EFFECTS OF ADOPTION INTENSITY OF DIGITAL MARKETING TECHNIQUES ON THE EFFICIENCY OF FOOD COMMODITY MARKETING IN IMO STATE, NIGERIA.

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CERTIFICATION

This is to certify that this work titled "**EFFECTS OF ADOPTION INTENSITY OF DIGITAL MARKETING TECHNIQUES ON THE EFFICIENCY OF FOOD COMMODITY MARKETING IN IMO STATE, NIGERIA**." was carried out by **Anyanwu, Amarachi Theodora. (Reg No. 20174083818)** in partial fulfillment for the award of Master of Science (M.Sc.) Degree in Agricultural Economics.

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DEDICATION

This thesis is firstly dedicated to God Almighty who has always been my strength and source of inspiration; He is my ever-present help in times of need; secondly to my loving parents for all the sacrifices they made for me from cradle to this point in my life and lastly to my sweet and amazing Husband who has always been supportive all through this journey.

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ABSTRACT

The study examined the effects of adoption intensity of digital marketing techniques on the efficiency of food commodity marketing in Imo State, Nigeria. The specific objectives were to describe the socioeconomic characteristics of the respondents, describe the various digital food marketing techniques in food commodity marketing, determine the adoption intensity of digital marketing techniques in food commodity marketing, analyze the factors influencing adoption intensity, in digital food marketing techniques, determine the effect of adoption intensity, its features on the rate of return in capital investment on digital food marketing techniques, and determine the effect of adoption intensity, its features on the efficiency of digital food commodity marketing techniques in the study area. Primary data were collected from 150 respondents using a well-structured questionnaire and the data were analyzed using descriptive statistics, adoption index model, multinomial logistic regression model, and Ordinary Least Square multiple regression models. Descriptive statistics revealed that the average age of digital food marketers was 34 years. The majority were female (61.33%) and possessed tertiary education qualifications (68.67%). Most respondents were married (56%), had an average household size of four persons, and had six years of experience in digital marketing. Findings on digital marketing techniques indicated high adoption rates for Facebook (5.00±0.00), WhatsApp (5.00±0.00), Instagram (4.88±0.432), TikTok (4.11±1.190), X Handle (3.42±1.459), SMS (5.00±0.00), YouTube (3.03±1.211), and Affiliate Marketing (3.02±1.712). Adoption intensity scores further showed Facebook (5.00), WhatsApp (5.00), Instagram (5.31), TikTok (5.30), X Handle (4.88), SMS (5.00), YouTube (4.24), and Affiliate Marketing (4.73) as key platforms used.The usage distribution revealed universal use of Facebook, WhatsApp, and SMS (100% each), while Instagram (90.67%), Affiliate Marketing (61.33%), YouTube (59.33%), TikTok (56%), and X Handle (36%) followed. Classification based on adoption intensity identified Late Adopters (22%), Late Majority (63.33%), Early Majority (13.33%), and Innovators (1.34%). Multinomial logistic regression showed that factors such as age ($P<0.01$), educational attainment ($P<0.05$), and access to information ($P<0.1$) significantly influenced adoption categories, with a pseudo-R^2 value of 63.2%. Analysis of the impact on capital investment returns indicated that 73.8% of the variation was explained by the model's variables. Significant factors included adoption intensity ($P<0.1$), cost of platform use ($P<0.01$), educational level ($P<0.01$), and marketing experience ($P<0.01$). Similarly, the model assessing efficiency showed that 74.5% of the variation was accounted for by the explanatory variables. Cost of use ($P<0.01$), education ($P<0.01$), and marketing experience ($P<0.01$) were key influences on the efficiency of digital food marketing. In conclusion, the study recommends stakeholders should consider subsidizing online training costs to encourage wider participation in digital marketing. Greater public awareness initiatives are also necessary to boost digital food marketing adoption, while regulatory bodies should enact laws to safeguard users of digital platforms.

Keywords: Adoption, Food Commodity, Digital Marketing, Digital Techniques, Efficiency.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Food commodities are primarily agricultural products that are traded in bulk on commodity exchanges. They are typically unprocessed or minimally processed and are used as inputs in the production of food products. Food commodities such as grains, dairy products, meat, eggs, sugar, fruits, and vegetables are essential for human consumption and their continuous supply is required to meet the current food demand of an increasing world population (Siva & Nur-Diana, 2022).

The marketing of Food commodity plays an essential role in the country's economy and food security by providing market access for farmers to enable them to sell their farm produce and provides income opportunities for farmers, traders, and other key players in the supply chain. Marketing makes it possible for specialization to take place. With the exchange system, people do not consider it plausible to labour themselves again to produce all they need. They tend to specialize on producing what they have relative advantage over others. The result of specialization is improvement and increase in production which contributes to economic growth and development (Udah, 2020).

The marketing of food commodities ensures that consumers have access to nutritious and affordable food by facilitating the distribution of food products from locations where they are produced in surplus to locations where they are in deficit; it ensures a consistent supply of essential food items to both urban and rural areas contributing to food security. It also ensures that farmers receive a fair price for their products by regulating supply and demand. Jari and

Fraser (2009) noted that some activities involved in agricultural and food marketing like processing, retailing, storage, and transportation also provide employment opportunities.

The traditional marketing of food commodities is faced with numerous challenges; Awoyinka, (2009) stated that agricultural markets in the country are poorly developed and ill-organized and are inadequate in the face of growing demand for products due to population growth and changing dietary demand patterns, Ateke (2015) stated that there is paucity of data and information which limit forecasting, planning, farm management and various marketing practices.

Iyagba and Anyanwu (2012) further pointed out that there are no organized ways of transmitting price information in Nigeria's agricultural markets; there is therefore no mechanism for coordinating production activities of the millions of farmers with the demand of millions of individuals, corporate and institutional consumers.

Oguoma, Nkwocha & Ibeawuchi (2010) stated that farmers encounter high production costs in their efforts to boost production but hardly get fair pricing for their products from the numerous middlemen and the bulk farm gate buyers. The real profit goes to the middlemen who buy up the farm products at almost give away prices and sell at outrageous prices to the consumers.

The digitalization of food commodity marketing has the potentials of removing most of these bottlenecks to improve agricultural and food marketing. Digital marketing is the use of digital channels, platforms and technologies to promote products and services and also engage with target audience. It involves a wide variety of marketing tactics to promote products, services and brands (Tairova, Aminova & Kadirova, 2021). Digital marketing is the use of digital technologies in the promotion of products or services to consumers. It entails the use of strategies

and tools that use the internet and electronic devices to connect with potential customers. Tairova et al. (2021) observed that traditional marketing methods are giving way to digital marketing, implying that every sector irrespective of geographic location should key in order to harness the full potential of the digital era. According to Leviakangas (2016) digitalization involves the integration of technological innovations into an existing system in such a way that it changes how the systems operate.

Digital Marketing transforms the way food commodity marketers promote, distribute, and sell their products, digital marketing has the ability to accurately obtain and measure results and effectiveness. It also makes it possible to reach many people in different locations quickly at a time, receive information from them and quickly analyze thereby enhancing flexibility in decision-making (Tairova et al., 2021). Abishek, Bharathwaj & Bhagyalakshmi (2016) noted that the use of digital marketing techniques in agricultural and food commodity marketing can ensure fair prices to the farming community by providing freedom of pricing and freedom of access. Digital marketing can bring significant benefits through better information on market prices and signal opportunities to producers, consumers, and traders. It can reflect changing consumption patterns and contain information that can be used by farmers to decide what and how much to produce (FAO, 2018).

Digital Marketing Platforms such as social media, search engines, and e-commerce, websites allow food commodity businesses to reach a wider market beyond their immediate vicinity, it offers more cost-effective options such as social media advertising and email marketing other than the traditional marketing methods of physical promotion allowing businesses to reduce marketing expenditures (Harsimran & Ramandeep, 2023). Digital platforms allow customers to

leave reviews and feedback about food products which inform for improvements or boost credibility; the connection of farmers directly with buyers helps reduce post-harvest losses and waste as farmers can better match production to market demand, this connection also streamline the supply chain reducing intermediaries, lowering costs and enhancing overall efficiency.

Studies have shown the potential of digital marketing techniques in food marketing. Bojkic et al. (2016) reported that the application of digital technologies in agricultural marketing improved selling, advertising, and gathering of information related to agriculture in Croatia. Hejazi & Bokor (2021) found that digitalization helped local farmers in gaining brand awareness in Budapest, Hungary. He further reported that digital technologies (social media) helped in the interactions among stakeholders in agricultural marketing. He also found that digital technologies helped farmers in knowing the trending agricultural products.

However, the effect of digital marketing techniques on food commodity marketing is a relatively unexplored terrain. While the adoption of digital marketing is on the rise, a comprehensive understanding of the level of adoption of these digital marketing techniques, and the effects these digital technologies have on the marketing of food commodities, including their benefits and challenges is essential for informed decision-making by stakeholders and policymakers.

1.2 Statement of the Problem

Nigeria has witnessed a radical advancement in the Information Communication Technology (ICT) sector within the last few years. Nigeria has seen incredible growth in ICT resources and facilities, and about twenty- eight million Nigerians now have access to the Internet and mobile phone devices (Ogbeide-Osaretin & Ebhote, 2020). Internet penetration in Nigeria is estimated to be 55.4% with over 76 million online shoppers (Sasu, 2023), The growth of e-commerce

platforms like Jumia, Konga, and Payporte reflects the digital transformation in retail implying that many Nigerians now shop online for a wider range of products; the rise of Fintech companies like Flutterwaves, paystack and Interswitch has revolutionized digital payments and financial services, making it possible to transact without physical involvements. This explains the fast rise of digital marketing in the country.

According to Desai (2019), Digital marketing encompasses all marketing efforts that use an electronic device or internet. Businesses leverage digital channels such as search engines, social media, email and their websites to connect with current and prospective customers. This can also be referred as 'online marketing', 'internet marketing' or 'web marketing'. Digital marketing is defined by use of numerous digital tactics and channels to connect with customers.

The importance of digital marketing cannot be overemphasized, digital marketing can help to creates customer services through chatting, give advice to customers about products for sale on their websites; train customers on the use of products, provide online product categories, attracting buyers and sellers online, take orders online, give firsthand information on new products, make prices more transparent, help consumers gain a better picture of their true value and build customer relationship (Ogbeide-Osaretin & Ebhote, 2020). It brings significant benefits through better information on markets, prices signal opportunities to producers, consumers, and traders, reflect changing consumption patterns, and contain information that can be used by farmers when they decide what and how much to produce (FAO, 2018).

However, it is important to understand the intricacies of integrating digital marketing techniques into the marketing of food commodities. Several authors have investigated digital marketing techniques in relation to food and agricultural marketing; Tonny, Palash, & Moniruzzaman

(2019) investigated the use of ICT in the decision-making of agricultural marketing; Factors determining farmers' involvement in Bangladesh; Khou & Suresh(2018) investigated the use of social media in agricultural marketing; Inegbedion et al (2020) investigated on the use of social media in the marketing of agricultural products and farmers' turnover in South-South Nigeria; Nwoye, Onubogu & Uzochukwu (2021) investigated on availability and utilization of digital marketing tools among fresh African Catfish marketers in Omambala Region of Anambra State, Nigeria. However, none of these studies appears to have focused on the cost and returns of using these digital marketing techniques and their efficiency, neither is their adequate empirical evidence on the level of adoption of these digital marketing techniques by food commodity marketers. Besides, related studies on the effect of digital technology in the marketing of food commodity in Imo State are relatively scarce or non-existent.

The understanding to what extent these digital marketing tools have been embraced by participants in the food commodity marketing industry, the various determinants of the levels of adoption of these digital technology techniques, the cost associated with the adoption of digital marketing techniques and the corresponding returns on investment and the efficiency of these digital marketing tools on food commodity marketing is the gap this study is set to fill.

1.3 Objectives of the study

The broad objective of the study is to examine the effects of adoption intensity of digital marketing techniques on the efficiency of food commodity marketing in Imo State, Nigeria. Specifically, the study seeks to:

i. describe the socioeconomic characteristics of the respondents in the study area;
ii. describe the various digital food marketing techniques of respondents in the study area;

iii. determine the respondents' adoption intensity of digital marketing techniques in food commodity marketing in the study area;
iv. analyze the various factors influencing the adoption of digital marketing techniques in food commodity marketing in the area;
v. determine the effect of adoption intensity and its features on the rate of returns to capital invested in digital marketing techniques of food commodity marketing in the area;
vi. determine the effect of adoption intensity and its features on the efficiency of digital food commodity marketing techniques in the area.

1.4 Hypotheses of the Study

HO_1: There is no significant relationship between the level of education of the respondents and their adoption intensity of digital marketing techniques.

HO_2: There is no significant relationship between adoption intensity and the rate of returns to capital invested in digital marketing techniques.

1.5 Justification of the Study

The rapid advancement of technology and increased use of internet and smartphones has made digital marketing a pivotal aspect of modern marketing; therefore, it is necessary to understand the dynamics and impact of these digital marketing technologies on food commodity marketing.

