and use of robotics in global retail and supply chain organisations (Ahmed et al., 2023; Damilola, 2022; Sodirovich, 2023). However, one area that has scarcely been addressed, when it comes to technology infrastructure and the optimization of such, is that of agricultural or agro-allied SMEs, especially such within developing African Countries like Nigeria.

Ogino (2022) argued that given the potentials, opportunities and existing capacities, the development of agriculture businesses and SMEs has rather been disappointing. This observation resonates with the views of numerous scholars (Alders et al., 2019; Adewale & Belewu, 2022; Mahmood, 2011) who identify the laxity in efforts channelled toward agriculture and the poor

attention offered toward sustainable agricultural policies. Mahmood (2011) identified the agro-allied industry as significant to the wellbeing of the economy. Apart from its role in improving the employment rate, standard of living and general supply and distribution of food and fibre, the agriculture industry has also been recognised as vital in stirring the economy from its current dependence on the oil and gas sector; a condition, most affirm to being unsustainable. Mahmood (2011) further noted that the shift from oil and gas to agriculture, would demonstrate sincerity in the economy's long-term wellbeing, and a more decentralised disposition to productivity and development; involving all key levels (micro, meso and macro) in the process.

Related research (Imoisi & Ephraim, 2015; Ibeogu & Abah, 2016; Oji-Okoro, 2011) affirms to the evidence of operational lag, poor investment and weak funding of agro-allied businesses and the poor attention offered the Nigerian agriculture industry. Ibeogu and Abah (2016) examined the significance of partnerships, and collaborative frameworks in the development of agro-allied businesses in Nigeria. According to Ibeogu and Abah (2016) partnerships, both international and local, support knowledge and skill transfer and facilitate effective agro-allied operations. Similarly, Imoisi and Ephraim (2015) observed that there is a need for improved participation by stakeholders in the agricultural industry. This is important in pooling ideas and investments,

resources and thus contributing at various levels to the development and support for agro-allied businesses. However, there is a paucity of research or studies addressing the role of technology infrastructure optimisation in the development of agro-allied SMEs in Nigeria. This research, thus, offers a theoretical position on the relationship between the variables; drawing on the Technology Acceptance Model (TAM).

Literature Review

Technology Acceptance Model (TAM)

The choice, application and optimization of technology infrastructure, builds on the understanding of the leverage technology offers, and an acceptance of its imperatives in the current business dispensation (Uwaifo and Uddin, 2009). The Technology Acceptance Model (TAM), developed by Fred Davis in 1989 (Cau & Hu, 2002), describes an approach to technology acceptance and use that draws on two major factors, (a) the perceived usefulness of the technology, and (b) the perceived ease of the use of the technology. *The perceived usefulness of the technology*, describes the extent to which referents or the individual, considers the technology as important or necessary, in their effectiveness and the achievement or actualisation of objectives and goals (Cau & Hu, 2002; Lee, 2009). To this end, it addresses concerns in line with output comparisons, quality of products and the extent to which adopted technology systems actually enhance and improve on existing processes and operations (He et al., 2017).

The second factor, the perceived ease of the use of the technology, bothers with the extent to which, the technology is not only cost-effective, but also easy to integrate and apply within established operational structures and frameworks. It details concerns over training, or the engagement of staff in line with manning related technology systems (Momani & Jamous, 2017). Chen and Chen (2009) pointed to the extent to which such perceptions shape the attitude of businesses toward technology. According to Chen and Chen (2009) these can be considered legit concerns as they also bother on technology control, efficiency and the effective monitoring of processes and outcomes. This aligns with Chau and Hu (2002) observation that technology can be disruptive. Despite its related potential and proposed significance in organisational change and competition, where poorly managed or controlled, technology can create disillusion of progress, while in actuality, draining the organisation of its values and deepening its debt through expenses.

