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RESEARCH ARTICLE

Beyond the line and hook: Identifying primary e-logistics technology adoption factors in the fishing industry

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Abstract

In the current era, e-logistics technologies have become commonplace in businesses to enhance supply chain and associated data analytics efficiencies. However, while contributing significantly to the GDPs in many countries, the fishing industry has been slow at adopting new technologies. Many slow adopters in this industry continue to use outdated data collection methods, thereby resulting in less-than-optimal data-driven decision-making. While prior research has examined the role of emerging technologies in the industry, there has been limited research to date to understand adoption issues. Our study therefore investigates factors that influence the adoption of e-logistics technologies in the fishing industry, using the Western Cape province in South Africa as the study site. The research investigated these factors using the Security-Technology-Organisation-Environment-Diffusion-of-Innovation framework. Qualitative data was collected via semi-structured interviews. The findings provide a rich insight into several adoption factors that demonstrate an interplay of technological innovations, organisational dynamics, and the environment within the industry. The findings were synthesized into an e-logistics technology adoption model. This paper enriches the existing literature on technology adoption, contributing insights for fishing industry stakeholders, and lays the foundation for informed decision-making in the realm of e-logistics integration.

Keywords

diffusion of innovation; e-logistics; fishing industry; supply chain management; technology adoption; technology-organisation-environment.

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1 Introduction

Organisations in several industries have adopted various tools, approaches, and associated technologies in their quest to implement systems to support both improved performance and the monitoring of growth (Schnegg & Möller, 2022). These systems leverage data as a core input. This proliferation and abundance of data, driven largely by the pervasiveness of inter-networks, has brought the realization of the importance of developing analytical capabilities and embracing data analytics as a business driver. Data analytics is the science of analysing raw data to draw conclusions and involves the process of inspecting, cleansing, transforming, and modelling data and applying algorithms to draw insights from the data, including identifying previously unknown patterns (Elgendy & Elragal, 2014; Frankenfield, 2020). Central to data analytics are e-logistics systems that capture data through the entire supply chain, integrating stakeholders and their activities, thus enabling complete data chains. Consequently, these systems engender an environment conducive to holistic data analysis approaches within organisations.

While the potential benefits of e-logistics systems are recognised, some industries remain slow to adopt. In addition, factors that drive or impede the implementation of such technologies within specific industries and regional contexts remain less explored. One such sector is the fishing industry, where opportunities for digitising remain significant. For many fisheries, fish stocks have continued to deplete, while a growing human global population has resulted in increased fish product demand (FAO, 2020). The Covid-19 pandemic crisis further accelerated this, where there were numerous supply chain shocks, lifestyle and supply chain reconfigurations, ongoing environmental concerns, and continued fisheries stock depletion (FAO, 2020). In response, many fishing authorities have implemented regulations to protect and preserve marine life, implemented fishing quotas, and applied fisheries science to improve the industry's sustainability. While acknowledging progress, the fishing industry has not fully exploited opportunities presented by modern software systems and has been adopting data management systems at a slow pace (Girard & Du Payrat, 2017; Merrifield et al., 2019). The industry has not embraced data-centred strategies to enable opportunities for process improvements, efficiency increases, revenue growth, and overall business sustainability (Siefkin, 2018). However, while prior research has examined the role of emerging technologies in the fishing industry, there have been limited studies to date to understand adoption issues.

Given the foregoing, this paper reports on an investigation into the multifaceted interplay of factors that affect the adoption and integration of e-logistics solutions in the daily operations of fishing organisations. This research was conducted amongst fishing organisations operating within the Western Cape province in South Africa, a region representing a well-established fishing sector. The primary question investigated is: "*What are the primary factors influencing the adoption of e-logistics technology in Western Cape fishing organisations?*". The technologies considered are those with the potential to improve data analytics by digitising some or all aspects of the fishing supply chain and providing safe, timely, and reliable data collection, movement, storage, access, sharing and analytics as needed in fisheries management.

In the next section, we present a literature review, encompassing an overview of fishing supply chains and the role of e-logistics technologies. We further discuss the extant literature in relation to adoption research before describing how prior research and research gaps informed our research model and investigation. In Section 3, we summarise our methodology for data collection and analysis and discuss our findings in Section 4. Finally, we present the e-Logistics Technology Adoption model in Section 5 and provide a conclusion, limitations and opportunities for future research in Section 6.

2 Literature review

2.1 Supply chain management and the use of data in the fishing industry

Supply Chain Management (SCM) concerns the integration of activities within and between organisations, incorporating the organisation's logistics capability, structures, and enabling technologies (Abuzaid et al., 2023; Wagner & Sweeney, 2010). In the fishing industry, SCM considers the different actors who maintain and manage fishing vessel fleets, provide

operational technologies, manage fishing activities, data collection, transformations, and analysis, and those who make, regulate, and enforce fishing laws accordingly in an effort to provide fish products in a sustainable manner (Barkai & Lallemand, 2014; FishSA, 2019).

In South Africa, the Western Cape is a business hub with notable presence of fishing organisations ranging from artisanal small-scale fishers to large-scale commercial fisheries. The province has 11 of the proclaimed 13 national fishing harbours, which contribute 5% to the province's Gross Domestic Product (GDP) and contributes over 70% of the national industry income and over 70% of the industry employment (FAO, 2018). Therefore, the Western Cape fishing industry served as an ideal delineation for this study.

2.2 The suite of e-logistics technologies to support fisheries SCM

Cloud-computing dependent technologies like mobile technology, remote-sensing and other Internet of Things (IoT) sensors, distributed computing, and storage capabilities are opening new integrations opportunities into agri-food systems, including fisheries, laying down a foundation for an agricultural revolution (Gray et al., 2018). E-logistics, which refers to the integration of digital tools and data-driven processes into SCM, heralds a transformation in navigating fishing organisations complex operations. It entails applying the latest information technologies to support logistics management (Dębkowska, 2017). In the fishing industry, Merrifield et al. (2019) note that at least three fishing industry-enabling technology advances have allowed a transition from paper-based systems to digital ones in a cost-effective manner. These include mobile, cloud and mapping on the internet. Bradley et al. (2019) classify enabling technologies as electronic monitoring, reporting, and mobile computing technologies. Other complementary technologies include traceability technologies like blockchain, fish-finding technologies, smart-weighing systems, drones and other machine learning tools or capabilities like artificial intelligence (Bradley et al., 2019; Girard & Du Payrat, 2017). These identified technologies could potentially improve management and decision-making through context, situation, and location awareness (Kamilaris et al., 2017). Furthermore, cloud-computing as an enabler of all these technologies provides affordable, efficient, volume-unlimited data storage (IBM, 2022a). The development of these technologies continues to play a vital role in reaching sustainable fishery resource management and the adoption thereof becomes imperative to understand towards better management of the uncertain realities of fishing operations (Fujii et al., 2017).

2.3 e-Logistics technology adoption in the fishing industry

While there are several new technologies and systems to support data analytics and associated business intelligence and data governance initiatives, Diaz (2020) notes that the adoption and implementation of these technologies, in fisheries, are still lacking. Furthermore, in the developing world, including South Africa, a discrepancy exists between the inherent characteristics of fisheries and the data systems utilized to delineate them (Mills et al., 2011). It thus follows, that organisations ought to manage their digital supply chain and enhance information flows (Wang & Pettit, 2016). e-Logistics technologies provide an opportunity for this improved data management (Rose, 2021). Managing fisheries sustainably in an era of uncertainty and climate change requires modernised fisheries data systems from the source of the data through the data chain to the end-user of the data (Merrifield et al., 2019). There thus have been calls for the adoption and implementation of e-logistics which would improve data analytics and overall fishing operations outcomes.