The study of the adoption intensity of these digital marketing techniques will provide insights on how well these technologies have been adopted by food marketers in the study area; relating this adoption intensity of digital marketing technologies to the efficiency and rate of returns on capital will provide insights on how digital marketing can affect marketing

process, it will help to ascertain if digital marketing has any impact on cost savings and increased profitability.

The findings from this study will inform policy makers of the potential benefits of embracing digital marketing technologies and the setbacks in the adoption of these technologies which will in turn influence policy decision related on infrastructure development, capacity-building initiative aimed at fostering digital literacy among stakeholders.

The findings from this study will contribute to the existing academic knowledge by adding empirical evidence on the effect of digital marketing technology adoption on the efficiency of food commodity marketing particularly within the context of Imo State and also provide foundation for further research in the digital marketing

CHAPTER TWO
LITERATURE REVIEW

2.1 Conceptual Literature

2.1.1 Concept of Marketing

Marketing, in the context of agriculture refers to a range of activities that facilitates the movement of farm produce from the point of origin to the final consumer. It encompasses economic operations that include production, planning, harvesting, processing, packaging, storage, transportation and distribution of agricultural goods. According to Hassanzoy, (2013) Agricultural marketing is not limited to selling produce but also involves coordinating services that ensure products reach consumers efficiently.

Kotler and Philip (2009), views marketing as a human activity aimed at satisfying needs and wants through exchange process. It involves various business activities that direct the flow of goods and services from producers to customers. Hence, marketing connotes a series of activities involved in moving the goods from the point of production to the point of consumption as well as the creation of time, place, form, and possession utilities. Agricultural marketing is defined as the performance of all business activities involved in the supply of farm inputs to the farmers and the movement of agricultural products from the farms to the ultimate consumers (Acharya and Agarwal, 2010).

Agricultural marketing in a broader sense is concerned with the marketing of farm products produced by farmers and of farm inputs and services required by them in the production of these farm products. Therefore, agricultural marketing includes product marketing as well as input marketing. Marketing of agricultural commodities begins with production decisions on the farm (what and how to produce? when and where to produce? how much to produce? etc.), and it is

completed once the product reaches the final consumers. In broad terms, marketing comprises strategic and tactical planning processes that aim to meet customers' needs and bring maximum profit

2.1.2 Concept of Digital Marketing

Businesses are increasingly moving into the digital space due to the spread of the Internet, rising competition, and globalization. Entrepreneurs have had to change their means of advertising to attract more customers and survive in the global market. Online marketing, also known as digital marketing is a process that uses information technologies to develop long-term relationships between companies and customers (Valdas, 2017).

Digital Marketing can be of two types: As a marketing strategy component of a whole organization, or as a standalone system that contains all traditional marketing components transferred into e-space (Kotler & Keller, 2006).

According to Winer (2007), digital marketing is associated more with an external perspective, using the Internet to liaise with the traditional environment, providing services to customers, and reducing costs (administrative, etc.). Internet technologies enable businesses to create the following competitive advantages:

i. Effective sales
ii. Effective advertising
iii. Improving customers' service
iv. Effective planning
v. Improving communication effectiveness
vi. Personalization and

vii. Reducing expenses

Mahaveer (2018) describes digital marketing as the application of internet-based tools and strategies to engage and attract potential customers. Often referred to as Internet Marketing, Web Marketing, Digital Marketing, or Online Marketing, it involves leveraging digital platforms such as websites, mobile devices, computer and other online media to promote goods and services. Unlike traditional marketing methods, digital marketing enables businesses to reach a much wider audience and to focus efforts on individuals who are more likely to be interested in their offerings. These strategies are not limited to websites; they also include communications through email, social media and mobile networks.

When applied to Agriculture, digital marketing entails promoting and selling farm products through online channels, allowing producers to connect directly with consumers or businesses. The core principle of successful marketing remains the same: reaching the right people at the right time. Given today's high screen time and internet usage, businesses have turned to digital platforms as the most effective place to meet their target audiences. As a result, companies-agricultural ones includes are increasingly adopting digital marketing techniques to enhance visibility and boost sales.

2.1.3 Concept of Marketing Efficiency

Efficiency means that the ratio of work to output is low. Marketing efficiency implies producing the maximum return for minimal cost, both in terms of budget and resources. In short, marketing efficiency focuses on reducing marketing costs without reducing output or results. According to Otekunrin, Momoh & Ayinde (2019), marketing efficiency is usually segmented into two form, 'technical efficiency' and 'economic efficiency'. As these

concepts are frequently confused, it seems necessary to clarify the difference between them. Technical efficiency concerns the effectiveness or competent with which the physical aspects of marketing are performed.

Economic efficiency in marketing refers to achieving the desired output while using the least possible resources. For a marketing system to be considered efficient, it must ensure that every function or activity is carried out with the highest possible output—whether measured in physical goods or monetary terms—using minimal inputs.

Technical efficiency focuses on achieving maximum productivity using the best available technology. For instance, air transport might be the fastest and most effective way to move goods over long distances, and using machines for grading agricultural produce could be more precise than manual methods.

However, technical efficiency does not always guarantee economic efficiency. Economic efficiency considers cost-effectiveness and profitability. For example, although air transport may be technically superior, its high cost per unit may make it economically impractical compared to rail transport. Similarly, in regions where labor is inexpensive, manual grading might be more cost-effective than mechanical grading, despite the latter's technical advantages.

In essence, a marketing system is economically efficient when it uses the most profitable methods to perform its tasks, even if they are not the most technologically advanced. The aim of overall marketing efficiency is to provide goods to consumer in the required from, at the required time and place, and with the lowest possible marketing costs consistent with the

interests of the producer. The principal means of ensuring that lower costs and/or improved services resulting from efficient marketing are passed on to producer and/or to consumer is the pressure of competition (Otekunrin et al., 2019).

2.1.4 Technology Adoption

Technology adoption refers to the process by which businesses and individuals begin to use and integrate new technologies into their daily operations. In the context of food commodity marketing, this involves the implementation of digital tools to enhance marketing efforts. Successful adoption requires a deliberate and coordinated approach, ensuring that relevant departments within an organization effectively utilize the new technology.

Altadonna (2023) outlines a model known as the Technology Adoption Life Cycle, which breaks down adoption into five key groups:

1. **Innovators**: These are the earliest adopters of new technology. They are adventurous, open to taking risks, and eager to experiment with emerging ideas. Innovators usually have the financial and technical resources to try out new tools first and often influence others through their early experiences. They make up about 2.5% of the overall population.
2. **Early Adopters**: This group follows closely behind the innovators and plays a critical role in the widespread acceptance of new technologies. Often seen as thought leaders and influencers within their communities, early adopters are respected and their opinions can significantly impact the broader market. They comprise roughly 10-15% of the population.

3. **Early Majority**: These individuals take more time to consider new technologies before adopting them. They prefer to see proof of value and positive results from others before committing. Representing around 33% of the population, their adoption marks the transition from novelty to mainstream use.
4. **Late Majority**: This group is more skeptical and cautious about change. They tend to wait until a new technology is widely accepted and well-tested before adopting it themselves. Often influenced by peer pressure or necessity, they also account for about one-third of the population.
5. **Laggards**: Laggards are the last to adopt new technologies, if they do at all. They tend to favor traditional methods and are generally resistant to change. This group, which represents approximately 16% of the population, may only adopt innovations when there are no other options left.

Understanding these adopter categories can help businesses, especially in agriculture, plan effective strategies for introducing and promoting new digital marketing tools.

2.1.5 Market Participation

Market participation is a core concept in agribusiness and has been interpreted in diverse ways by different scholars. Generally, it refers to the involvement of farming households in economic transactions—whether through cash or barter—that support the sale of agricultural products (Otekunrin et al., 2019). Another perspective defines it as the integration of small-scale or subsistence farmers into both input and output markets with the aim of improving their income levels and reducing poverty (Olukosi, Isitor, & Ode, 2007). In this context, commercialization or

market orientation is often measured by the proportion of farm output that is sold rather than consumed.

Access to markets plays a significant role in encouraging participation. For smallholder farmers, this could mean selling produce directly at the farm gate or transporting it to local markets. Active market participation is associated with greater adoption of improved agricultural technologies, which in turn enhances overall productivity (Singbo, Badolo, Lokossou, & Affognon, 2021).

Singbo et al. (2021) also highlight that market engagement encompasses the use of purchased inputs and the sale of farm products, ideally with the goal of maximizing profit. In this study, market participation is viewed as the shift from subsistence farming—where most products are consumed by the household—to a more commercialized model where farmers rely on purchased inputs and sell outputs to external buyers. This transition is driven by farmers' ability to meet market expectations in terms of product quality, consistency, timeliness, and fair pricing (Poole, 2017).

2.1.6 Digital Transformation

Digital transformation refers to the adoption and integration of digital technologies by organizations to redesign or improve their products, services, and operations by digitizing core processes. This transformation is being increasingly pursued by both public and private actors aiming to enhance the efficiency of agricultural markets.

In regions such as Africa, where agricultural systems are often underdeveloped and dominated by smallholder farmers operating on fragmented plots, digital solutions are being employed to address key challenges (Abate, Makhija, & Spielman, 2023; Aker, Ghosh, & Burrell, 2016). These digital initiatives focus on linking buyers with sellers, providing real-time price

information, and lowering transaction costs and risks in agricultural trade. As a result, digital innovation has become a vital component of efforts to modernize food systems and promote inclusive market access.

2.2 Theoretical Literature

2.2.1 Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Davis in 1986, is a well-established theoretical framework used to understand and predict user acceptance and adoption of technology. The model identifies two key factors that influence users' decisions to embrace new technologies: **Perceived Ease of Use (PEOU)** and **Perceived Usefulness (PU)**.

Perceived Ease of Use refers to the degree to which a person believes that using a particular system would be free of effort. Perceived Usefulness, on the other hand, is the extent to which a person believes that the technology will enhance their performance or meet their needs.

For example, older adults who find digital marketing applications difficult to use are less likely to adopt them. In contrast, if they perceive these apps as easy to use and beneficial—for instance, as convenient tools for buying and selling products or for mental engagement—they are more likely to be interested in learning how to use them and to adopt the technology.

TAM, as explained by Taherdoost (2018), was built from the foundations of the theory of reasoned action (TRA) and the theory of planned behavior (TPB).

However, core construct central to both theories (e.g., social norms, behavioral intentions) manifest in technology acceptance processes across global contexts. Zhang and colleagues

(2019), for instance, integrated TPB into their examination of the impact of individual differences (e.g., efficacy, attitude, personal health status, disease vulnerability) on mobile health services adoption in China, reinforcing the salience key of TRA/TPB components on use.

Beliefs and misconceptions about the risks of online marketing information (OMI) sharing exacerbate challenges in the acceptance process. Information management is recentered in digital technology acceptance processes given that OMI privacy boundaries (e.g., permeability, linkage, and ownership) not only vary across the lifespan, but have differing rules for online and offline information sharing (Magsamen-Conrad et al., 2020) and the perceived interpersonalness of online marketing management apps are influential in adoption decision making.

Bol and colleagues (2018) reference UTAUT and DOI, and present another construction of privacy in their examination of health technology usage among Dutch smartphone users. They found associations between privacy concerns related to surveillance, intrusion, and secondary information use, and specific mobile health app use among Dutch smartphone owners who had downloaded health apps, underscoring the importance of a multidimensional understanding of privacy in this context. Understanding the nuances of the construction of privacy, information ownership, and boundaries as an interpersonal process within a digital environment is complicated by the variance in how personal users perceive the environment to be (e.g., teleconferencing with marketers vs. inputting marketing information into digital apps). Those concerns when they intersect with marketing information security (e.g., hackers, data breaches; Glowacki et al. 2021) are receiving increased attention as technology acceptance theory develops in post-COVID-19 global contexts, and people become progressively reliant on and motivated to navigate marketing of food commodity in a digital space.

2.2.2 Diffusion of Innovation Theory

The Diffusion of Innovation Theory explains how new ideas, technologies, and practices spread within a social system. It highlights the transfer of information, which can lead to behavioral change, typically following a vertical flow—from innovators to adopters. This model considers five main elements that influence the diffusion process:

1. **Innovation Characteristics** – The features of a new idea or product that can impact its adoption.
2. **Innovation-Decision Process** – The series of steps individuals follow from initial exposure to a new concept through to its adoption or rejection.
3. **Change Agents (Opinion Leaders)** – Influential individuals who are more open to adopting innovations early and often influence others.
4. **Adoption Rate** – The speed at which an innovation is accepted within a group.
5. **Communication Channels** – The methods used to spread the innovation, and the presence or absence of a supportive social structure.

Anaeto, Onabajo, and Osifeso (2012) explain the adoption journey through stages: awareness, interest, evaluation, trial, and adoption.

Rogers further identifies five categories of adopters:

- **Innovators** – Risk-takers who try new ideas first.
- **Early Adopters** – Open to change and often respected opinion leaders.
- **Early Majority** – Wait to see evidence of success before adopting.
- **Late Majority** – More cautious and resistant to change.