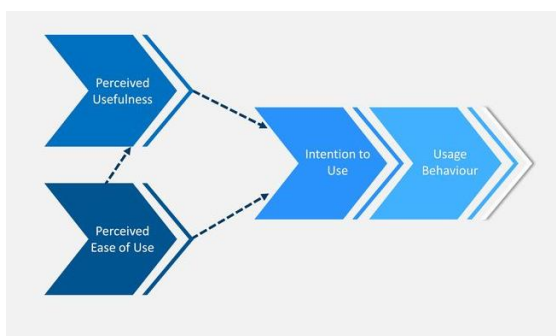


Figure 1: Technology Acceptance Model (TAM) (Davis, 1989)

Within the context of this paper, the TAM is adopted as a theoretical framework in expatiating the concerns of technology infrastructure optimization; drawing on the perceptions, and attitudes of businesses, groups and stakeholders toward the

optimization of technology infrastructure comprising hardware, software, network systems and others. Zamani (2022) linked the poor adoption and focus on technology integration in the Agricultural sector as a consequence of distrust and illiteracy among farmers and agro-allied entrepreneurs, noting that the reluctance of these groups to engage such technologies in their agro-allied enterprises stem from their aversion to change and their preference for existing traditional farming practices, models and systems. Such concerns are not only considered precautionary in view of some negative experiences, for example fraud and exploitation by third parties, but are also hinged on the SMEs desire to maintain control of their businesses and enterprises; thus, preferring to maintain existing small-scale productions rather than risk the loss of their business in the technology-based expansion or development (Zamani, 2022).

However, technology infrastructure optimization entails not just the adoption, but also the control and effective integration of technology in the operations of the business. Zamani (2022) argued that there is a need for a more structured and ethical-oriented approach to technology use. This is supposed to strengthen the trust in such systems, encouraging its use and reliance, while maintaining its integrity. This agrees with the observation that technology systems and infrastructure today, require stricter measures, especially in a country like Nigeria; given increasing concerns of cybercrime, and online fraud. Likewise, Uwaifo and Uddin (2009) opined that the investment in technology systems should also incorporate related control measures that clearly establish operational parameters, monitoring and essentially, ethical boundaries that emphasize transparency, and professionalism. These are crucial in driving collaboration between agro-allied SMEs and stakeholders, and also in facilitating sustainable development for such enterprises and for the sector as well.

Technology Infrastructure Optimization

Technology is a central factor in businesses and work systems. Its conditioning of functions, processes and its integration of work facets, contribute toward outcomes of efficiency and effectiveness (Idris, 2019; Salawu, 2008). Alabi et al., (2022) asserted that technology dictates the quality of work; facilitating the extent to which functions and operations turn out seamless. This agrees with Salawu's (2008) view that technology can be considered the pivot for organisational as it enables system fluidity and coherence. These features, as Alabi et al. (2022) pointed out, advance the strategic and competitive posture of the organisation. However, the evidence of technology, does not invariably imply the optimization or effective application of such in the organisation. Studies (Sodirovich, 2023; Drydak, 2022) indicate that despite evidence of technology and supportive frameworks, most Nigerian industries, particularly those of manufacturing and agriculture, yet fail to capitalize on opportunities occasioned by globalisation and information technology.

Technology infrastructure optimisation, describes the intentional and deliberate focus on the use and adequate engagement of the organisation's technology systems. Akinwale et al. (2023) identified technology infrastructures as comprising network resources, hardware, software, data storage, operating systems, and all of which are crucial in enabling knowledge management, connectivity and the transfer of information across various platforms, and levels in the organisation. Akinwale et al. (2023) noted that technology infrastructure today, determines the

operational capacity of organisations; enabling change receptivity and the development of features that are imperative for driving the economic concerns and goals of the organisation. This reiterates of position of (Ahmad, 2023) that technology, is the bedrock of innovation and performance in the 21st century, given the current operational dynamics of the business context and the attributes enabled through infrastructure such as hardware and software.