2.3.1 Drivers of technology adoption

In a study on aquaculture technology adoption among smallholder fish farmers in Kenya, Obiero et al. (2019) developed a framework categorizing themes like Farmer Characteristics, Technology Characteristics, External Environment, Economic Characteristics, and Advisory and Extension Support into intrinsic, intervening, and decision-making variables. The framework was modified from Kumar et al. (2018) and Meijer et al. (2015). The authors *(ibid.)* identified education, household size, advisory services and farm-specific characteristics as influencing the decision to adopt aquaculture

technologies. Notably, their findings align with several other studies including Okello et al. (2020), Fadeyi et al. (2022), and Mesere & Worth (2022) in that perceived usefulness and perceived ease of use are primary factors of technology adoption.

Adewale Isaac et al. (2020), in their study in Ondo State, Nigeria, found that profit, education, household size, experience, fish price, cooperative society and perceived cost of equipment were the main factors influencing the adoption of improved fish processing technologies. The study employed a questionnaire on fishing technologies used and classified these into traditional and improved fishing technologies. By this classification, the study discerned the factors driving the adoption of improved fish processing technologies.

Isaacs et al. (2022), considering a transition from vulnerability to viability of small-scale fishers in South Africa suggest an understanding of various supply chain dynamics including power, ownership, demographics of fishers, fisher communities and technology as influencing the adoption and use of fishing technologies. The authors *(ibid.)* emphasise the importance of understanding the current state-of-affairs in tandem with the intricate interplay of these factors from various perspectives to promote sustainable fisheries practices. As one of the primary contributions, their research highlights technology's role towards equitable outcomes in fishing and a need to investigate this as an adoption factor. Furthermore, e-logistics enable data to be collected once and used many times, sometimes in real-time (Barton et al., 2011; Merrifield et al., 2019). This single version of the truth enables timely, accurate, and objective analyses facilitating fisheries' transition from vulnerability to viability.

2.3.2 Barriers to technology adoption

In understanding drivers of adoption, barriers ought to be considered too (Murphy et al., 2022). A study in South India by Giné & Klonner (2005) found that asset poverty or a lack of financial capital inhibits the ability to adopt fishing technologies. The study, conducted in a rural community estimated the impact of poverty on adoption of technology and recommends the adoption of relevant policy in such contexts. The authors conclude that a lack of wealth is a key predictor for delayed adoption.

Furthermore, this research acknowledges that fishers want to improve their fishing effort. In this end, therefore, there is a need to understand fishers' consideration of conservation in their activities. Murphy Jr. et al. (2022) found that there is a need to marry profitability with environmental sustainability and identified a lack of knowledge in this understanding as being a barrier to the adoption of technologies geared towards sustainability. The authors *(ibid.)* conclude their paper by recommending an all-stakeholder collaboration in the implementation of fishing technologies.

Considering these findings, both drivers and barriers to adoption were considered and are discussed in this paper. While humans decipher and operationalize data, technologies serve as the generators of this data (Fujita et al., 2018). Technology is a complement to human activities, and it is people who identify and decide on the most suitable technology and act on the purchase, use and discarding thereof. Our paper acknowledges that e-logistics technologies awareness may lead to adoption and use and provides a lens into lived experiences of fishers.

2.4 Framework for the study

Following on the literature review the research gaps that were identified include a lack of industry context-specific studies, as well as a limited consideration of the role of socio-economic factors in relation to the adoption of technologies. Secondly, there appears to be a dearth of studies which provide guidance for the development of data-driven policy in the fishing industry. Lastly we identified a need to demonstrate the interplay of traditional practices and other adoption barriers that are unique to the geographical context of the industry given that technology adoption is not a one-size-fits-all endeavour (Jokonya et al., 2014).

As such, the extant literature was considered in developing our research framework. Previous studies and frameworks considered were both at individual and organization level. Theories primarily used in the individual technology adoption studies included the Technology Acceptance Model (TAM) by Davis (1989), the Theory of Planned Behaviour (TPB) by Ajzen (1991), the Theory of Reasonable Action (TRA) by Fishbein & Ajzen (1975) and the Unified theory of acceptance and use of technology (UTAUT) by Venkatesh, et al. (2003). The organisational focus of the study, that proposes limited volitional control in decision-making in organisations thus necessitated a consideration of other frameworks that would better capture the research question dynamics both within organisations and externally.

2.4.1 The technology-Organisation-Environment framework (TOE)

The Technology-Organisation-Environment framework (TOE) served as a foundational framework for the study. The TOE brings into perspective the human and non-human actors of a supply chain, categorising the factors of technology adoption into the *technological*, *organisational,* and *environmental constructs* (Awa et al., 2016; Tornatzky & Fleischer, 1990). It is an integrative and holistic framework (Ramdani et al., 2013). The *organisation* factors are descriptive, considering the nature, resources and managerial structure of the business and the *environment* construct considers external factors like external support, government regulation, and competitors (Hoang et al., 2021; Liu, 2019). The TOE framework displays its strength in industry and size friendliness as evidenced by numerous information systems research studies carried out and is useful in the investigation of a wide range of innovations and contexts (Awa et al., 2016). Furthermore, it has been broadly supported in empirical work and remains among the most prominent and utilized theories of organisational technology adoption since its development (Agrawal, 2015).

2.4.2 The Diffusion of Innovation framework (DOI)

The diffusion of innovation framework (DOI) served to complement the TOE as it is broad-based and provides a complementary technology perspective to the TOE by design (Qasem et al., 2020; Rogers, 1962). The five perceptual characteristics of innovation provide good structure to the investigation of the technological influences identified in the TOE. These are: *relative advantage*, *compatibility, complexity, trialability* and *observability* and are defined in Table 1. Innovativeness, in this regard is related to specific independent variables, namely, individual characteristics, internal organizational structural and external characteristics (Oliveira & Martins, 2011). It integrates three components: adopter characteristics, characteristics of innovation and the innovation-decision process (Taherdoost, 2018) and was developed in considering and synthesising over 508 innovation diffusion studies to explain both the adoption and acceptance of an innovation (Liu, 2019). The DOI posits that an innovation, which is an idea, practice or object perceived to be new, undergoes a process of communication to members within a social system, over time (Chui-Yu et al., 2017; Rogers, 1962). The framework assumes that individuals have different degrees of willingness to adopt technology and classifies them into five categories from most likely and willing to adopt to least willing to adopt categories of adopters, namely, innovators, early adopters, early majority, late majority, and laggards, respectively (Rogers, 1995). In playing a complementary role to the TOE, Taherdoost (2018) found that the DOI was one of the most common complements in research relating to Information Management. Furthermore, various studies incorporated the TOE and DOI frameworks in combination including Kumar et al. (2018), Hiran & Henten (2020), Lai et al. (2018), and Sabu et al. (2018).

2.4.3 Security as a construct

Investigating blockchain adoption factors, Mthimkhulu & Jokonya (2022) found that security within the logistics supply chain was an important influence on adoption. Similarly, other studies found that, among other factors, data security was a barrier to technology adoption, especially with cloud-centred technologies (Awa et al., 2016; Maroufkhani et al., 2020; Park & Kim, 2021; Salleh & Janczewski, 2016). In this research, security is predicated on the three fundamental principles of data security: the CIA triad of confidentiality, integrity, and availability (Brooks, 2022; Murphy et al., 2022). Data security covers numerous aspects, including security access, resource optimisation and analytics trust (Haufe et al., 2016).

Furthermore, the construct was investigated in terms of privacy, hacking, spoofing, deception, and encryption (Girard & Du Payrat, 2017). Given its criticality, data security was integral to our investigative framework. We considered concerns relating to safeguarding intellectual property rights, protecting sensitive information like fishing location and other catch-related data and discussed issues relating to data ownership, stewardship, accountability and responsibility.