- **Laggards** – The most skeptical and resistant group, typically the last to adopt new ideas.

2.2.3 Market Performance Theory

Market Performance Theory examines how well marketing systems function in achieving economic and social goals. It focuses on the efficiency and outcomes of market interactions, particularly in the context of agricultural commodity markets.

According to Bain (2020), market performance can be assessed by evaluating factors such as pricing relative to production costs, output volume, efficiency of production methods, and innovation in techniques or products. Essentially, it's about how well the market fulfills both the expectations of society and the stakeholders involved.

Zhang, Chi, and Hong Seock-Jin (2017) highlight that market performance serves as a key indicator of business success, often reflected through market share growth and operational efficiency.

Marketing performance share is the metrics and outcomes that marketing departments look at 63 to determine how well their marketing activities are plans. Marketing performance is defined as doing at achieving the goals in their marketing the alignment between the marketing team's stated goals and objects versus actual results. It is measured using a selection of metrics and key 19 performance indicators (KPIs), including return on investment, cost per sale, cost per lead, conversion rate, and customer lifetime value (Singbo et al., 2021). Those marketing metrics are not the only elements to consider when understanding marketing performance as a concept, there are marketing departments that need to focus on planning for future marketing activities using

predictive analytics to determine the best activities to employ, and such planning is done by the marketing performance management, who plans and strategize on activities to achieve market performances.

2.3 Empirical Literature Review

The study by Gbughemobi, Umebali, and Nkamigbo (2021) explored the socioeconomic variables and accessibility of ICT among smallholder rice farmers in Southeast Nigeria. Their findings revealed that 61.3% of the farmers were male, with 39.7% being female, confirming the male-dominated nature of rice farming in the region—traditionally viewed as a male-oriented occupation. This aligns with Ettah and Kuye's (2017) observations that recorded a similar trend in gender distribution among rice farmers.

Age distribution among the respondents indicated that 31.9% were aged 31–40 years, 27.3% were between 21–30, 26% between 41–50, 10.1% between 51–60, 3.4% under 20, and only 1.3% above 60. The average age was 38, suggesting that most of the farmers were still within their productive years. Given the physical demands of rice farming, this demographic structure supports the potential for increased ICT adoption.

Educationally, the average number of schooling years was 10, reflecting a relatively literate farming population. This is critical for ICT engagement, as noted by Ettah and Kuye's (2017), who emphasized the role of literacy in enhancing productivity and technological comprehension among farmers.

Interestingly, the Tobit regression analysis presented by Gbughemobi et al. (2021) revealed that while variables such as sex, education, farming experience, crop income, and cooperative

membership were not statistically significant, age had a negative effect on ICT use, with a coefficient of -0.040 at a 5% significance level. This implies that as age increases, ICT adoption decreases by 4%, likely due to reduced willingness or ability to engage with new technologies. Marital status also negatively affected ICT use, with a coefficient of -72.2% at a 1% significance level, suggesting that increased family responsibilities could limit digital engagement.

In contrast, the farmers' primary occupation positively influenced ICT use, with a 34.9% coefficient at a 1% significance level. Those transitioning into farming from other occupations may be more inclined to utilize digital tools to acquire necessary agricultural knowledge. Household size was another significant factor, with a positive effect of 14.5%, indicating that larger households may have more members capable of utilizing digital tools to access and disseminate agricultural information. Farm size also positively influenced ICT use (0.3%), perhaps due to the greater need for improved farm management and extension services.

These findings differ from those of Kabir (2015), who argued that educational attainment and farming experience were key drivers of ICT utilization in agriculture.

Adeniyi and Yekini (2018) also studied the use of ICT for agricultural marketing information (AMI) in Oyo State. Their study showed that 72.8% of the respondents were aged 33–52 years, with a mean age of 45.7, indicating a relatively young and active demographic. Additionally, 83.2% were male, and 79% had received formal education, with an average of 9.6 years of schooling—further supporting the idea that literacy enhances ICT engagement.

Their results also indicated that 92.3% of the respondents were married, and 63% had households with 6 to 10 members. The high marriage rate may reflect a sense of responsibility and a greater interest in accessing marketing information to improve income from agricultural activities.

Okello et al. (2014) emphasized that socioeconomic variables such as gender and cooperative membership positively affect market commercialization through ICT usage. Similarly, Martey (2014) found that various socioeconomic factors, when considered together, significantly influenced commercialization levels. Although ICT-based information alone did not significantly affect market participation, the combination of gender, age, marital status, non-farm income, and cooperative affiliation created favorable conditions for improved market involvement. This finding was also echoed by Kyaw, Ahn, and Lee (2018), who suggested that market participation and its intensity are determined by multiple interrelated factors at various decision points.

2.3.2 Empirical literature review on various digital food marketing techniques

In today's world, digital marketing has become an integral part of our lives due to the extensive use of mobile technologies, social media platforms, and eWOM. It has replaced traditional modes of communication and marketing. As a result of intense global competition and new technology, the marketing industry has become more sophisticated. These factors have a considerable impact on customer behavior and how tourists perceive various destinations.

According to a study conducted by Finotto & Mauracher (2020), small wineries in the wine industry prefer digital marketing strategies due to their effectiveness in communicating product information and terroir, lower cost compared to traditional marketing, and ability to reach

foreign markets. Although the benefits of digital marketing are widely acknowledged (Alreany et al., 2022), small wineries seem to benefit more from it.

In a literature review by Alreany et al. (2022) on digital marketing strategies and their impact on online businesses during the COVID-19 crisis, it was found that digital marketing played a significant role in the marketing of commodities, particularly food commodities. Therefore, businesses today are trying to adopt digital marketing channels to provide customers with the best possible services to increase their satisfaction levels. The study identified four factors, out of which operational strategic factors and environmental factors had a direct and positive impact on the development of a digital marketing skill gap. The study also revealed that the largest and smallest skill gaps in digital marketing for the investigated organizations were in the areas of Principles of Communication and Predicting the Future, respectively (Ghotbifar, Marjani and Ramazani, 2017).

As per Dewi (2020), social media can be considered as a virtual medium that helps people enhance their social interactions. The digital marketing approach of Wonderful Bali has been able to establish a positive reputation among consumers due to the company's effective connection with them through public relations. Almost every business owner has used digital media to sell their products. The advent of the internet and social media has led to predictions of growing consumer power in the digital age. This has led to businesses rethinking their digital marketing strategies to accommodate changes in consumer behavior. Currently, most of the research in this area is focused on the client rather than the firm. The second generation of internet applications enables marketing efforts by allowing businesses to experiment with new modes of communication and collaborate with their customers on content creation. To increase

customer engagement through digital marketing, marketers must emphasize relationship-based interactions (Bizhanova, Mamyrbekov, Umarov, Orazymbetova & Khairullaeva, 2019).

The emergence of the internet and information technologies has brought about significant changes in the business world over the past decade. Businesses have had to adapt their internal structures and organizations in response to the digital environment created by Internet business models and digital marketing approaches. However, studies show that Micro, Small, and Medium Enterprises (MSMEs) still rely heavily on traditional customer acquisition and retention techniques, and have yet to fully adopt digital marketing techniques. This is hindering their financial performance, as marketing tactics involving information and communication technology (ICT) have a direct impact on their success. By increasing the level of adoption of these tactics, the MSME sector's financial performance can improve.

Studies conducted in Pakistan's banking sector show a significant correlation between e-commerce and organizational performance, with the deployment of e-commerce providing benefits to business operations, employee job performance, and consumer satisfaction. In the Isabela province of the Philippines, however, the financial performance of MSMEs is characterized as "low," with limited access to credit and working capital. Providing sufficient financing to MSMEs can help to increase and sustain their profitability and growth.

The COVID-19 pandemic has further emphasized the importance of online shopping and e-commerce platforms like Lazada and Shopee are expected to continue leading online sales platforms, with sales revenues projected to reach millions of pesos. Online marketing has become a crucial tool for businesses, as it is a low-cost yet effective way to attract clients 24

hours a day. The rapid progress of computerized media has paved the way for new channels of publicity and promotion, resulting in the rapid development of computerized promotion.

2.3.3 Determinants of adoption and adoption intensity of digital marketing techniques in food commodity marketing

Results of Albore, Anshiso & Getachew (2019) study in Sheko Woreda of Bench-Maji Zone, South West Ethiopia, showed that farmers tend to adopt only certain components of beekeeping technology packages and that there is variation in the intensity of use of these components. The study found that diversity among farmers in their level of package adoption could be attributed to economic, social, personal, institutional, and psychological factors. Understanding why farmers adopt some components and not others, and the underlying reasons for the variation, is crucial. The survey revealed that 32% of the total respondents were non-adopters of beekeeping technology, while of the adopters, 9.5% were low, 44.5% were medium, and 14% were high adopters. The mean adoption index scores of non-adopters, low, medium, and high adopters were 0.000, 0.166, 0.217, and 0.300, respectively. One-way analysis of variance showed a significant mean difference (F=2.401& P=000) among the adoption index scores of the four adopter categories. Thus, there was variation in the level of adoption of beekeeping technology among farmers in the study area.

The study also used a censored Tobit model to determine the factors that influence the adoption and intensity of adoption of honey bee hive technology. The model revealed that among the twelve explanatory variables, six significantly influenced adoption and intensity of adoption. These were livestock (TLU), apiary visit (APVIST), market distance (MARKTDIST), knowledge of beekeeping management (KNLDBEMGT), availability of technology (AVAILTECH), and perceived cost of technology (PRICPERC).

Arfida, Nurainia & Suliswantoa (2017) researched strategies for increasing the competitiveness of food commodities in the digital era. The study identified E-commerce as a vital tool for business activities that involve consumers, manufacturing, and marketing agents, using computer networks, specifically the Internet. The E-commerce system is classified into three types:

1. Electronic Markets (EMS): A platform that utilizes information and communication technologies to perform and present offers in a market segment, allowing buyers and sellers to transact more quickly and efficiently. This means for sellers to quickly distribute information about their products to reach more buyers.

2. Electronic Data Interchange (EDI): A means to streamline the data exchange transactions that are repeated regularly in large quantities between commercial organizations.

3. Internet Commerce (IC): The use of internet-based information and communication technology to trade. Transactions can be done on the Internet, usually through the booking/purchase of goods and then shipped after the buyer makes a transfer payment to the seller's account.

Arfida et al. (2017) also discovered that the competitiveness of food commodities in a region is not only about fulfilling the availability of food in that region but also ensuring that the public at large in other regions can access the food. Therefore, the competitiveness dimension of food commodities is not only about developing a good agricultural foundation in the region but also has a dimension of product marketing. Attention to food commodities cannot only be seen from a macro or aggregate aspect but must also use a smaller unit of analysis like the household or farmer. Food security at the household level is crucial and needs to be monitored from time to time. The success of this monitoring depends on well-organized data collection systems.

Improving the competitiveness of food commodities is not just the obligation of the government but also the wider community. Therefore, public participation in efforts to increase the competitiveness of food commodities is very important. The government, as a facilitator and a dynamic economic region, needs support in creating a climate that is conducive to the production and marketing of food and agriculture products in general, both at farm and investment levels, through deregulation packages and institutional restructuring of agriculture. Public participation in efforts to increase the competitiveness of food commodities can be shaped to support efforts to improve the capacity of food production and agriculture in general. The public should also accept new technologies, respect domestic or local food products, and increase their knowledge about the pattern of good food that matches their expectations so that they can acquire sufficient nutrition for a healthy body and productive life.

In efforts to maintain public health, providing infrastructure and health facilities is crucial. With the development of globalization and trade liberalization, some food commodities have become increasingly strategic commodities. Therefore, researchers propose a program to help farmers market their agricultural products to improve information related to food commodities.

2.3.4 Factors Influencing the Adoption Categories of Digital Marketing Techniques in Food Commodity Marketing

Eze et al. (2020), in a qualitative investigation of the key factors driving the adoption of digital marketing technologies by service-oriented micro-businesses in Nigeria, identified several critical variables across different contextual domains. Within the technological context**,** factors such as functional capability, adaptive capacity, and system scalability were emphasized. In the

organizational context, collective understanding, strength of partnerships, and information diversity played significant roles in influencing adoption. Furthermore, within the environmental context, the study highlighted customer satisfaction, the quality of service delivery, competitive pressure, and training availability as influential determinants.

Additional drivers such as financial budgeting, anticipated returns on investment, and opportunities for business expansion were found to contribute meaningfully to the decision-making process surrounding digital marketing strategy adoption. The study also pointed to the importance of reducing the resource burden through improved awareness and structured approaches to digital marketing device (DMD) integration among micro-businesses.

Complementing these findings, Otika, Anene, Osuagwu, and Uche (2022) conducted a quantitative analysis to uncover the determinants of electronic marketing (e-marketing) adoption among small and medium-sized enterprises (SMEs) in Nigeria. Their research identified eleven key factors affecting e-marketing uptake. This included information technology (IT) skills and knowledge, the educational level of business owners, resource availability, the presence of IT infrastructure and facilities, and perceived compatibility of digital tools with existing operations.