The Development of Agro-Allied SMEs

Agro-allied SMEs are agriculture-based enterprises that profit from the transformation and utilisation of farm products in the creation of finished products; such that are useful and offer value to consumers (Mahmood, 2011). Agro-allied SMEs are such that commercialise their farm-related activities, advancing operational structures, designed to ensure economic advantage or interest from related product and service offerings (Chauvin et al., 2012). Ntale et al. (2015) described most African countries as having a high potential for agriculture due to their vast arable lands and favourable climates, both of which support and present opportunities for farming and the expansion of agriculture. Unfortunately, these opportunities and the related prospects are largely ignored and hardly developed. Apart from the poor level of infrastructure and funding, Ntale et al. (2015) argued that most farmers in Nigeria are illiterates and are that there exists a significant gap in terms of stakeholder's inclusion in government agriculture policy formulation and implementation.

Creating conducive conditions where businesses can thrive and also enabling supportive frameworks within the agricultural sector, drives investment within the sector. This promotes active participation at all levels, including the development of agro-allied SMEs (Atarere, 2016). By development, one refers to the emergence and evolution of agro-allied SMEs that are equipped and have the requisite capacities to effectively advance their business concerns at the local and global markets. Development also entails relative stability, in terms of policy consistency. This is imperative for trust-based relationships or partnerships between the government and the various stakeholders of the industry (Opafunso & Adepoju, 2014; Sertoglu et al., 2017). Atarere (2016) identified the changes in government agro-allied policies, and the inconsistencies in regulatory measures as highly unsettling and discouraging for investors. According to Atarere (2016), there is the need to bridge such concerns, through improved integration and collaboration within the sector.

Technology Infrastructure Optimization and the Development of Agro-Allied SMEs

The development of agro-allied SMEs, points to the strengthening and reinforcement of the features and operations of the related enterprises in ways that advance their competitiveness and capacity to match the pace of change in their environment or markets (Bharadiya, 2023). Ogiriki and Atagboro (2022) argued that technology systems create advantages for businesses, enabling a more responsive and efficient disposition, that is imperative for the strategic posture and success of the business. Such features are crucial for agro-allied SMEs, especially since it would provide the basis for their effective adaptation to the realities of their environment, and the changing nature and approaches to global agro-allied business practices and markets. Research (Salawu, 2008; Sodirovich, 2023; Adeyemi et al., 2023) identifies various forms of technology infrastructure that are currently applied in most developed countries, such that have contributed significantly to business and farmers operations and which could also positively

drive the operations and development of agro-allied SMEs also in Nigeria.

Most common examples of the optimization of technology infrastructures, especially in Western and European countries include, the use of automated systems and robots in the performance of routine and repetitive functions, for example, the repetitive spraying of crops, Smart irrigation using IoT-based irrigation systems, the integration of Farm Management Information Systems (FMIS) which facilitates cloud-based in the storage and management of farm data; enabling the tracking and monitoring of such. Others include automated machinery, for example the use of tractors and other farm equipment, equipped with GPS for effective navigation and mechanised farming operations (Adeyemi et al., 2023; Akinwale et al., 2023; Drydak, 2022). The application of these technology systems, anchor on ensuring a more convenient, consistent and integrated approach to farming; creating a holistic outcome where various aspects or attributes of operations are clearly controlled and channelled in a cohesive and coherent manner.

Conclusion

Technology infrastructure is critical to the operations of businesses and groups today. It offers an efficient and effective way of harmonising organisational functions and creating a more coherent disposition toward the pursuit of organisational objectives and goals. Within the context of the Nigerian agricultural sector, the optimization of technology infrastructure, can facilitate automated farming support for regular or routine farm tasks, and farming management of farming records, transactions and other related processes. Technology infrastructure optimisation, as discussed in the paper, also extends to the enabling of frameworks that support partnerships between organisations. Such involve the use of systems such as the FMIS, which allows for knowledge or information transfer, through network sharing and cloud-storage. In essence, technology infrastructure optimization, can contribute to conditioning of the processes and operations of agro-allied SMEs in ways that contribute to their development, thus, advancing their competitiveness, innovativeness and capacity to thrive within the dynamic business context of the 21st century.

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