2.4.4 An integrated framework: Sec-TOE-DOI framework

Integrating the model into a Security-TOE-DOI (Sec-TOE-DOI) model facilitates a nuanced examination of the multifaceted influences driving or hindering the adoption of e-logistics technologies in the fishing industry, ultimately paving the way for more informed decision-making and strategic interventions. In this manner, therefore, security and the persuasion stage characteristics of the DOI were merged with the technology construct of the TOE. The resulting framework is depicted in Figure 1, highlighting the interactions of constructs and concepts investigated. The adoption of this framework enabled both small and large corporations to be investigated. This informed our survey instrument design.

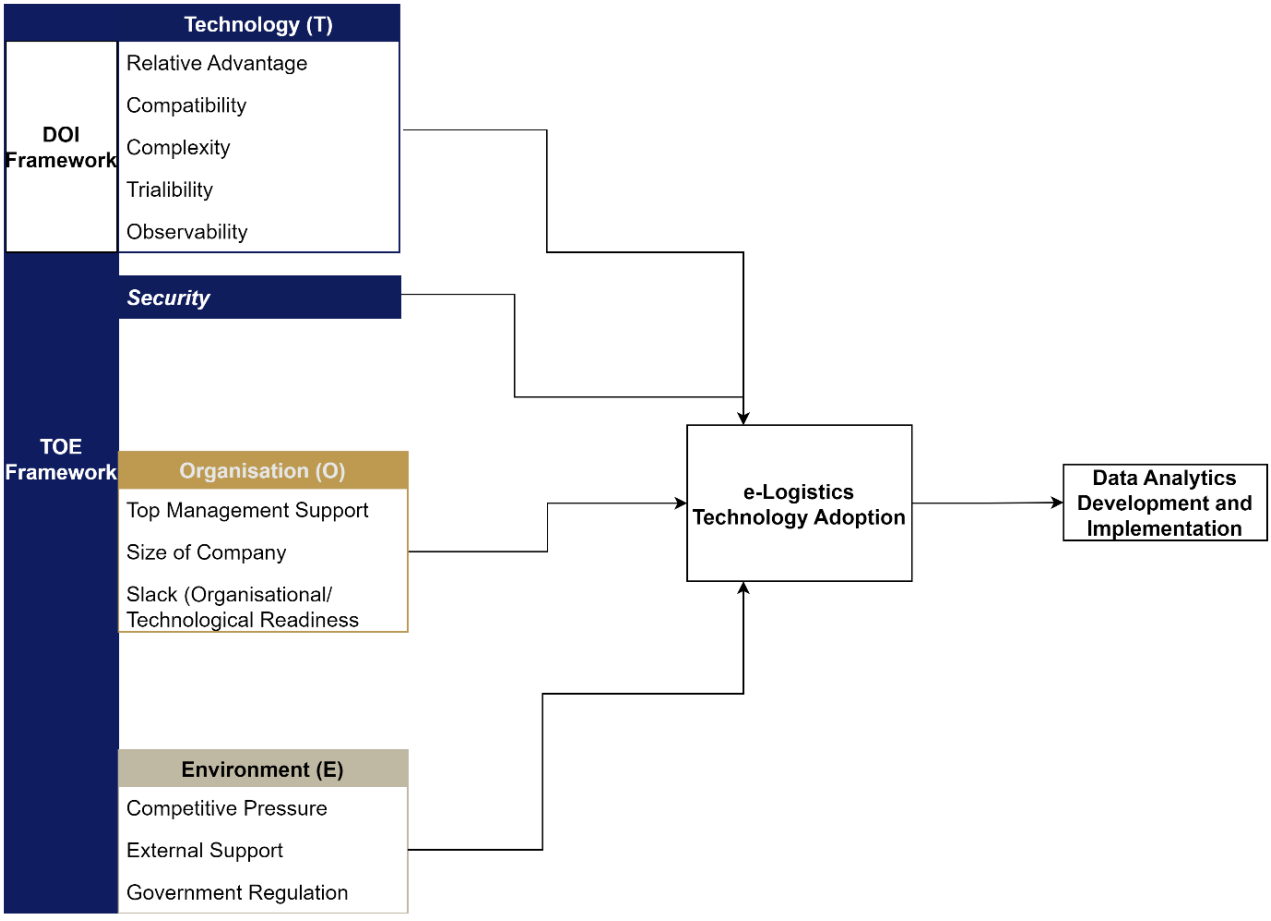

Fig. 1. Sec-TOE-DOI framework to investigate e-logistics technology adoption

Figure 1 as a framework, enabled the development of qualitative surveys to capture the importance of each of the constructs and concepts defined. Table 1 defines the constructs and concepts as used within the Sec-TOE-DOI.

Table 1. Sec-TOE-DOI Concepts definitions

Construct	Concept	Definition	Source
Technology *(consideration of both the internal and external aspects of technology)*	Relative advantage	The degree to which an innovation is perceived to be better than the preceding idea.	(Kumar et al., 2018; Liu, 2019)
	Compatibility	The degree to which an innovation is consistent with existing business processes, practices, and values.	(Rogers, 1995)
	Trialability	The degree to which an innovation can be experimented with.	(Rogers, 1995)
	Complexity	The degree to which an innovation is difficult to use.	(Rogers, 1995)
	Observability	The degree to which the results of an innovation are visible to others.	(Rogers, 1995)
	Security	This considers data security in terms of access, confidentiality, privacy, IP protection and data ownership. It includes measures taken for business continuity.	(Bertino, 2016; Lopez, 2013)
Organisation *(descriptive factors considering nature, resources, and managerial structure)*	Top management support	The degree to which managers comprehend and accept the capabilities of the new technology system, including providing a vision, support, and/or commitment to the technology.	(Maroufkhani et al., 2020)
	Size of the company	The firm's size in terms of employee numbers, revenue, and relative size in the Western Cape fishing industry.	
	Slack	The fishing organizations' readiness to invest in new technologies, technical expertise, and information Technology (IT) capability, including IT infrastructure, and the availability of personnel with the relevant skills.	(Maroufkhani et al., 2020)
	Absorptive capacity	The organisation's ability to recognise the value of new information, assimilate, and apply it towards a commercial end.	(Cohen & Levinthal, 1990)
Environment *(consideration of external factors)*	Competitive pressure	Influences from the external environment, including customers, suppliers, and competitors.	(Maroufkhani et al., 2020)
	External support	Support from vendors and/or other third parties to encourage firms to innovate and adopt an innovation.	(Maroufkhani et al., 2020)
	Government regulation	Rules and policies that either inhibit or encourage the adoption of certain technologies, including technology standards.	(Tornatzky & Fleischer, 1990)

The definitions as found in literature were contextualised and analysed within the context of the fishing industry.

3 Methodology

3.1 Research design

To address the research question, the interpretivism paradigm was adopted. Interpretivism supposes that reality is subjective and based on individual experiences (Ryan, 2018). We adopted an explorative and qualitative design approach. This was ideal, as little is available regarding the Western Cape fishing industry. The objective was thus to listen to research participants to build an understanding of what is heard (Potter, 2015). Semi-structured interviews were used to investigate the adoption factors that were conceptualised in the Sec-TOE-DOI structured framework. The qualitative research captured the nuanced insights from interviewed stakeholders within fishing organisations.

3.2 Unit of analysis

Fishing organisations in the Western Cape comprised the unit of analysis. Individual respondents represented organisational perspectives and behaviours that influence the decision to adopt specific e-logistics technologies, responding from various perspectives of technical, financial/procurement involvement, managerial control, and operational knowledge.

3.3 Data sources, sampling strategies and techniques

To identify prospective interview respondents, purposive sampling was applied. The companies were identified using the Fishing Industry Handbooks, 45th (George Warman Publications, 2017) and 46th (George Warman Publications, 2018) editions. Interview participation requests were sent to ninety fishing companies (both large commercial-scale and small-scale). Of the ninety organisations, 20% (18) consented to participating in the research. The eighteen respondents allowed for in-depth interviews that in turn allowed for analysis and the development of the Western Cape's fishing industry's e-logistics adoption framework. Table 2 presents a summary of the participants.