Additional influential elements were organizational size, access to IT experts, business owners' attitudes towards technology, financial constraints, and general IT awareness. These findings collectively emphasize that both technical and socio-organizational factors significantly shape the likelihood of digital marketing adoption across various business categories.

2.3.5 Effect of Adoption Intensity on the rate of returns on capital invested in digital marketing techniques of food commodity marketing

Simoes et al. (2020) compared three adoption rates (slow, medium, and fast) via two groups of farm size (small and large) and revealed that depending on farm size and rates, technological adoption effects differ in the short and long term. Technology adoption is profitable since unit costs of production are lower with high-income shares for adopters. Similarly, Verkaart et al. (2017) found that technology adoption significantly increases household income thus, reducing poverty. While the adoption of a new technology favoured all farm sizes, the impacts on income were greater with small farm size holders. Abdulai and Jumpah, (2021) on agricultural technologies adoption and smallholder farmers‟ welfare: Evidence from Northern Ghana. The study adopted the logistic regression model to analyze the impact of the project intervention using the Propensity Score Matching (PSM) procedure to determine the propensity scores of the variables determining participation and/or adoption of the technologies. The model results show a p> Chi^2 of 0.000 and Pseudo R^2 (0.43). This means that the model is asymptomatically significant at 99% and the independent variables explain about 43% of the variations in the dependent variable. The variables that are statistically significant in determining adoption of the technologies are the regional location of the farmer, age, educational level, Farmer Based Organization (FBO) membership, and the number of extensions visit. While age, FBO membership, and the number of extensions visit influence adoption positively; regional location, and educational-level influence adoption negatively.

2.3.6 Effect of Adoption Intensity on the Efficiency of Digital Food Commodity Marketing Techniques

Strong technological capabilities significantly facilitate the adoption of digital technologies, such as e-commerce and app-based marketing models, resulting in enhanced market performance. Research has shown that the innovation of e-commerce within the agribusiness sector is largely a consequence of enterprises' technological capabilities and their ability to adapt (Bramley & Ouzman, 2019). Furthermore, advancements in digital banking and payment processing technologies have proven essential in enabling agri-startups to scale their operations (Kruja-Demneri, 2020).

Jianli et al. (2023) explored the impact of e-commerce and digital marketing (DM) adoption on the financial and sustainability performance of micro, small, and medium enterprises (MSMEs) during the COVID-19 pandemic, using partial least squares structural equation modeling (PLS-SEM). Their findings highlighted that digital marketing played a crucial role in improving firms' financial performance during the pandemic.

Similarly, Chatterjee and Kar (2020) found that MSMEs in India that adopted digital marketing mechanisms experienced superior sales performance and overall business success. These findings align with those of Franco et al. (2016), who reported that MSMEs leveraging digital marketing tools, particularly through social media platforms like Facebook, experienced significant improvements in both financial outcomes (e.g., profitability) and non-financial metrics, including human resource performance.

Dumitriu et al. (2019) further emphasized the role of digital marketing tools in enhancing MSMEs' brand equity, thereby driving firm growth and sustainability. Their research underlined

the potential of combining digital marketing strategies with traditional marketing methods to foster long-term business viability.

Empirical evidence consistently shows that e-commerce adoption has a robust mediating impact on the sustainability of firms. Companies that adopted e-commerce platforms for selling their products generated higher financial outcomes, which could be reinvested into sustainable business practices. Additionally, many MSMEs have increasingly adopted digital marketing tools and strategies to connect with potential customers, improving their performance and contributing to long-term sustainability.

2.4 Analytical Literature Review

2.4.1 Descriptive Statistics

Descriptive statistics are a useful tool to summarize and organize the characteristics of a collection of responses or observations from a sample or entire population. After collecting data in quantitative research, it is important to describe the characteristics of the responses, which may involve determining the average of one variable, such as age, or examining the relationship between two variables, such as age and creativity. The next step involves inferential statistics, which helps you determine whether your data confirms or refutes your hypothesis and whether it can be generalized to a larger population.

Descriptive statistics aim to provide brief yet insightful summaries of the sample and its observations. These summaries may either be quantitative, such as summary statistics, or visual, such as easily understandable graphs. They may serve as the basis for the preliminary description of the data as part of a comprehensive statistical analysis or be adequate on their own for a particular investigation.

Descriptive and summary statistics have been around for a long time. The initial way statistics was approached was by tabulating populations and economic data. Exploratory data analysis has recently formulated a set of summarization techniques, with the box plot being a prime example.

2.4.2 Likert Scale

According to Bhandari and Nikolopoulou (2020), a Likert scale is a type of rating scale that is widely used to measure opinions, attitudes, or behaviors in various fields such as marketing, psychology, and social sciences. It consists of a statement or question followed by a set of five or seven answer statements, where respondents select the option that best aligns with their perspective on the statement or question.

Likert scales are an effective tool for capturing nuanced opinions and levels of agreement. However, they can be susceptible to response bias, where respondents agree or disagree with all statements due to fatigue, social desirability, or other factors. Additionally, some respondents tend to respond extremely or exhibit nonchalance.

Ehirim (2014) used a Likert-type scale called NAEITA + D to measure adoption stages, which was adopted and modified from Fakoya's (2006) NAEITA scale. The NAEITA + D is a 7-point Likert scale that stands for "Not aware", "Aware", "Evaluated", "Interest", "Trial", "Adopted", and "Discontinue" process of adoption of a digital food marketing technique by an ith respondent in the area. The adoption process model in this study follows a subjective preference of a digital technique by traders on their characteristics and the time of adoption and is expressed as:

$$ADP = NA\ AIETAd + D \qquad 2.1$$

Where:

The adoption process is abbreviated as ADP, and the awareness level is represented by NA (Not Aware), A (Aware), I (Interested), E (Evaluated), T (Tested), Ad (Adopted), and D (Discontinued). Each respondent assigns an ordinal value from 0 (not aware) to 6 (discontinued) to the adoption process of the jth digital technique. Therefore, the adoption score (ADS) ranges between 0 and 6. The standard mid value of the adoption process (SMAd) is calculated as the average of the total sum of ordinal values (X) assigned to the adoption process by the respondent.

$$\text{SMAd} = \frac{\sum X}{7} = \frac{0+1+2+3+4+5+6}{7} = 3.0 \text{----------2.2}$$

The study has already identified 11-point compendiums of digital food marketing techniques (DFMT), denoted as V_i as shown in a set notation in equation 3.3 below.

$$EST = \{V_i : i, 1...11\} \text{----------2.3}$$

Where;

$V_1 = \text{Facebook}$

$V_2 = \text{WhatsApp}$

$V_3 = \text{Instagram}$

$V_4 = \text{Tiktok}$

$V_5 = \text{Search engine optimization}$

$V_6 = \text{Twitter}$

$V_7 = \text{Pay per click}$

$V_8 = \text{SMS}$

$V_9 =$ YouTube

$V_{10} =$ Email

V_{11} = Affiliate marketing

The mean score of the jth technique will be estimated and used in identifying the digital techniques adopted by the respondents in food commodity marketing in the area by comparing it with the standard mid-adoption score of 3.0. Therefore, the mean adoption score of an ith technique is expressed as:

$$M = \frac{\sum FX}{\sum F} \text{----------} 2.4$$

The standard adoption mid value (SMAd) is used in making decisions by simply comparing the mean adoption level of each technique with the standard mid value. Therefore, a technique is said to be adopted at the point where the mean adoption score is just equal or greater than the mid value of 3.0

2.4.3 Adoption Intensity

The adoption intensity as used by Ehirim (2014) extended the process of adoption index (AI) to adoption intensity by subjecting an ith respondent adoption index to the maximum obtainable adoption index in an area. The maximum obtainable adoption index must have operated at the same time as the time of the respondent and it is adjusted by the same time of this study (Ehirim, 2014). Adoption intensity is expressed as:

$$AI = \frac{\text{Adoption Intensity of an ith trader}}{\text{Maximum Adoption index}} \text{----------} 2.5$$

The traditional adoption/diffusion continuum reorganizes five categories of adopters (Ehirim, 2014) and the distribution of these adopters within the adopters' population follows a familiar typically bell-shaped distribution curve in a system. The study will apply the normal distribution theory of the respondents into five adopter categories innovators, early majority, late majority, late adopters, and laggards in this study. Each category has adoption potential limits, which are broken by a change in adoption intensity using the mean and standard deviation. Adoption intensity therefore increases with an increase in a trader's attitude towards a technique or set of techniques (Fakoya, 2006). Adoption intensity as used in this study represents push or pulls to or from another adoption potential limit to the other.

$$AP = \frac{\sum_{i=1}^{N} AS_i}{N} \pm Std.Dev(n) \text{----------} 2.6$$

Where

AP = Adoption Potential

AI = Adoption Score

Std. Dev. = Standard deviation

n = Successive Adoption intensity

The various adoption categories emerge from the addition and subtraction of the standard deviation from the mean adoption score. The lower adoption categories are obtained by subtracting the products of successive adoption intensities and standard deviation from the mean adoption score. The higher adoption categories are estimated from the addition of the product of successive adoption intensities and standard deviation to the mean adoption score in the study.

2.4.4 Multinomial Logit Regression Model

A multinomial logit model is a polychotomous model (Ehirim et al., 2013; Ehirim, 2014) that predicts the utility derivable by an ith adopter falling in a choice based on his level of adoption intensity. If the utility derived from being in a certain category is expressed as:

$$U_{ij} = \gamma_j N_{ij} + \varepsilon_{ij} \text{ ----------2.6}$$

U_{ij} = Utility derived by the adopter derives in being in the jth category due to his adoption intensity

N_{ij} = The set of determinants that is constant across alternative categories

N_1 = Age of the traders in years

N_2 = years of traders experience in years

N_3 = household size (nominal value)

N_4 = level of formal education of the traders in years

N_5 = Access to Internet (nominal values)

N_6 = Technology compatibility index based on the number of years of training

N_7 = cost of using the device or platform or technology (₦)

N_8 = Amount of Operating Capital (₦)

N_9 = Number of information sources available to traders

$N_{10=}$ Food Commodity Marketing as a major source of Income (nominal Value)

ε_{ij} = The random

This model is built on 'j' possible categories, as 'j' = 1,2,3..., J. – that are exclusive and exhaustive (Cramer, 1991). In this analysis, the five (5) categories considered are: (1). None adopters or Laggards, (2). Late Adopters, (3). Late Majority, (4). Early Majority, and (5). Innovators.

The multinomial logit assigns probabilities $P_{ij}(1,2,...5)$ to the likelihood of an ith trader or adopter belonging to any of the 5 adopters' categories. The multinomial logit model as designed by Greene (1993), Babcock et. al., (1995) and Kennedy, (1998), is given by

$$P_{ij} = \frac{\exp^{\gamma_j N_i}}{1+\sum_{J=I}^{5}\exp^{\gamma_j N_i}} \qquad j=1,2,...,5 \text{----------} 2.8$$

P_{ij} is the probability of being in each of the groups 1,2,…,5

$$P_{i0} = \frac{1}{1+\exp^{\gamma_j N_i}} \qquad j=0 \text{----------} 2.9$$

P_{i0} is the probability of being in the reference group

γ_{ij} are estimated using LIMDEP(c) (Greene, 1993)

In practice, however, the reference category is usually normalized to zero (Madalla, 1983; Greene1993; Kimhi, 1994). This is because the probability of belonging to all adopter categories is summed up to unity. Hence, for J choices, only J_{5-1} distinct parameters can be estimated and identified.

The natural logarithm of the odd ratio of equation3.9 and 3.10 gives the estimating equation (Greene, 1993) as

$$\ln\frac{P_{ij}}{P_{i0}} = \gamma_j N_i \text{ ----------} \quad 3.10$$

This denotes the relative probability of each group to the probability of the reference group. The estimated co-efficient for each choice therefore reflects the effect of Ni's on the likelihood of the fishermen belonging to a category relative to the reference category. The Maximum Likelihood Estimation (MLE) method was used in estimating the model using LIMDEP 7.0 software (Greene, 1995). However, following Hill (1983), the coefficient of the reference category may be recovered by using the formula

$$\gamma_0 = -(\gamma_1 + \gamma_2 + \gamma_3 + \gamma_{5-1})$$

This is estimated in such a way that for each explanatory variable, the negative of the sum of its parameters for the groups is the parameter for the reference group.