While a significant portion of our respondents hailed from fishing operations companies, we deliberately ensured a diverse representation of stakeholders to broaden perspectives. The respondents were drawn from various business units and multiple roles and were in positions to directly influence the adoption of e-logistics technology or had already participated in operations using such technologies.

Table 2. Research participant summary

Type of Company	Definition	Type of Role	No. of People	% of people
Fishing Association **(4 | 22.2%)**	A group of organisations of a specific fishery, pursuing a joint purpose.	Executive Management, Operations	2	11.1%
		Fisheries Management Consultant	2	11.1%
Fishing Consultancy **(3 | 16.7%)**	A consultancy firm in environmental sustainability and fishing consulting.	Executive Management - Operations	2	11.1%
		Fisheries Management Analyst	1	5.6%
Fishing Operations Company **(7 | 38.9%)**	A company that owns, manages or operates fishing vessels.	Executive Management, Operations	3	16.7%
		Fisher/ 2nd Mate	1	5.6%
		Fisher/ Skipper/ Owner	2	11.1%

Type of Company	Definition	Type of Role	No. of People	% of people
		Fisheries Management Consultant	1	5.6%
Fishing Technology Company **(4 | 22.2%)**	Organisations providing and/or developing fishing technologies used by fishers.	Business Development Manager - Fisheries	1	5.6%
		Developer and Analyst	2	11.1%
		Executive Management - Operations	1	5.6%
Total Respondents			**18**	**100%**

3.4 Data analysis

Figure 2 provides an example of the logic applied during the analysis phase of the research.

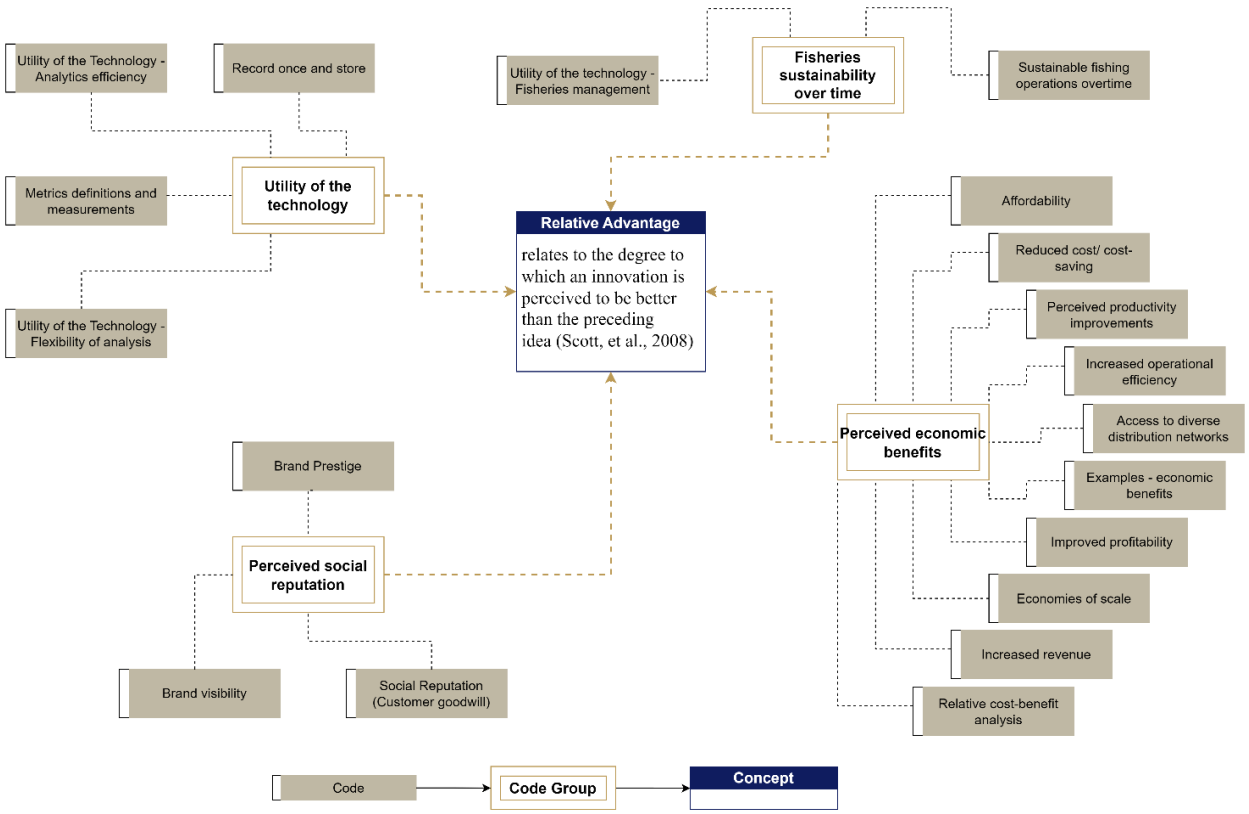

Fig. 2. An example of coding during qualitative analysis

Once the interview consent had been received, both physical and online interview sessions were organised over a 3-month period. The interviews were recorded, transcribed, and the data collected and cleaned up to ensure that inputs were coherent. Data validation, editing and masking techniques were applied to ensure that no self-identifiable analyses would be provided, and that information would not be misinterpreted or misrepresented. During the interviews, memos were added, highlighting frequently occurring thoughts. Soon after the interview, some time was taken to; listen to the

recordings, transcribe the interview, re-consider frequently highlighted thoughts, and add any other insight as was relevant. In analysing this data, coding units were identified, and data were classified within these units. A combination of deductive coding based on the framework, augmented with inductive coding to make provision for that which was not apparent from the framework was used. Deductive coding refers to a top-down approach where codes are developed from an already-developed framework or codebook (Saldana, 2015). Inductive coding refers to a ground-up approach where codes are developed from the data (Saldana, 2015). The codes applied to interviews were grouped into code groups, then further into concepts. The concepts then informed the constructs as identified in the Sec-TOE-DOI framework.

The logical flow of codes to the code group to the concept (theme) and finally upward to the construct from the model enabled informed analyses of factors, including their interplay across all stakeholders.

4 Findings

The respondents were 50% female (9) and 50% male (9). In terms of the respondents' companies, 22.2% (4) were from Fishing Associations, while 16.7% (3) were from Consultancies. Additionally, 38.9% (7) were from Fishing Operations companies and the remainder of 22.2% (4) were from Fishing Technology companies. At least 50% of respondents had over 10 years of tenure in their organisation and at least 61% had over 10 years of experience in the fishing industry. The experience and knowledge of the interviewees in relation to the fishing industry and technology use trends informed us of the objectivity and depth of the respondents' qualitative feedback as further discussed in the sections that follow.

Table 3. Respondents' fishing industry experience

Years of Experience	Under 1 Year		1-2 Years		3-5 Years		6-10 Years		Over 10 Years	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Current Company	1	6%	4	22%	2	11%	2	11%	9	5%
Fishing Industry	0	0%	3	17%	1	6%	3	17%	11	61%

The findings show that while the constructs: Technology, Organisation, and Environment influence technology adoption in the sector, specific concepts within these constructs drove this adoption.