2.4.5 Regression Analysis

The Ordinary Least Squares (OLS) is a regression method that estimates models to test relative and global statistics. It is a common technique used to estimate the coefficients of linear regression equations that describe the relationship between one or more independent quantitative variables and a dependent variable, simple or multiple linear regression. The model can be expanded by adding more explanatory variables to the equation. The form of the model remains the same as above, with a single response variable. (Y), but this time Y is predicted by multiple explanatory variables (X_1 to X_2). $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$. The interpretation of the

parameters (α and β) from the above model is the same as for the simple regression model above, but the relationship cannot now be graphed on a single scatter plot. α indicates the value of Y when all values of the explanatory variables are zero. Each β parameter indicates the average change in Y that is associated with a unit change in X, whilst controlling for the other explanatory variables in the model. Model fit can be assessed by comparing deviance measures of nested models. The model can be expressed in four functional forms,

(i) Linear functional form, the functional form is expressed as;

$$Y= \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_{3+} \beta_n X_n \quad \text{(Equ 1)}$$

(ii) Exponential functional form, this functional form is expressed as follows;

$$LnY = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_n X_n \quad \text{(Equ 2)}$$

(iii) Semi-long functional form, functional form can be expressed as follows;

$$Y = \alpha + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_n Ln X_n \quad \text{(Equ 3)}$$

And; (iv) Double-Log functional form, this functional form is expressed as follows;

$$LnY = \alpha + \beta_1 Ln X_1 + \beta_2 Ln X_2 + \beta_3 Ln X_3 + \beta_n Ln X_n \quad \text{(Equ 4)}$$

Eliot et al. (2012) define a statistic that measures the relationship between variables in a model. This statistic indicates the direction of the variables between dependent and independent variables, as well as the magnitude of the independent variables about the dependent variable. In other words, it shows how much the dependent variable changes when the independent variable changes by one unit.

For this study, regression analysis will be employed to analyze the effect of adoption intensity and its effect on returns on investment.

The effect of adoption intensity and its features on the rate of returns to capital invested (RoRCI) will be estimated using the ordinary least square (OLS) regression model for the cost and returns analysis of digital food commodity marketing. First, the RoRCI will be estimated using the RoRCI model as expressed below;

$$\text{ROI (Return on Investment)} = \frac{\text{Net Profit from Investment}}{\text{Cost of Investment}} X\ 100$$

Net profit from investment = $\sum TR - TC$

Where TR = Total revenue

TC = Total Cost of investment in digital food commodity marketing

Then, the RORCI estimated as the dependent variable with the adoption intensity and its features as the explanatory variables will be fitted into four functional forms of linear, semi-log, exponential, and Cob-Douglas equation before subjecting them to OLS. This is expressed as;

$RoRCI = f(X_1, X_2, X_3, X_4, X_5, \ldots e)$

Where;

RoRCI = Rate of Returns to capital invested in the digital technology

X_1 = Adoption intensity index of the traders

X2 = Cost of use of digital marketing technology (in naira)

X3 = Level of formal education (in years)

X4 = Level of experience in digital marketing (in years)

X5 = Number of trainings had in digital food commodity marketing

The lead equation will be estimated using the following criteria:

i. The model with the best fit.

ii. The model with the highest coefficient of multiple determinations is expressed as R^2.

iii. The model with the highest number of significant explanatory variables.

iv. The model with the consistent priory expectation is based on the sign of the explanatory variables.

2.4.6 Marketing Efficiency Model

Marketing efficiency is a measure of market performance. The movement of goods from producers to the ultimate consumers at the lowest possible cost consistent with the provision of service desired by the consumers is termed as efficient marketing. The marketing efficiency is given according to Sharma et al., (2000) as;

ME = (Net price received by the producers – Consumer's price)/ (Total Marketing Cost).

The Calkin's index of marketing efficiency is estimated using the following formula;

ME = 1+(Sum of profit/Sumof Marketing Cost)

Decision Rule:

The lower the value of the index, the higher would be the efficiency

The higher the value of the index, the lower would be the efficiency

Marketing efficiency is divided into operational efficiency and pricing efficiency. Operational efficiency measures the degree to which costs are reduced while output level either maintained or increased. However, marketing costs are incurred when commodities move from the point of production to the final market, whether they are moved by the farmers or marketing intermediaries.

On the other hand, pricing efficiency focuses on the need for the price in a commodity market to correspond to the value being exchanged.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Study Area

This study was conducted in Imo State, Nigeria. The state is made up of 27 local government areas. Agriculturally, the state is divided into three zones namely Owerri, Orlu, and Okigwe. It is located geographically within latitudes $4^0$45'N and $7^0$15'N and longitudes $6^0$50'E and $7^0$25'E with an area of around 5100sqKm (Nwaobiala, 2018). The state shares a border with Anambra State to the north, Abia State to the east, Rivers State to the south and River Niger and Delta State to the west. The population of Imo State stood at about 5,408,300 in 2016 and is estimated to grow at a rate of 3.8% per annum (Rural Access and Mobility Project, 2019).

Imo State is in the rainforest vegetative region with average rainfall, temperature, and relative humidity of 1500mm, 27^0 C, and 80% respectively. The vegetation is majorly characterized by tall trees with different layers of canopies and shrubs at the base. Agriculture is the predominant occupation of the people, for almost all farm families either as a primary or secondary occupation. The state agricultural production is characterized by large arable and tree crops with moderate livestock production spread across the three zones. The crops grown are grains like maize and rice with other tuber crops like yam, cassava, and cocoyam. The state is also known for its involvement in forest products such as timber and non-timber production. Off-farm production activities going on in the state, which include: processing and food preservation that are primarily done to prolong the shelf-life of the harvested arable and fruit crops are important food commodity marketing activities.

Food commodity marketing in the area is carried out in open markets mostly found in rural areas. Sometimes, aggregators buy from farmers directly on their farms and send them to urban and

bigger markets. However, the emerging digital protocols in the state have involved food commodities to help reduce the cost and improve the overall efficiency of food commodity marketing in the state.

3.2 Sample Selection Procedures

The emerging digital marketing of Nigeria and Imo State in particular has not fully developed a properly organized structure. The structural outlook of digital marketing in Nigeria is yet to include food commodity marketing but an important feature it has is that it is gaining a wide interest among the traders across the three zones of the state who adopted various devices and platforms to make their food product relevant and increase consumers' preferences and customers interest for their products. Since the market does not have a well-defined and suitable arrangement, the study adopted a snowball sampling technique.

The use of this technique was to enable the researcher to reach as many traders as possible who have identified with the different devices and platforms in food commodity marketing in the area. To have wider coverage, different food commodities such as grains, beans, palm oil, crayfish etc with their various outlets engaged in by these traders were identified using 150 respondents across the three zones of Imo State.

The study made repeated visits and referrals to the different respondents identified using the snowball sampling method. As soon as one (1) food commodity marketer using a digital marketing technique is located in an area, others within the same area who were referred by the respondents were also visited to get more respondents into the study.

3.3 Method of Data Collection

Data for the study were obtained mainly from primary and secondary sources. The primary data collection was done with the aid of a structured questionnaire. The instrument was divided into sections to correspond to the objectives of the study.

3.4 Method of Data Analysis

Data obtained for this study were analyzed using both descriptive and inferential statistics. The descriptive statistics included the use of mean, mode, and relative frequency distribution of the respondents. The inferential statistics obtained from econometric tools such as Multinomial Logit Model (MLM) regression analysis and ordinary least square (OLS) regression analysis were used.

Objective 1, which is to describe the socioeconomic characteristics of the respondents in the study area was analyzed using descriptive statistics such as frequency tables, mode, means, and percentages.

Objective 2, which is to describe the various digital food marketing techniques of the respondents was analyzed using mean and standard deviation estimated from the stages of adoption of digital marketing techniques in food commodity marketing by the traders in the area. A 7-point Likert scale used by Ehirim (2014) was adopted and used to measure the adoption stages of the respondents. The responses were rated into NA = Not Aware (0), A = Aware (1), I = Interested (2), E = Evaluated (3), T = Tested (4), Ad = Adopted (5) and D = Discontinue (6) A standard mid value of the adoption process (SMAd) is expressed as the average of the total sum of ordinal value (X) attached to the adoption process of an ith respondent and it is expressed as

$$\text{SMAd} = \frac{\sum X}{7} = \frac{0+1+2+3+4+5+6}{7} = 3.0 \quad \text{---------- (3.1)}$$

The study has already identified 11-point compendiums of digital food marketing techniques (DFMT), denoted as V_i as shown in a set notation in equation 3.2 below.

$$\text{EST} = \{V_i : i, 1 \ldots 11\} ------------------------ 3.2$$

Where;

V_1 = Facebook

V_2 = WhatsApp

V_3 = Instagram

V_4 = Youtube

V_5 = Email

V_6 = Search Engine Optimization

V_7 = Websites

V_8 = Pay-per-click (PPC)

V_9 = SMS

V_{10} = Tiktok

V_{11} = Affiliate marketing

The mean score of the jth technique was estimated and used in identifying the digital techniques adopted by the respondents in food commodity marketing in the area by comparing it with the standard mid-adoption score of 3.0. Hence, where the mean adoption score is just equal to or greater than the mid value of 3.0, techniques were adopted and if the mean adoption score is less than 3.0 the technique is not adopted

Objective 3, is to determine the adoption intensity of the respondents, hence their categories of adoption of digital food marketing techniques were achieved using the adoption intensity model as used by Ehirim, (2014) and adopted for this study. The model is remodelled as:

$$\mathrm{AI} = \frac{\text{Adoption intensity response score}}{\text{numbers of digital marketing techniques}} \qquad ---(3.4)$$

A compendium of digital food marketing techniques adopted by the traders varies across time and space and the variation is captured in adoption scores between cross products of 0 X 11 and 6 X 11 which was used to determine the adoption intensity. The scores obtained were divided by the number of digital marketing techniques to give an adoption intensity score.

The categorization of respondents into laggards, late adopters, late majority, early majority, and innovators was adapted from Rogers' (2003) Diffusion of Innovations theory, which group adopters based on their tendency and speed of adopting innovations. To operationalize this framework, adoption intensity (AI) scores were computed by dividing the total adoption response score (from the 7-point Likert scale applied across 11 digital food marketing techniques) by the number of techniques. Based on Ehirim (2014) and similar empirical studies, these AI scores were then used to classify respondents as follows: laggards (0.50–1.99), late adopters (2.00–2.99), late majority (3.00–3.99), early majority (4.00–4.99), and innovators (5.00 and above).

Objective 4, which is to analyze the various factors influencing the adoption categories of adopters of digital marketing techniques in food commodity marketing in the area was achieved using the categorization of marketers to different categories of adopters based on specification and estimation of the multinomial logit model. The model used by Ehirim, 2014) predicted the utility derivable by an ith adopter falling in a choice based on his level of adoption intensity was adopted for this study and is expressed as:

$$U_{ij} = \gamma_j N_{ij} + \varepsilon_{ij} \qquad ----------(3.4)$$

U_{ij} = Utility derived by the adopter derives in being in the jth category due to his adoption intensity

N_{ij} = The set of determinants that is constant across alternative categories

N_1 = Age of the traders in years

N_2 = years of traders experience in years

N_3 = household size (nominal value)

N_4 = level of formal education of the traders in years

N_5 = Access to the Internet (nominal values)

N_6 = Technology compatibility index based on the number of years of training

N_7 = cost of using the device or platform or technology (₦)

N_8 = Amount of Operating Capital (₦)

N_9 = Number of information sources available to traders

$N_{10=}$ Food Commodity Marketing as a major source of Income (nominal Value)

ε_{ij} = The random

This model is built on 'j' possible categories, as 'j' = 1,2,3..., J. – that are exclusive and exhaustive. In this analysis, the five (5) categories considered are: (1). None adopters or Laggards, (2). Late Adopters, (3). Late Majority, (4). Early Majority, and (5). Innovators.

Objective 5, is to determine the effect of adoption intensity and its features on the rate of returns to capital invested (RoRCI) model in digital marketing techniques of food commodity marketing in the area was achieved using the ordinary least squares (OLS) regression model. First, the RoRCI was estimated using the RoRCI model as expressed below;

$$\text{ROI (Return on Investment)} = \frac{\text{Net Profit from Investment}}{\text{Cost of Investment}} X\ 100 \qquad - - - (3.5)$$

Net profit from investment = $\sum TR - TC$

Where TR = Total revenue

TC = Total Cost of investment in digital food commodity marketing

Then, the RORCI estimated as the dependent variable with the adoption intensity and its features as the explanatory variables was fitted into four functional forms of linear, semi-log, exponential, and Cob-Douglas equation before subjecting them to OLS. This is expressed as;

$$RoRCI = f(X_1, X_2, X_3, X_4, X_5, X_6, \ldots e) \qquad - - - (3.6)$$

Where;

RoRCI = Rate of Returns to capital invested in the digital technology (per cent)

X_1 = Adoption intensity index of the traders

X2 = Cost of the digital technology (in Naira)

X3 = Level of formal education (in years)

X4 = Level of experience in digital marketing (in years)

X5 = Number of trainings had in digital food commodity marketing

A Priori Expectation

It is expected that the adoption intensity index (X_1)**,** level of formal education (X_3)**,** experience in digital marketing (X_4), and number of trainings attended (X_5) will have positive effects on the rate of returns to capital invested (RoRCI), as increased knowledge, skill, and adoption levels are likely to enhance marketing efficiency and profitability. Conversely, the cost of digital technology (X_2) is expected to have a negative relationship with RoRCI, as higher costs without proportional revenue gains may reduce overall returns. These expectations guide the interpretation of the regression results.

Objective 6, which is to determine the effect of adoption intensity and its features on the efficiency of digital marketing of food commodity marketing in the area was achieved using the ordinary least squares (OLS) regression analysis. Digital food marketing efficiency was estimated first value fitted as the dependent variable to estimate the effect of adoption intensity and its features on the efficiency of digital marketing of food commodity marketing. The model is specified as;

$$\text{Digital food Marketing Efficiency} = \frac{\text{value added from using digital marketing technique}}{\text{cost of the digital marketing technique}} \quad \text{- (3.7)}$$

Value added from using digital marketing was proxied into the numbers of completed transactions and the total amount realized from the completed transactions.

$$DFME = f(X_1, X_2, X_3, X_4, X_5, X_6, \ldots e) \quad \text{- - - (3.8)}$$

Where;

DFME = Digital Food Marketing Efficiency

X1 = Adoption intensity index of the traders

X2 = Cost of the digital technology (in Naira)

X3 = Level of formal education (in years)

X4 = Level of experience in digital marketing (in years)

X5 = Number of trainings had in digital food commodity marketing

Apriori Expectation

Based on theory and previous studies, it is expected that the adoption intensity, level of formal education, experience in digital marketing, and number of trainings attended will have positive effects on the efficiency of digital food commodity marketing. These factors are believed to enhance traders' ability to effectively use digital tools, improve operational performance, and increase value generated relative to cost. Conversely, the cost of digital technology is expected to have a negative effect on marketing efficiency, as higher costs without proportional gains can reduce overall efficiency.

3.5 Test of Hypotheses

HO 1: which stated that there is no significant relationship between the level of education of the respondents and their adoption intensity of digital marketing techniques was tested using the Z test.

HO 2: which stated that is no significant relationship between adoption intensity and the rate of returns to capital invested in digital marketing techniques was tested using Z test.

The model is specified as follows;

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \quad \text{---(3.9)}$$

where,

Z = Statistic value for judging the significant difference in the two samples

$\overline{X}_1$ = mean of first sample

$\overline{X}_2$ = mean of second sample

S_1^2 = variance of the first sample

S_2^2 = variance of the second sample

n_1 = sample size of the first sample

n_2 = sample size of the second sample

The model was specified for the two stated hypotheses.

Decision

If $Z_{cal} > Z_{tab}$ at 5%, the null hypothesis was rejected and an alternative hypothesis was accepted.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Digital Food Marketers in Imo State.

The marketer's socioeconomic characteristics such as age, sex, marital status, level of education, household size, digital marketing experience, and occupation were analysed using descriptive statistics such as mean, frequency distribution and per cent.

4.11 Age Distribution

The results of the age distribution of the digital marketers are presented in Table 1

Table 1: Distribution according to age

Age Limit	Frequency	Per cent	Cumulative per cent
20 – 29	43	28.67	28.67
30 – 39	72	48.00	76.67
40 – 49	32	21.33	98.00
50 – 59	3	2.00	100.00
Total	150		

Source: Field Survey Data Analysis, 2024 Mean Age (34.17 Years)

Table 1 shows that 28.67% of the respondents fall within the age limit of 20 – 29 years , 48.00% of the respondents fall within the age limit of 30 – 39 years, 21.33% of the respondents fall within the age limit of 40 – 49 years and 2.00% of the respondents fall within the age limit of 50 – 59 years. The results also show that the respondents' mean age was 34 years. This implies that the respondents are young, youthful and energetic. This proves that the youth are the drivers of digital marketing in the study area more than the older people. This agrees with the findings of

Tarazona-Montoya et al (2024) that younger people are more inclined to shop and market online compared to older adults, who tend to prefer physical stores.

4.1.2 Gender Distribution

The results of the gender distribution are presented in Table 2

Table 2: Distribution of respondents according to gender

Gender	Frequency	Per cent
Male	58	38.67
Female	92	61.33
Total	150	

Source: Field Survey Data Analysis, 2024

Table 2 displays the gender distribution of the respondents. The results indicate that 38.67% of the respondents were male, while 61.33% were female. This suggests that female digital marketers are predominant in the study area, highlighting a significant presence of women in the digital marketing workforce.

4.1.3 Levels of Education

The results of the levels of education are presented in Table 3

Table 3: Distribution according to levels of education

Levels of Education	Frequency	Per cent
Primary	0	0.00
Secondary	33	22.00
Undergraduate	14	9.33
Graduate	103	68.67
Total	150	

Source: Field Survey Data Analysis, 2024

The results indicated that none of the respondents had only a primary education, highlighting the value they place on higher education which could be because of the presence of several tertiary institutions in the State. Specifically, 22.00% of the respondents completed secondary education, 9.33% were undergraduates, and 68.67% were graduates. The majority of respondents in digital marketing were graduates. This implies that graduate respondents are more into the use of digital food marketing techniques. Marketers with a graduate degree often have a deeper understanding of complex marketing concepts, data analytics, and consumer behaviour theories (Okorie et al., 2024)

4.1.4 Household Size

The results of the household size of the respondents are presented in Table 4

Table 4: Distribution according to household size

Household Size	Frequency	Per cent	Cumulative Per cent
1 – 3	74	49.33	49.33
4 – 6	49	32.67	82.00
7 – 9	27	18.00	100.00
Total	**150**		

Source: Field Survey Data Analysis, 2024 Mean household size (4 persons per household)

The results regarding household size indicate that 49.33% of digital marketers belong to small households with one to three members. This suggests that a significant number of digital marketers may have fewer family responsibilities, potentially allowing them more flexibility in their careers. Meanwhile, 32.67% of digital marketers come from larger households of four to six members, which may provide additional support for their marketing activities. Additionally, 18.00% have households with seven to nine members. The data also reveals an average household size of 4 members per household.

4.1.5 Marital Status

The results of the marital status of the respondents is presented in Table 5

Table 5: Distribution of respondents according to marital status

Marital Status	Frequency	Per cent
Single	48	32.00
Married	84	56.00
Widowed/Widower	18	12.00
Total	**150**	

Source: Field Survey Date Analysis, 2024

The results showed that the majority of the digital marketers were married (56.00%), 32.00% of the digital marketers were single, and 12.00% of them were widowed or widowers. This implies that married marketers engage in digital marketing to support their physical marketing activities. Married digital marketers may focus on products that meet the needs and preferences of families. This enables them to contribute to the well-being of their families.

4.1.6 Digital Marketing Experience

The results of the digital marketing experience is presented in Table 6

Table 6: Distribution according to digital marketing experience

Digital Marketing Experience	Frequency	Per cent
1 – 5	93	62.00
6 – 10	34	22.67
11 – 15	21	14.00
16 – 20	2	1.33
Total	**150**	

Source: Field Survey Data Analysis, 2024 Mean Digital Marketing Experience (5.73 Years)

The results indicated that most digital marketers have between one to five years of experience in the field. The average digital marketing experience among the marketers in the study was 6 years, suggesting that digital marketing in the area is still developing. With six years of experience, these marketers are better equipped with the necessary knowledge and effective strategies to increase their volume of marketed food and customer reach. Experience is a crucial factor that helps digital marketers manage risks effectively

4.2 Various Digital Commodity Marketing

The results of the various digital food marketing techniques of respondents are presented in Table 7

Table 7: Distribution according to various digital food marketing techniques

Digital Food Marketing Techniques	Mean (μ)	Standard Deviation	Remark
Facebook	5.00	0.00	Adopted
WhatsApp	5.00	0.00	Adopted
Instagram	4.88	0.432	Adopted
Tiktok	4.11	1.190	Adopted
Search Engine Optimization	0.56	0.930	Not Adopted
X handle (Twitter)	3.42	1.453	Adopted
Pay Per Click	0.54	0.832	Not Adopted
SMS	5.00	0.783	Adopted
YouTube	3.03	1.211	Adopted
E-mail	1.95	0.780	Not Adopted
Affiliate Market	3.02	1.712	Adopted

Source: Field Survey Data Analysis, 2024. Mean (μ) > 3.0 Adopted, mean (μ) < 3.0 Not Adopted

The result shows that out of the 11 digital marketing techniques selected only 9 could be said to be adopted by digital food marketers in the state. It could be seen from the result that most digital marketers took speedy action on the majority of the digital marketing techniques. Among the techniques adopted were Facebook (5.00±0.00), WhatsApp (5.00±0.00), Instagram (4.88±0.432), Tikok (4.11±1.190), X handle (3.42±1.459), SMS (5.00±0.00), YouTube (3.03±1.211), and Affiliate market (3.02±1.712).

The results also showed that Facebook, WhatsApp, SMS, Instagram, and TikTok had a high proportion of mean values of adoption of digital marketing techniques. This result agrees with the study of Nwoye et al (2021) that Search Engine Optimization (SEO), and Pay Per Click (PPC) had a low level of adoption amongst marketers because these tools were noted as unavailable digital marketing tools in the study area. The finding agrees with the finding of Dwivedi et al. (2023) who indicated that so many companies and individuals make use of numerous social media platforms such as Facebook, Instagram, and X-Handle for social media/online marketing.

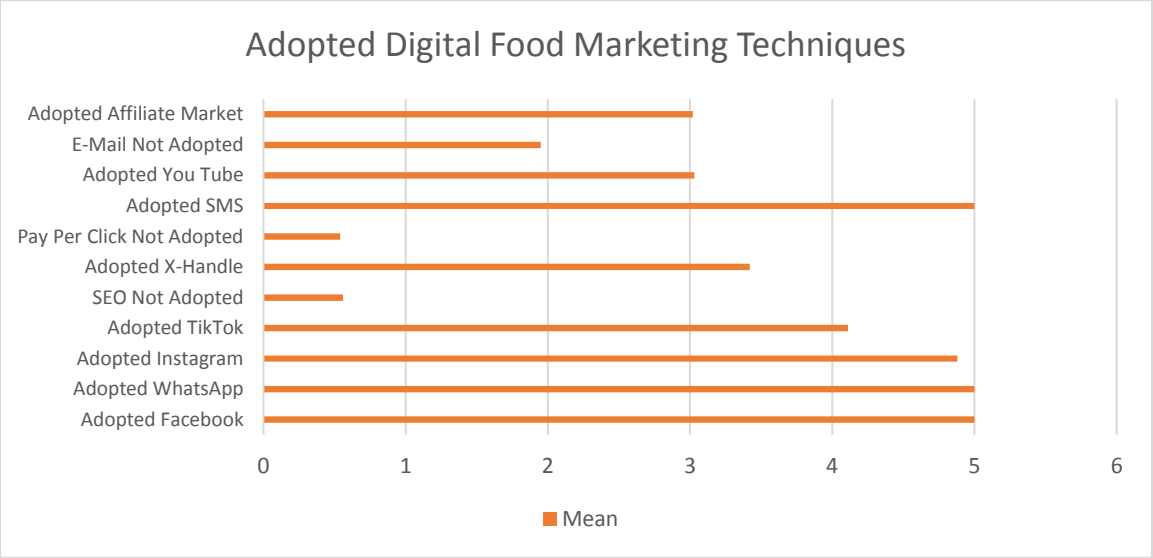

Figure 1: Chart showing Digital Food Marketing Techniques Adopted by the Marketers in Imo State. Mean value > 3.0 digital food marketing techniques adopted, mean value < 3.0, digital food marketing techniques not adopted

4.3 Adoption Intensity and Categorization of Digital Food Marketing Techniques

The results of adoption intensity and categorization of digital food marketing techniques of the respondents are presented in Table 8

Table 8: Distribution according to adoption intensity and categorization of digital food marketing techniques

Digital Food Marketing Techniques	Number of Respondents that Adopted the Digital Food Marketing Techniques	Per cent Adoption	Adoption Intensity
Facebook	150	100.00	5.00
WhatsApp	150	100.00	5.00
Instagram	136	90.67	5.31
TikTok	84	56.00	5.30
Search Engine Optimization	0	0.00	1.49
X handle (Twitter)	54	36.00	4.88
Pay Per Click	0	0.00	1.37
SMS	150	100.00	5.00
YouTube	89	59.33	4.24
E-mail	0	0.00	2.73
Affiliate Market	92	61.33	4.73

CATEGORIZATION OF RESPONDENTS ACCORDING TO THEIR ADOPTION INTENSITY

Respondents Levels of Adoption Intensity	Frequency	Per cent	Cumulative per cent
Laggards	0	0.00	0.00
Late Adopter	33	22.00	22.00
Late Majority	95	63.33	85.33
Early Majority	20	13.33	98.66
Innovators	2	1.34	100.00
Total	**150**		

Source: Field Survey Data Analysis, 2024 *** = Multiple Responses AI (0.50 – 1.99) = Laggard, AI (2.00 – 2.99) = Late Adopter, AI (3.00 – 3.99) = Late Majority, AI (4.00 – 4.99) = Early Majority, AI (> 5.00) = Innovators, and AI = Adoption Intensity