4.1 Technology construct

Concepts of relative advantage and compatibility were found to be primary adoption-influencing factors. Within the relative advantage concept, respondents emphasized the utility of the technology, the perceived economic and social benefits, and overall fisheries sustainability. One fishing operations executive captured this succinctly, by stating:

> *"I hate doing things twice and that's what the digital world stops us from doing. My policy was to have data, keep data on our servers and have the flexibility to analyse it whenever we wanted to do so."*

This finding is consistent with other technology adoption research in other industries that found that perceived usefulness is an adoption-driving factor. Hubert et al. (2019) found that perceived usefulness and a technology's utility increased trust in smart home technologies and, therefore, the likelihood of adopting the technology. Similarly, Thevaranjan and Samantha (2022) found relative advantage as an influencing factor in e-commerce while Baptista & Oliveira (2015), using the UTAUT model, found performance expectancy, a construct assessing the utility of a technology as significant in the decision to adopt mobile banking.

The respondents further emphasised the importance of differentiating between systems and process compatibilities. Systems compatibility refers to technological compatibilities while process compatibilities refer to the technology fitting into the organisations' operations, e.g., software for compliance purposes. In both instances, compatibility was identified as influencing technology adoption, with process compatibility being more emphasised.

> *"You need something fit-for-purpose for your business. It's not a one-size-fits-all. People who get into operations tweak the operations."*

Fishing organisations tend to be willing to adapt operations to technology and vice versa, to reach internal efficiencies. A different executive noted:

> *"The fishing environment is very harsh. The weather elements sometimes determine what technology may be out at sea and what technologies may not be out... As a rule, fishermen must focus on fishing and not any other role. Technology must therefore complement the fishers' efficiency."*

Concepts of complexity, observability and trialability were not seen to primarily influence e-logistics technology adoption. Respondents noted that all new technology requires familiarity and thus may initially seem complex. Additionally, while one may observe success in other organisations, using certain technologies, in fishing, organisations tended to look inward, to seek internal efficiency optimisation as opposed to observing other organisations and imitating their winning formulae. Dynamics relating to differing operations from one organisation to the next diminish the value of observability as a factor. A different fishing executive noted:

> *"You may have a way your operational structure is and that influences what technology you use. One rarely looks next door. You can understand the competitor but it's generally about your operations."*

Respondents emphasised that fishing is a specialised industry requiring partnerships between technology developers and other fishing stakeholders, and that the partnership cannot begin at trialing the software but must be a continual exercise from conceptualising the idea to the final delivery of the specialised solution. As Nwaiwu et al. (2020) advocate, all-stakeholder involvement is imperative to build the needed trust and the adoption of technologies thereof.

4.2 Organisation construct

In moving to the organisation construct, one of the interview respondents acknowledged this factor by discussing the human resources dynamics, stating:

> *"The fishing career was previously not a desired one. It was simply a question of the choice of employer and not the choice of employment. Significant changes are being made to make the industry more attractive."*

In this end, therefore, top management support was identified as primarily influencing human capital to adopt technology. Management's ability to impose policy, their ability to assess and assume risk, and their influence on absorptive capacity both in terms of capital and financial resources make them a pivotal centre of technology adoption. In literature, likewise, Chandra and Kumar (2018) assert that positive attitudes of top management have tended to positively influence technology adoption at organisational level.

Absorptive capacity and slack were considered as one construct with respondents identifying the availability of uncommitted resources (human and financial), inherent fishermen's biases, and the knowledge and experience with technologies as primary adoption factors. As a factor of adoption, this implied both a positive and negative influence. The research found that the experience of human actors in the industry, especially fishers, was a primary contributor to the

adoption or rejection of e-logistics technologies. Fishers tend to be conservative in nature and prefer to stick to proven ways of working. One of the respondents noted:

> *"Usually, a younger crowd tends to be more receptive to technology than people who are set in doing things how they do them."*

New technologies thus may not be readily accepted as they may challenge this notion. Additionally, fishers tend to include, as part of their expertise, their knowledge of fishing grounds and techniques. E-logistics pose a threat to this specialisation, by moving the fishing grounds expertise and knowledge from the fisher to the technology. This, various fishers, especially small-scale fishers, mentioned as being a threat to their economic livelihood.

Another find from this analysis was that contrary to previous studies highlighting formal education as a key adoption-influencer, in the Western Cape fishing industry, it was the awareness and familiarity with available technologies that drove adoption, rather than formal education levels. A fisherman, describing some of his fishing mates stated:

> *"There are a lot of fishermen out there that don't even have smartphones, though they're still working with old cell phones. Guys are working with texts instead of WhatsApp and so you can kind of understand that there are people that are old school that do not want to change."*

As such, fishers in the industry may have varied formal education qualifications yet possess skills and knowledge much harder to quantify. There is an opportunity for technology developers to develop solutions with some educational material to accompany their technologies. This finding also supports Ghobakhloo et al. (2012), who identified a lack of knowledge, complexity of technology and unfamiliarity as barriers to technology adoption, these, needing consideration in all technology adoption endeavours. This barrier, the authors *(ibid.)* note, leads to a cultural distrust of technology, an alluded to reality in our research.

Concluding their interview, a female fishing consultant captured the absorptive capacity and slack concept's importance by stating:

> *"As a concluding remark, the most important factor is will. Everyone must be willing. Will is a fundamental influence and there are many examples when discussions stalled because of unwilling parties."*

Cultural biases, a lack of knowledge, a lack of resources and other organisational realities could hinder technology adoption, yet a willingness to overcome these challenges is a fundamental influencer to adopt modern e-logistics technologies. As the popular adage goes, "where there's a will, there's a way".

The size of the fishing organisation did not feature as a primary adoption factor. Different organisations employ different technologies with varying degrees of complexity. These technologies range from basic weather forecasting tools to electronic logbooks, onshore data analytics solutions and other paper-to-digital innovations. Larger companies tend to focus on leveraging economies of scale to increase fish production, while smaller companies prioritize affordability, opting for technologies that align with their specific operations.

4.3 Environment construct

In terms of the environment construct, competitive pressure, a modern driver of economic development, was not considered a primary adoption-influencing factor. While business ought to remain competitive for business continuity, fishing organisations tend to optimize internal operations to remain competitive.

A fishing operations' executive with engineering expertise noted:

> *"I applied fishermen's knowledge together with engineering knowledge and some technical knowledge and this has given our company a competitive edge by reducing the cost of developing our services and increasing the efficiency and reliability of our vessels across the board. We are perceived positively by our customers."*

The inward efficiency focus ensures business continuity and sustainability. However, external environment support was found to be a primary adoption-influencing factor. In particular, codes relating to partnerships, confidence and trust building, continual consultation and feedback, social partnerships and availability of industry skills and vendor support featured significantly during interviews, and these were identified as influencing technology adoption. A fishing consultant noted:

> *"You've to trust this or you've done this wrong and it's more about them (fishers) getting their confidence in it, which they will then pass on to other people."*

This trust was emphasized as the foundation to partnerships in solutions development, unseating a need for software trialing and other traditional "get-to-know" activities. These partnerships, in turn, provide the ability to lower barriers to technology adoption. As fishers' development input is considered, trust is built. As trust is built, usage of the solution and the needed feedback thereof are more likely to be provided, further continuing the cycle of development and use of e-logistics technology solutions. People do what they do and technology complements what people do.

As found in the research, governments tend to have the power to impose and enforce fishing licenses and laws. By virtue of this reality, all respondents considered government regulation as a primary adoption-influencing factor. However, further analysis revealed that many organisations using e-logistics technologies had not done so by direct government influence. Of note, in South Africa, many fisheries are required to provide paper logbooks in specified document structures, thus diminishing the returns on digital data capture and reporting automation. A fishing association executive thus added a caveat to government regulation influence stating:

> *"Yes, I think it's a primary factor because these processes are integrated, yet government systems are outdated. There is no incentive for the industry to provide electronic data because they simply can't use it at present. They (government) still want the notebooks, you know?"*

An organisation thus may adopt e-logistics technologies but still need to provide paper logbooks to the government authority to fulfil regulatory requirements. For these organisations, internal dynamics drive adoption, yet if the government were to force digital inputs, the adoption of these technologies would then be driven both internally and externally.

Government regulation may negatively impact adoption if they hinder or dis-incentivise e-logistics technology use. In South Africa, respondents highlighted that fishing licenses and quota management regulation are sometimes unpredictable, hindering significant capital investments. Regulation may increase risk and diminish e-logistics technologies return on investment. A recommendation in this light is for the government to reconsider legislation and remove outdated clauses and or improve them. This augments both Marciniak (2010) and Bolosha et al. (2023) who found that removing the uncertainties in business continuity and removing outdated legislation may incentivise businesses to adopt new e-logistics technologies, especially from small-scale fishermen's perspective.

Government's human resources skills play a critical role in that, if there is a misalignment between government human resources e-logistics technology use with the other fishing industry personnel, there may not be an incentive for the fishing organisations to digitise operations as the government would still require traditional reporting outputs. In this end, a recommendation was raised, that government legislation ought to follow a standards-based approach which, when defined

by a fishing consultancy executive referred to legislation that provided strategic and sometimes operational guidelines yet not stifling innovation. The executive suggests an approach to legislation where fishers, scientists, government, technology providers and fish product consumers develop fishing standards that inform operations and encourage e-logistics technologies. This finding and impact was alluded to by Bolosha et al. (2023) and Smidt & Jokonya (2022), who emphasised the need for farmer-centred/ stakeholder-centred participation in innovation and collaboration when developing policy with particular consideration of small-scale farmers in South Africa.

An additional realisation was the government's role in influencing technology adoption on organisations within the DOI's spectrum of organisations' propensities to adopt new technologies. Government regulation and incentives are most relevant where industry-wide technology adoption is needed. It is most necessary for laggards while as one moves away from the laggards to innovators, the need for such regulation and incentives becomes less necessary. This presents an opportunity for government-driven digitisation initiatives.

4.4 Security

The security construct was analyzed from a data security, quality, and governance perspective, then from an ethical and business sustainability and continuity perspective.

4.4.1 Data security, quality, and governance

The security construct was analyzed in terms of the security, quality, and governance throughout the data life cycle from fish retrieval and data capture offshore to integration and analysis, storage and archiving at the shore. E-logistics technologies ought to reliably showcase an ability to prevent data loss, theft, and manipulation, prevent hacking, and ensure and protect data ownership, data confidentiality and controlled data access. As Haufe et al. (2016) notes, securing sensitive organisational data has become increasingly vital to organisations. Technologies that provide clarity on ownership and risks associated with adoption are more likely to be favored.

Furthermore, data integrity was mentioned within the security concept. While data security emphasises the protection of digital information from unauthorised access, corruption and theft, *data integrity* informs part of the data security concept and emphasises the consistency and trustworthiness of the data, complementing data quality in terms of accuracy, timeliness and completeness (IBM, 2022b; Monczka et al., 2009). These technologies ought to provide data as and when needed within the shortest time possible.

While nothing may be completely secure, reflecting some level of security measures within an e-logistics technology improves the possibility of the technology being adopted. This finding was in line with Monczka et al. (2009) and Nwaiwu et al. (2020) who found that many technology adoption studies show the importance of security and trust as factors that could either directly influence behavioural intentions or indirectly influence other independent variables, such as perceived usefulness and ultimately lead to a positive influence on behavioural intentions.

4.4.2 Ethics and business continuity

In the South African context, ethical challenges were raised as influencing technology adoption. How technology displays fairness and acts as a complement to personnel within the fishing organisation and government may influence whether the e-logistics technology will be adopted. This relates to the ethics surrounding fishing technologies, their development, use, partnerships, and overall contributions to society. In discussing the philosophy of their market-available technology, a fishing technology executive noted:

> *"The idea is to build collective action, build a movement, build a brand of small-scale fishers, providing premium quality, ethically sourced, fully traceable, socially just fishing package."*

The executive continues to note:

> *"It is not just about competitive advantage but about fairness as well. It's about moving small-scale fishers from informal marginalised spaces to a state of social entrepreneurship."*

As Diaz (2020) found, community partnerships are a necessary foundation for encouraging technology adoption. Technologies that have this ethical bias are more likely to be adopted.

Furthermore, the question of automation, artificial intelligence and implications for employment ensued, i.e., will the adoption of e-logistics technologies result in significant job losses and loss of income for many personnel and thus families? South Africa's Gini Coefficient (gap between the rich and poor) measured at 0.65 in 2015 (Leibbrandt & Díaz Pabón, 2021). Unemployment rates have persistently remained high, at 34.5% as of 2022 (Stats SA, 2022). As such, employment opportunities and losses influence decisions relating to technology adoption. E-logistics technologies that may result in perceived unsustainable job losses are less preferred to those that support increased efficiency, yet re-skilling and growing employment prospects due to organisations and industry growth and restructuring. An environmental consultant noted:

> *"In South Africa, one question to ask is: How many workers am I going to lose? What is my employee turnover? Employment is a hot topic in South Africa. We have a really high unemployment rate. The rise in technology, specifically within the operational fishing sector is not always viewed in a positive light as it can be seen as a method or process to reduce staff numbers and replace workers."*

As such, e-logistics technologies adoption in South Africa ought to consider more socially-just distributive outcomes as noted by Jokonya et al. (2014). At the same time, isolated political sentiments were shared. The major premise presented in this light highlighted that affirmative action amongst other laws in the country had enabled some groups of people yet disabled other groups of people. This, in turn, disincentivised investment into longer-term capital-intensive e-logistics technologies by some groups. One fishing operations executive, who mentioned that he started fishing at a tender age and carried over his father's legacy notes:

> *"We have animosity in society, black trying to rid of whites and vice-versa, through whatever means and for whatever reasons."*

The sentiment was shared to suggest that, in addressing societal realities, business predictability and continuity has suffered leading to reduced investments including in e-logistics technologies that would have otherwise grown the fishing industry. In this end therefore, e-logistics technologies ought to enable, as far as possible, organisational sustainability requirements. At the same time, government regulation ought to complement the efforts by pursuing social justice ends for all groups of fishers to enable and develop further, the South African fishing industry.

5 e-Logistics technology adoption model

These findings were synthesized into the e-Logistics technology adoption model presented in Figure 4. The adoption model harnesses the factors identified as the primary e-logistics technology adoption factors. Within the **technology** construct of the Sec-TOE-DOI, concepts of *relative advantage* and *compatibility* were found to be primary adoption factors. *Complexity, trialability,* and *observability* were not considered as primary adoption factors. Within the **organisation** construct, *top management* and the s*lack and absorptive capacity* concepts were found to be primary factors of adoption, while the *size of the organisation* did not feature. *Competitive pressure* was not considered a primary adoption factor among the **external environment** concepts, while e*xternal support* and g*overnment regulation* were considered as primary factors both in encouraging adoption and in becoming barriers to adoption. Furthermore, **security** was emphasized as pertinent to the adoption endeavor. This is presented in Figure 3.