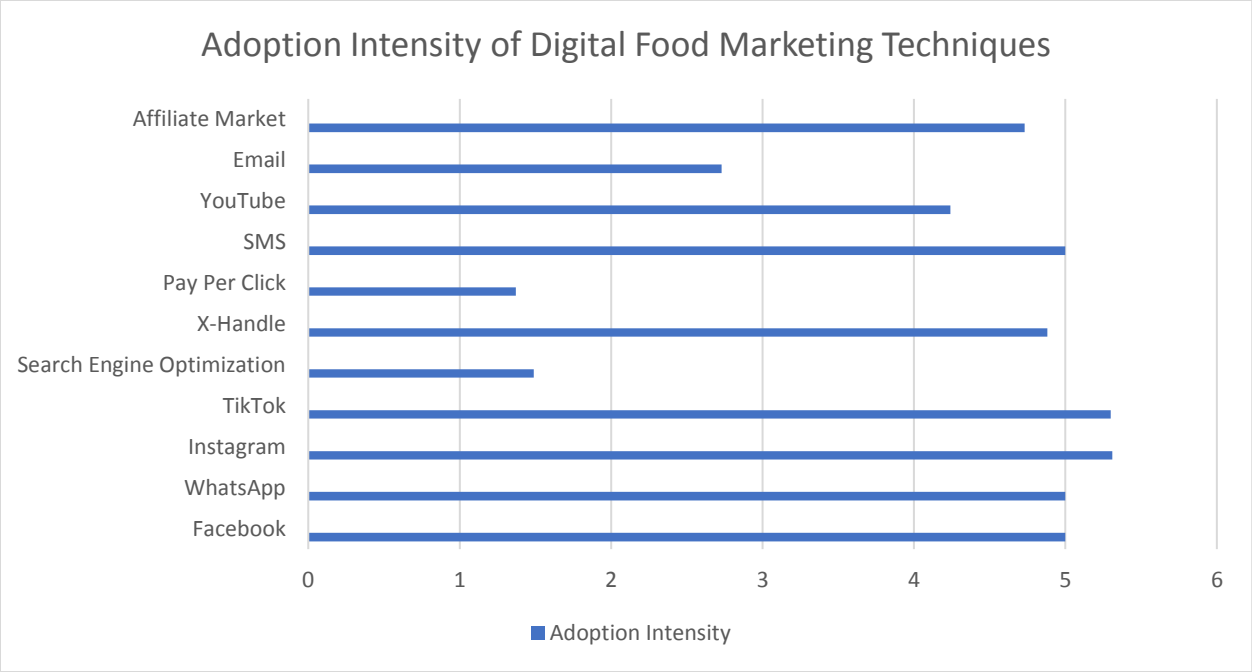

Figure 2a: Chart showing the adoption intensity of digital food marketing techniques in Imo State

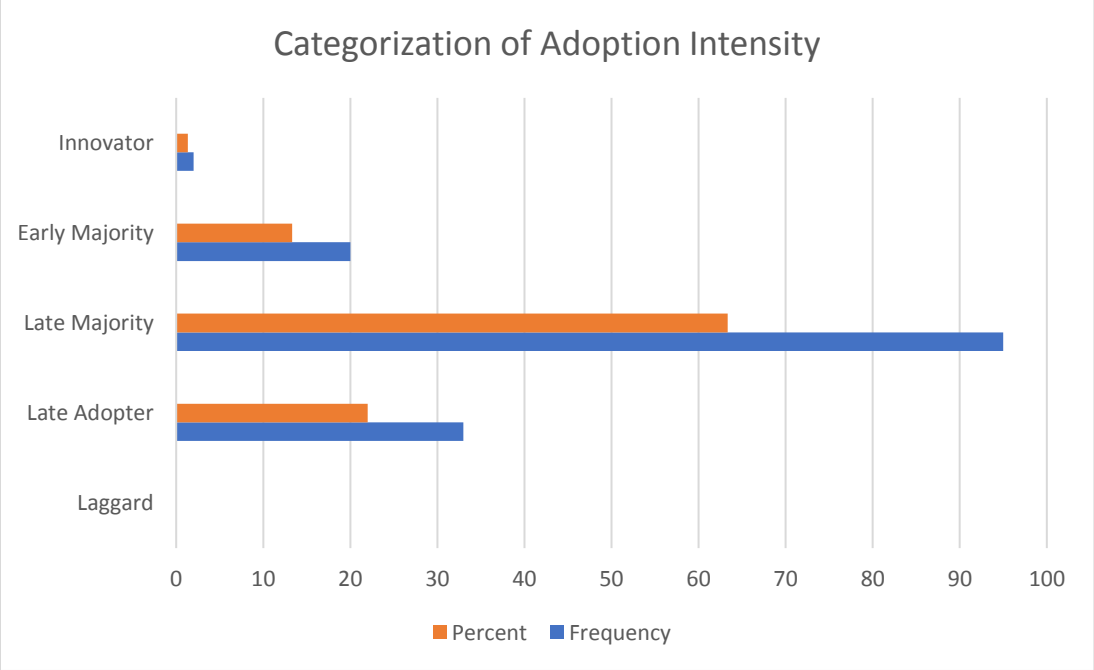

Figure 2b: Chart showing the categorization of levels of adoption intensity of respondents

The result shows that out of the 8 digital food marketing techniques adopted by the respondents in the state, Facebook had an adoption intensity of (5.00), WhatsApp (5.00), Instagram (5.31), TikTok (5.30), X-Handle (4.88), SMS (5.00), YouTube (4.24), and Affiliate market (4.73). The findings indicate a significant level of engagement with social media platforms, suggesting that visual and interactive content is preferred in digital marketing strategies within the food sector. These results are consistent with trends noted in current literature about the effectiveness of social media in agricultural marketing. Recent research by Richard, Mburu & Amimo (2023) highlighted that platforms like Facebook and WhatsApp are essential for farmers and marketers, as they enhance market access and customers engagement. This allows for more direct interactions with consumers, potentially leading to improved marketing outcomes. Additionally, Geng, Liu, Zhao, Kang and Wang (2024) reported that digital technologies can boost growers' economic benefits by reducing labour and input costs, increasing yields, and improving quality. Specifically, they found that there is a 30.4% increase in economic benefits for each unit increase in the intensity of digital technology adoption.

The results indicated that all respondents used Facebook (100%), WhatsApp (100%), and SMS (100%). Additionally, 90.67% used Instagram, 61.33% engaged in affiliate marketing, 59.33% utilized YouTube, 56% were active on TikTok, and 36% had accounts on X-Handle. This demonstrates that respondents are well-acquainted with various digital food marketing techniques to enhance their marketing potential. This aligns with the findings of Adeola, Oredipe & Jones, (2023) and Ismail, Khamis & Abubakar (2023), which state that Facebook and WhatsApp have become essential tools for farmers looking to connect directly with consumers and effectively market their products. Moreover, using Instagram and TikTok in agricultural

marketing is particularly successful in reaching younger audiences, who are increasingly influenced by social media in their purchasing decisions.

The categorization of digital food marketers based on their adoption intensity reveals Late Adopters (22.00%), Late Majority (63.33%), Early Majority (13.33%), and Innovators (1.34%). These results indicate that a significant percentage of respondents belong to the Late Majority category when it comes to adopting digital food marketing techniques in the study area. This finding aligns with the research conducted by Okwu, Olaniyi & Taiwo (2022), which also identified a predominant Late Majority among agricultural producers and marketers across various regions. This reflects farmers'/marketers' tendency to observe and evaluate the experiences of their peers before fully committing to new marketing strategies.

4.4 Factors Influencing the Adoption Categories of Digital Marketing Techniques in Food Commodity Marketing

The results of the factors influencing the adoption category of adopters of digital marketing for food commodity marketing is presented in Table 9

Table 9: Factors Influencing the Adoption Categories of Digital Marketing Techniques in Food Commodity Marketing

Factors	Innovation		Early Majority		Late Majority		Late Adopter	
	Marginal influence	Z	Marginal influence	Z	Marginal influence	Z	Marginal influence	Z
Age	0.946	2.964***	-0.315	-0.672	-0.114	-0.644	-0.050	-0.367
Experience	-2.357	-0.004	-0.763	-1.042	0.062	0.346	0.143	0.198
Household size	3.732	0.006	2.749	0.878	0.592	1.833*	-0.013	-0.78
Education	-5.242	-2.367**	11.700	2.049**	0.005	0.007	0.017	0.287
Access to Information	0.001	1.984*	0.001	1.561*	0.001	0.013	0.04	0.175
TCI	-0.179	0.095	0.008	0.095	-0.071	-1.268	0.902	0.279
Cost of device	-0.001	-0.19	0.059	0.765	0.001	0.001	0.34	0.277
AOC	0.001	0.016	0.001	0.403	0.001	0.010	0.001	0.021
NOI	6.328	0.063	22.544	0.063	1.041	1.099	0.833	0.343

Source: Field Survey Data Analysis, 2024. *Significant at 10% (p<0.1); **Significant at 5% (p<0.05); * Significant at 1% (p<0.01), LR CHI^2=67.83Pseudo R^2 = 0.632, Log likelihood = -132.057, TCI = Technology Compatibility Index, AOC = Amount of Operation Capital, NOI = Number of Information source**

The Multinomial logit regression model was used because it exhibits a superior ability to predict discrete choices. The Chi-square value of 132.057, which was significant at 1%, is an indication that the model is well-fitted. Adoption levels were captured as techniques employed among digital food marketers in digital marketing. These were categorized into four: (a) innovation levels, (b) early majority levels, (c) late majority levels, and (d) late adoption levels. Results in Table 9 showed that age ($P< 0.01$), level of education ($P< 0.05$), and access to information ($P< 0.1$) were the factors that significantly influenced adoption categories of digital marketing techniques in the study area.

The age of digital marketers had a positive and significant influence on the adoption of digital marketing techniques implying that a year increase in the age of the respondents will increase the likelihood of the digital marketers getting involved in digital food marketing in the levels of innovation. But in all the other categories of adoption levels, age does not have any significant influence.

Level of education had a negative influence at the innovation levels and a positive influence at the early majority on the adoption of digital marketing techniques among digital food marketers indicating that a yearly increase in the education level of marketers increased the likelihood of the marketers to adopt digital marketing techniques. Thus, in line with a priori expectations, the positive influence of levels of education on the adoption of digital marketing techniques implies that marketers with higher levels of education are more likely to adopt digital food marketing techniques. A probable reason is that educated marketers, because of their exposure, are likely to be more aware of the trends and globalization of digital marketing more than the physical shops.

Access to internet shows a positive and significant influence on adoption of digital marketing. This implies than an increase in the access to internet increases the adoption of digital marketing

techniques. According to Nwoye, et al (2021), access to unlimited internet across a geographical location is a benefit to adoption to digital food marketing techniques.

4.5 Effects of adoption intensity and its features on Returns to Capital Invested on Digital Marketing Techniques of Food Commodity Marketing

The results of the Effects of adoption intensity and its features on Returns to Capital Invested on Digital Marketing Techniques of Food Commodity Marketing is presented in Table 10

Table 10: Effect of Adoption Intensity and its features on Return to capital invested on digital marketing techniques

Explanatory Variable	Linear Function	Exponential Function	+Double-Log Function	Semi-Log Function
Constant	134.973	5.086	2.312	-644.316
	(8.819)	(92.198)	(9.008)	(-8.723)
Adoption intensity	0.584	0.002	0.027	7.358
	(0.874)	(0.920)	(1.990) **	(1.268)
Cost of use	0.009	3.044E-005	0.336	94.622
	(12.716) ***	(12.168) ***	(12.092) ***	(11.838) ***
Education	16.668	0.064	0.179	47.575
	(4.966) ***	(5.310) ***	(5.089) ***	(4.705) ***
Trading experience	-2.269	-0.008	-0.044	-12.368
	(-3.149) ***	(-3.203) ***	(-3.101) ***	(-3.058) ***
Number of training	0.974	0.006	0.004	0.387
	(0.242)	(0.442)	(0.285)	(0.095)
		Functional Parameters		
R^2	**0.745**	**0.738**	**0.749**	**0.738**
Adj R^2	**0.737**	**0.726**	**0.740**	**0.728**
F-Statistics	**84.297**	**81.072**	**85.896**	**80.949**

Source: Field Survey Data Analysis, 2024. + = Lead equation * = significant at 1%, ** = significant at 5%, figures in parenthesis= coefficients**

The results of the ordinary least squares multiple regression analysis on the effect of return on capital investment on the digital marketing techniques showed that the double log functional form was chosen as the lead equation with the coefficient of multiple determination of 0.738 and an F-statistics of 85.896 model which was significant at 1%, is an indication that the model is

well fitted. This implies that 73.8% of the variation of the effect of return to capital investment on the digital food marketing techniques in the study area was accounted for by the explanatory variables in the model. Variables such as adoption intensity ($P < 0.1$), cost of use ($P < 0.01$), education level ($P < 0.01$), and trading experience ($P < 0.01$) were significant effects of return to capital investment of digital marketing in the study area.

The coefficient of adoption intensity was positive and statistically significant at the 5% level, consistent with the a priori expectation. This suggests that as traders increase the intensity of digital marketing adoption, their return on investment also increases. The implication is that deeper engagement with digital platforms likely enhances visibility, reduces transaction costs, and improves customer outreach. This finding aligns with Li et al. (2022), who emphasized that higher digital adoption intensifies customer interaction and boosts profitability.