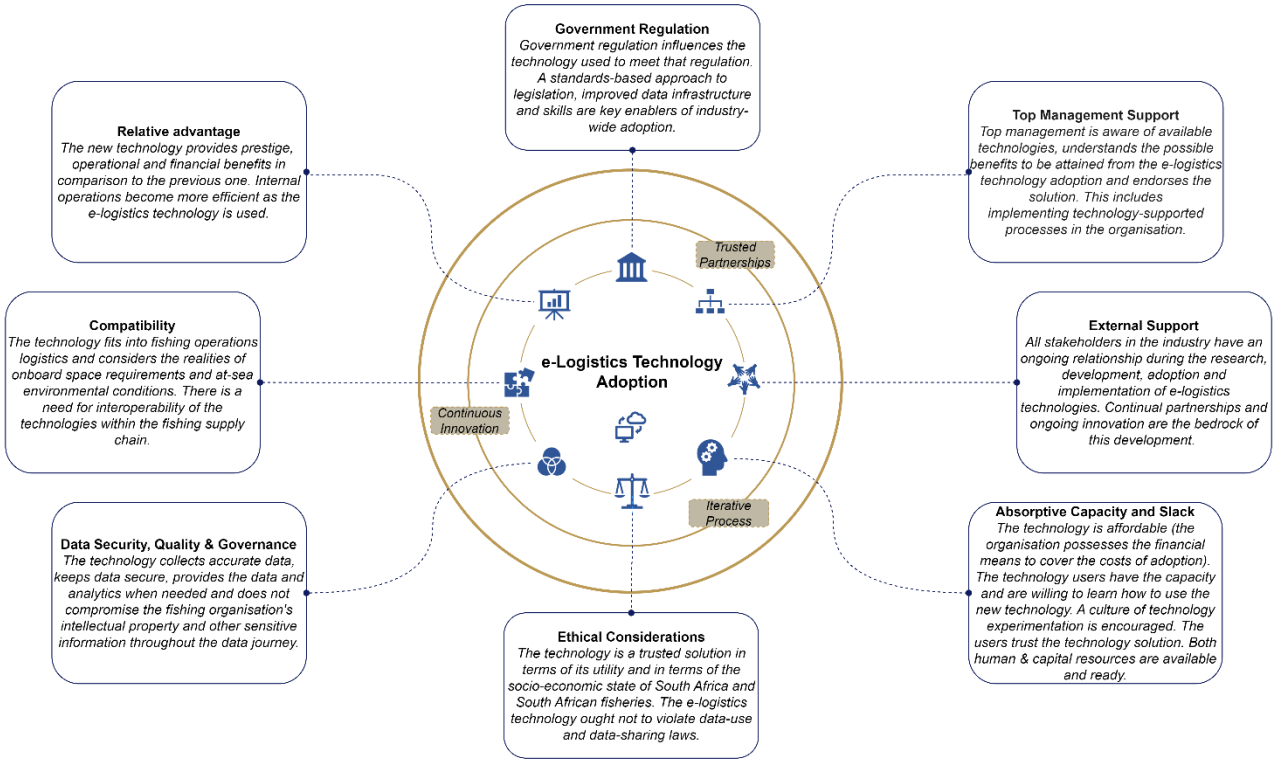

Fig. 3. e-Logistics technology adoption model

The findings may be summarized as:

- ***Relative advantage:*** Technologies that offer increased prestige, operational and financial benefits are likely to be adopted. Internal efficiency is a primary driver of fishing operations and e-logistics technologies that drive this are more likely to be adopted.
- ***Compatibility:*** E-logistics technologies must consider and adapt to fishing operations realities of vessel space, availability of power, and at-sea environment conditions. Additionally, these technologies ought to enable interoperability of technologies within the supply chain.
- ***Top management support:*** Effective top management tends to champion innovation, driving technology adoption with an understanding of the benefits and assuming risks associated with the use thereof. Furthermore, top management controls the financial capital and has the power to adjust business operations in line with available e-logistics. Technologies that have this top management buy-in are more likely to be adopted than those not favored.
- ***Slack and Absorptive capacity:*** E-logistics technology adoption depends on the organisations' human, technical and financial capacity. Organisations that have a culture of innovation or experimentation are likely to adopt e-logistics technologies. Furthermore, there must be a willingness (capacity to learn, trust and use technology) and availability of financial resources for investment in technology (affordability). Technologies that show these values are more likely to be adopted, necessitating partnerships between stakeholders to build such a foundation.
- ***External support:*** To improve adoption prospects, all industry stakeholders ought to work as a unit, building continual relationships throughout the adopted e-logistics technology life cycle and the data chain. It is insufficient to introduce technologies for trials and train individuals on use without partnerships at the solution development level.

- ***Government regulation:*** As a primary adoption-influencer in the South African context, the government has powers to incentivize activities and impose compliance. Regulations thus ought to play this role, building controls (standards) without imposing technologies and stifling innovation. Governments may further improve their infrastructure to match modern technology trends and align both the infrastructure and technical skills with industry, improving opportunities for e-logistics technologies adoption with a limited punitive push industry-wide.
- ***Security:*** Improved data security, integrity, quality, and governance, ethical considerations, and business security, and, therefore, certainty, are primary adoption factors. E-logistics technologies that enhance trust in the solution while appealing to socially acceptable norms and providing the necessary security are more likely to be adopted.

Our study recognises the intertwined web of stakeholders and activities in the fishing industry and acknowledges that the identified primary adoption factors operate within an interdependent environment, where each element enables the other or is better served as part of a whole. The identified factors are valid within an ecosystem of stakeholder partnerships and innovation. Furthermore, in South Africa, ethical development and policy considerations are significant influencers in technology choices, aligning with the nation's efforts to address historical disparities. While perceptions play a role in technology adoption decisions, policy amplifies their influence.

6 Conclusion

By meticulously untangling the intricate web of influencing factors of adoption, this research enriches the existing literature on technology adoption, contributing insights for fishing industry stakeholders, and lays the foundation for informed decision-making in the realm of e-logistics integration. Through this exploration, we aspire to not only enhance the academic discourse on technology adoption but also foster meaningful advancements in the sustainable growth of the fishing sector. The study thus seeks to establish a bedrock in informed decision-making in the e-logistics technology adoption body of knowledge.

The findings align harmoniously with the United Nations Sustainable Development Goals (SDGs): notably SDG9, which pertains to the advancement of industry, innovation, and infrastructure, SDG12 which encourages responsible consumption and production and SDG14 with the goal of considering life below water by encouraging sustainable fishing. The study promotes inclusive innovation, sustainable fishing, and efficient data analytics. Adopting e-logistics technologies may be a catalyst for solving global fishing crises (Ortiz, 2019).

It is acknowledged that the limitation of the study is that it was conducted in a single fishing region. This presents opportunities for future research in that future studies may proceed to validate the findings across the wider fishing population, including statistical analyses of the identified factors across regions for generalizability. Future research may additionally include the factors' influence by type of organisation to build stakeholder awareness across the industry. Furthermore, research could include investigations into fishery-specific technologies as deep-sea fishing may prove more sophisticated compared to small-scale fishing and thus requiring different sets of technologies to build efficiencies. This could include longitudinal studies to understand the impact of the ongoing interventions towards sustainable fishing.

Finally, the study provided insight into the factors that underpin the adoption of e-logistics technology among Western Cape fishing organisations. The paper conceptualised a unique Sec-TOE-DOI framework by drawing on the extant body of knowledge. Based on the data collected, the framework was refined into an e-Logistics technology adoption model. The findings emphasize a resounding truth: the bedrock of success lies in fostering robust and unwavering partnerships among all stakeholders. Beyond the identification of influential factors, it is the strength and trust within these alliances that steer the course. Consequently, the study offers valuable insights into potential interventions for the industry, grounded in the conclusions derived from the empirical findings. It is essential to acknowledge that the world of technology is one of perpetual evolution. The journey of adoption and utilization is not a finite destination but a continual iteration. It is a journey in which adaptation is not just a choice but a necessity.

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Appendix A. Research Instrument

Construct	Concept	Objective	Question
Technology	Relative Advantage	**Non-Adopted Company** a) To assess whether a non-adopted is actually considering Relative Advantage as part of their potential adoption. **Tech-Adopted Company** a) To assess the extent to which Relative Advantage influenced the decision to adopt.	**Non-Adopted Company** a) How important is your position in the industry? b) If a technology will give you an advantage (prestige, economic, productivity) - will that on its own convince you to buy? **Tech-Adopted Company** a) When you adopted the e-logistics did you consider how it would place you at an advantage in the industry, in terms of prestige or economic or productivity? b) To what extent did this industry advantage feature in your decision to procure the technology?
	Security	**Non-Adopted Company** a) To assess the degree to which security, data security and governance may influence the decision to adopt a technology. **Tech-Adopted Company** a) To assess the degree to which security, data security and governance influence technology adoption decisions.	**Non-Adopted Company** a) In your organisation, does an understanding and assurance of data security in a technology primarily drive the decision of whether the new tech will be adopted or not? **Tech-Adopted Company** a) As you were deciding on whether or not to adopt new e-logistics technologies, to what extent was the concept of security (data protection, governance, and security) a major driver of the decided outcome?
	Compatibility	**Non-Adopted Company** a) To assess the relevance of specific e-logistics technologies (e.g. e-logs, GPS, iEMR etc.) in relation to business processes and systems. b) To assess the extent to which compatibility of new e-logistics technologies to business processes and systems influences the decision to adopt. **Tech-Adopted Company** a) To assess the extent to which compatibility of adopted technology with previous processes influenced the decision to adopt.	**Non-Adopted Company** a) How important is compatibility between business processes/ available business systems and the new e-logistics technology? b) Would you consider this compatibility as a primary driver of the decision to adopt a new technology? **Tech-Adopted Company** To what degree what the compatibility of the new technology to your business systems and processes a priority decision-maker in adopting e-logistics technologies.
	Complexity	**Non-Adopted Company** a) To assess the degree to which perception and or knowledge of ease of use of available	**Non-Adopted Company** a) To what extent does the complexity or the simplicity (ease) of use of a technology influence your decision to adopt a technology?

Construct	Concept	Objective	Question
		technology on its own, by company personnel changes the decision to adopt.	b) Regardless of other known benefits of a technology, would complexity alone influence your decision to adopt/ not adopt the technology?
		Tech-Adopted Company a) To assess the degree to which ease of use or perception of ease of use of adopted technology within the company influenced the decision to adopt.	**Tech-Adopted Company** a) To what extent was the perceived complexity of the technology (or simplicity), the primary driver of the decision to adopt e-logistics technologies?
	Trialability	**Non-Adopted Company** a) To assess whether trialability is an important factor for the company in making the decision to adopt an e-logistics technology and to what degree this is so.	**Non-Adopted Company** a) In your decision to adopt a technology, does the ability to easily implement incremental milestones and or stop the technology altogether influence whether you adopt the technology or not?
		Tech-Adopted Company a) To assess whether the adopted technology was easily piloted and whether that ability/ inability was a factor in the decision to adopt.	**Tech-Adopted Company** a) To what degree was the possibility of easily piloting or trialling the software the key driver of the decision to adopt the said technology?
	Observability	**Non-Adopted Company** a) To assess the extent to which observed benefits of technology experienced by other companies influence the decision to adopt.	**Non-Adopted Company** a) Does the organisation benchmark any technology likely to be adopted against seen benefits from other companies b) If yes, does the observed success in one company automatically imply a decision to adopt the technology?
		Tech-Adopted Company a) To assess whether the adopted technology decision was influenced by observed benefits in other companies.	**Tech-Adopted Company** a) To what extent would you consider the observed results in another company of using a new e-logistics technology a primary influence in the adoption of the technology? b) If no organisation were observed, then would you say the idea of seeing positive results from a technology in another company can be a key driver of the decision to adopt a technology?
Organisation	**Top Management Support**	**Non-Adopted Company** a) To assess top management's awareness of technology and the degree to which they influence the decision to adopt.	**Non-Adopted Company** a) To what degree do you consider top management's endorsement and support of a technology as being a primary driver to adopt a technology?
		Tech-Adopted Company a) To assess the degree to which top management awareness	**Tech-Adopted Company** a) To what extent did you find the role of top management and their support in deciding

Construct	Concept	Objective	Question
		and support of adopted technology influenced the decision to adopt.	the new e-logistics technology to adopt? Was this a primary feature?
	Size	**Non-Adopted Company** a) To assess the extent to which organisation size (employee count and size of operations) affects the decision to adopt a technology. **Tech-Adopted Company** a) To assess the degree to which the size of the company and the size of the operations influenced e-logistics technology adoption in the past.	**Non-Adopted Company** a) To what extent is the size of your organisation influencing the decision of whether to adopt e-logistics technologies for data analytics or not? Please consider size in terms of employee numbers, the size of your operations, annual revenue, and industry market share. **Tech-Adopted Company** a) To what extent was the size of your organisation a major driver of the decision of whether to adopt e-logistics technologies for data analytics or not? Please consider size in terms of employee numbers, the size of your operations, annual revenue, and industry market share.
	Slack (Absorptive Capacity)	**Non-Adopted Company** a) To assess the extent to which availability of funds, people, people skills, and information technology infrastructure (uncommitted resources) influence the decision to adopt e-logistics technologies. **Tech-Adopted Company** a) To evaluate whether the availability of uncommitted resources influenced the decision to adopt, on its own.	**Non-Adopted Company** a) To what extent within the organisation does the education of the people, the availability of IT resources and availability of funds influence a decision of whether to adopt a technology? b) Would you consider the availability of these factors as a major driver in your decision to adopt and would these alone make you decide on adopting a new e-logistics technology? **Tech-Adopted Company** a) To what extent within the organisation did the education of the people including fishermen, the availability of IT resources and availability of funds influence the decision of whether to adopt a technology? b) Would you consider these factors as a major driver in your decision to adopt a new technology and would you say these alone could have been the sole/ primary drivers of your technology adoption decision?
Environment	Competitive Pressure	**Non-Adopted Company** a) To understand and assess the extent to which competitors have an influence in informing the company's e-logistics technologies adoption.	**Non-Adopted Company** a) The decision to adopt any technology is driven primarily by that the industry is extremely competitive and the technology may give a competitive edge. Some competitors are already using this technology. To what extent is this

Construct	Concept	Objective	Question
		b) To assess the extent to which industry competition intensity (push and pull factors) influences the decision to adopt.	statement true in your experience and to what extent does this reality influence your decision to adopt an e-logistics technology?
		Tech-Adopted Company a) To assess the extent to which competitors influenced the decision to adopt e-logistics technologies. b) To assess whether competition intensity, in the fishing industry influenced the decision to adopt.	**Tech-Adopted Company** a) The decision to adopt any technology is driven primarily by that the industry is extremely competitive and the technology may give a competitive edge. Some competitors are already using this technology. To what extent was this statement true in your experience and to what extent did that reality influence your decision to adopt the e-logistics technologies in use?
	External Support	**Non-Adopted Company** a) To assess the extent to which third parties, vendors or software providers influence the adoption of e-logistics technologies within the business.	**Non-Adopted Company** a) To what extent do you consider external support from software vendors and other service providers being a primary influencing factor for whether to adopt a technology?
		Tech-Adopted Company a) To assess the extent to which third parties, vendors or software providers influenced the adoption of e-logistics technologies within the business.	**Tech-Adopted Company** a) With regards your adopted e-logistics technologies, to what degree were availability of software vendors and support thereof a major driver in making your decision?
	Government Regulation	**Non-Adopted Company** a) To evaluate the influence that government regulation and laws have in the decision to adopt different e-logistics technologies.	**Non-Adopted Company** a) In South Africa, some fisheries are regulated by the government. Do government legislature and laws feature in your determination of what technologies to consider for your data analytics? - And to what extent would you say this is a factor in your decision to adopt an e-logistics technology?
		Tech-Adopted Company a) To assess the extent to which government regulation and legislation influenced e-logistics technology adoption.	**Tech-Adopted Company** a) In South Africa, some fisheries are regulated by the government. Do government legislature and laws feature in your determination of what technologies to consider for your data analytics? - And to what extent would you say this was a factor in your decision to adopt an e-logistics technology?

Biographical notes

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