Contrary to the a priori expectation of a negative relationship, the cost of digital technology had a positive and highly significant coefficient (at the 1% level). This indicates that an increase in the amount spent on digital tools is associated with an increase in returns. This unexpected outcome suggests that higher investments in digital infrastructure may be justified, as they enable access to more effective, possibly more sophisticated digital tools that enhance performance. This is consistent with Nwafor and Nwibari (2021), who argued that while initial costs may be high, well-targeted digital investments lead to substantial long-term gains.

The level of formal education was positively and significantly related to RoRCI at the 1% level, as anticipated. This finding reinforces the notion that education enhances digital literacy and the ability to navigate digital platforms effectively. Educated traders are more likely to understand market analytics, manage digital content, and engage with online consumers in strategic ways.

This finding is supported by Alhassan, Abdulai, and Kwabena (2022), who observed that higher educational attainment improves the capacity to integrate and benefit from digital marketing innovations.

Interestingly, trading experience had a statistically significant negative effect on RoRCI, contrary to the a priori expectation. This suggests that longer trading experience does not necessarily lead to better outcomes in digital marketing. It is possible that more experienced traders are accustomed to traditional marketing methods and may be slower to adopt or adapt to new digital tools. Their reluctance or inability to transition effectively may reduce the benefits they derive from digital marketing. Ojo and Adeyemo (2022) similarly reported that experienced traders often face challenges in adapting to rapid technological changes, which may hinder their digital marketing success.

Finally, the number of trainings attended showed a positive but statistically insignificant effect on RoRCI. While the direction aligns with the theoretical expectation, the lack of statistical significance suggests that the number of trainings alone may not influence returns unless the content, delivery, and practical application of the training are tailored and effective. This implies a need to focus not just on increasing training sessions but also on improving their quality and relevance.

4.6 Effect of Adoption Intensity and its Features on the Efficiency of Digital Marketing of Food Commodity Marketing

The results of the effect of adoption intensity on the efficiency of digital marketing of food commodity marketing are presented in Table 11

Table 11: Effect of Adoption Intensity and its features on the efficiency of digital marketing techniques

Explanatory Variable	Linear Function	Exponential Function	+Double-Log Function	Semi-Log Function
Constant	2.350	0.939	-1.090	-5.436
	(15.334)	(23.425)	(-5.781)	(-7.348)
Adoption intensity	0.006	0.002	0.020	0.073
	(0.866)	(0.903)	(1.957)	(1.260)
Cost of use	8.828E-005	2.250E-005	0.246	0.946
	(12.706) ***	(12.374) ***	(12.056) ***	(11.812) ***
Education	0.167	0.046	0.130	0.477
	(4.963) ***	(5.252) ***	(5.022) ***	(4.707) ***
Trading experience	-0.023	-0.006	-0.032	-0.124
	(-3.145) ***	(-3.198) ***	(-3.110) ***	(-3.066) ***
Number of training	0.010	0.004	0.002	0.004
	(0.255)	(0.387)	(0.233)	(0.110)
		Functional Parameters		
R^2	**0.745**	**0.742**	**0.747**	**0.737**
Adj R^2	**0.736**	**0.733**	**0.739**	**0.728**
F-Statistics	**84.134**	**82.707**	**85.177**	**80.719**

Source: Field Survey Data Analysis, 2024. + = Lead equation * = significant at 1%, ** = significant at 5%, * = significant at 1%, figures in parenthesis= coefficients**

Table 11 presents the result of the Ordinary Least Squares (OLS) multiple regression analysis on the effect of adoption intensity and its features on the efficiency of digital marketing techniques. Among the four functional forms linear, exponential, double-log, and semi-log, the double-log function was chosen as the lead equation, with the highest R^2 value (0.747) and adjusted R^2

(0.739). The F-statistic of 85.177, significant at the 1% level, confirms that the model is statistically reliable and well-fitted. This implies that approximately 74.7% of the variation in digital food commodity marketing efficiency in the study area is explained by the variables included in the model. Based on the a priori expectation, it was anticipated that adoption intensity, education level, trading experience, and number of trainings attended would positively influence efficiency, while cost of digital marketing tools would negatively affect it. The results both confirmed and contradicted these expectations.

The coefficient of adoption intensity was positive (0.020) and statistically significant at the 5% level (t = 1.957) in the lead equation. This aligns with the a priori expectation that greater use of digital tools would enhance marketing efficiency. The result implies that traders who adopt digital marketing techniques more intensively are more likely to experience improved operational performance. Increased adoption may lead to better market visibility, reduced transaction costs, and quicker responses to market demand, thereby improving marketing outcomes.

Contrary to the initial expectation of a negative effect, cost of use showed a positive and highly significant effect on efficiency across all model forms. In the double-log equation, the coefficient was 0.246 (t = 12.056), indicating that higher spending on digital marketing tools is associated with improved efficiency. This suggests that the cost incurred may reflect investment in quality technologies, such as paid digital platforms, premium features, or targeted advertising tools, which enhance marketing performance. This finding supports Hossain et al. (2021), who observed that strategic spending on digital infrastructure can lead to better resource utilization and improved business outcome.

As expected, the coefficient for education level was positive (0.130) and significant at the 1% level (t = 5.022) in the lead model. This finding supports the view that formal education increases digital literacy and the ability to navigate complex marketing platforms. Educated traders are more likely to adopt innovative tools, optimize their marketing strategies, and respond to market dynamics. This finding is consistent with Hossain, Kosaka, and Rahman (2021), who emphasize that education enhances technology adoption and fosters innovation in rural and agricultural contexts.

In contrast to the a priori expectation, trading experience had a negative and statistically significant effect on efficiency (coefficient = -0.032, t = -3.110). This result may be due to the possibility that more experienced traders are more reliant on traditional marketing methods and may be less adaptable to digital innovations. Over time, resistance to change or lack of digital exposure may reduce the efficiency of marketing activities. This is in line with Nwafor et al. (2021), who noted that extensive experience without digital engagement can result in stagnation and missed opportunities in dynamic markets.

The coefficient for number of trainings attended was positive (0.002) but not statistically significant (t = 0.233). Although the direction aligns with the expectation, the result suggests that training alone may not guarantee improved digital marketing efficiency. This may be due to poorly structured or non-practical training content. Without follow-up or skill-based training, traders may not be able to translate the knowledge gained into actionable marketing practices.

4.7 HYPOTHESES TESTING

The results of the test of hypotheses are presented in Table 12

Table 12: Results of hypotheses

Description	**Value**	**Decision**
H0:1		**Accepted H0**
Mean Level of Education	3.47	
Mean Adoption Index	9.95	
Stdev of Level of Education	0.84	
Stdev of Adoption Intensity	3.96	
Sample size ($n_1 = n_2$)	150	
Z calculated	-36.22	
Z tabulated @ 5% critical level	0.9978	
H0:2		**Rejected H0**
Mean Return on Investment	292.49	
Mean Adoption Index	9.95	
Stdev of Return on Investment	60.47	
Stdev of Adoption Intensity	3.96	
Sample size ($n_1 = n_2$)	150	
Z calculated	431.10	
Z tabulated @ 5% critical level	0.9978	

Source: Field Survey Data Analysis, 2024

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.4 Summary

The study examined the effects of adoption intensity of digital marketing techniques on the efficiency of food commodity marketing in Imo State, Nigeria. The specific objectives were to describe the socioeconomic characteristics of the respondents, describe the various digital food marketing techniques in food commodity marketing, determine the adoption intensity of digital marketing techniques in food commodity marketing, analyze the factors influencing adoption intensity, in digital food marketing techniques, determine the effect of adoption intensity, its features on the rate of return in capital investment on digital food marketing techniques, and determine the effect of adoption intensity, its features on the efficiency of digital food commodity marketing techniques in the study area.

Primary data were collected from 150 respondents using a well-structured questionnaire and the data were analyzed using descriptive statistics, adoption index model, multinomial logistic regression model, and Ordinary Least Square multiple regression model.

The descriptive statistics results showed the mean ages of the digital food marketers was 34 years, mostly female (61.33%), mostly graduate levels of education (68.67%), mean household size of 4 persons, mostly married (56.00%), and a mean digital marketing experience of 6 years.

The results of the various digital food marketing techniques of the respondents showed that Facebook (5.00±0.00), WhatsApp (5.00±0.00), Instagram (4.88±0.432), Tikok (4.11±1.190), X handle (3.42±1.459), SMS (5.00±0.00), YouTube (3.03±1.211), and Affiliate market

(3.02±1.712) were among the 8 digital food marketing techniques adopted by the digital marketers in the study area.

The results of adoption intensity and categorization of digital food marketing techniques of the respondents showed that Facebook had an adoption intensity of (5.00), WhatsApp (5.00), Instagram (5.31), TikTok (5.30), X-Handle (4.88), SMS (5.00), YouTube (4.24), and Affiliate market (4.73). The results also indicated that all respondents used Facebook (100%), WhatsApp (100%), SMS (100%), Instagram (90.67%), Affiliate marketing (61.33%), YouTube (59.33%), TikTok (56%), and X-Handle (36%). The categorization of digital food marketers based on their adoption intensity reveals Late Adopters (22.00%), Late Majority (63.33%), Early Majority (13.33%), and Innovators (1.34%).

The results of the factors influencing the adoption category of adopters of digital marketing for food commodity marketing showed a pseudo-R^2 of 63.2% and age ($P< 0.01$), level of education ($P< 0.05$), and access to information ($P< 0.1$) were the factors that significantly influenced adoption categories of digital marketing techniques in the study area.

The results of the effect of a return to capital investment of digital marketing techniques of food commodity marketing showed that 73.8% of the variation of the effect of a return to capital investment on the digital food marketing techniques in the study area was accounted for by the explanatory variables in the model. Variables such as adoption intensity ($P < 0.1$), cost of use ($P < 0.01$), education level ($P < 0.01$), and trading experience ($P < 0.01$) were significant effects of return to capital investment of digital marketing in the study area.

The results of the effect of adoption intensity on the efficiency of digital marketing of food commodity marketing showed that 74.5% of the variation of the effect of adoption intensity

features on the efficiency of digital food marketing techniques in the study area was accounted for by the explanatory variables in the model. Variables such as cost of use ($P < 0.01$), education level ($P < 0.01$), and trading experience ($P < 0.01$) were significant effects of adoption intensity features of the efficiency of digital marketing in the study area.

5.2 Conclusion

The study revealed that the majority of digital food marketers in the area are young, youthful and energetic. They are predominantly female, majority of respondents in digital marketing were graduates which gave them a deeper understanding of complex marketing concepts.

The findings also revealed that household size provides additional support for their marketing activities, and that marriage also helps the married digital marketers to focus on products that meet the needs and preferences of families hence enabling them to contribute to the well-being of their families. The finding further revealed that marketers are better equipped with the necessary knowledge and effective strategies to increase the volume of their marketed food, and customer reach, and help manage risks effectively.

Furthermore, the finding also revealed that a high proportion of digital marketers adopted 100% of Facebook, WhatsApp, and SMS as a digital marketing technique. In addition, the findings showed that high categories of digital marketing techniques showed Late Majority adoption levels and only a small proportion showed the early majority, late adopters and Innovators.

More to note, it was found that young marketers increase the likelihood of getting involved in digital food marketing, higher levels of education are more likely to adopt digital food marketing techniques, and increased internet access increases the adoption of digital marketing techniques. More so, the level of adoption of digital marketing improves the return on investment in digital

marketing, a decrease in the cost of digital marketing techniques leads to an increase in the return on investment in digital food marketing techniques, and a decrease in the trading experience leads to a reduction in the return to investment in digital food marketing.

Lastly, findings revealed that a decrease in the cost of digital marketing techniques leads to an increase in the efficiency of digital food marketing techniques, education level positively increases the efficiency of digital food marketing, and a decrease in the trading experience leads to a decline in the efficiency of digital food marketing in the study area.

5.5 Recommendations

Based on the findings of this study, the following recommendations have been made:

1. Governments and Non-Governmental Organizations are encouraged to build synergy on youth development through skill acquisitions to integrate more young people into digital marketing to reduce rising unemployment.
2. Stakeholders in digital marketing are encouraged to subsidize the cost of online digital courses on digital marketing certifications to encourage more participation and development of the sector.
3. More awareness should be made for more people to know about digital marketing techniques to encourage more participations.

5.6 Contribution to Knowledge

1. **Socioeconomic Insight**: The study identified young digital food marketers, predominantly involving young female marketers. There is a need to encourage more of these younger and dynamic female marketers to shape the dynamics of digital marketing.
2. **Impact of Education**: The study highlights the importance of education to improve the effectiveness and efficiency of digital marketing. Educated people stand in a position to improve the effectiveness of digital marketing, hence there is a need to invest in education.
3. **Foundation for Future Research**: The study identifies gaps in knowledge regarding the age structures of digital marketers, laying the foundation for future research efforts.
4. **Alternative means of employment**: The study highlighted how marriage and household size influence the focus on family-oriented products, shaping marketing strategies in the digital food industry for income generation.

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