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RESEARCH

A Systems Thinking Approach to Improving Firms' Competitive Capabilities and Firm Performance

R. Siriram[1] · **C. Du Plessis**[2]

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Abstract
This research aims to establish how systems thinking (ST) can be used to develop firm competitive capabilities (CC) and improve firm performance (FP). The focus is on ST applications in the South African information and communications technology (ICT) industry. The methodology includes Structural text condensation of relevant literature combined with interviews involving a selection of participants. From the analysis, some of the key findings are that ST enables the firm to contextualize itself in the wider systems environment, which results in improvements in FP. The research stream is specifically on soft ST and its contribution to improvements in firm CC and FP. This research creates an opportunity for further research into how soft ST can be leveraged in delivering firm CC and improvements in FP. The theoretical contribution made in this paper is exploring the relationship/linkage between the different concepts of soft ST, CC and FP.

Keywords Systems thinking · Soft systems thinking · Competitive capabilities · Firm performance

Introduction

Today's business environment is complex, fast-paced, and uncertain (Akhtar et al. 2018; Pascale 1999; Tetenbaum 1998, Siriram 2022a, b), and as a result, firms face challenges in daily operations (Akhtar et al. 2018). Jackson (2020) refers to this business environment as exhibiting VUCA characteristics, i.e. volatility, uncertainty, complexity, and ambiguity. Jackson (2020) further argued that this definition lacks precision and, in particular, questions what does "uncertainty and "ambiguity" relate to? Jackson (2020) posed two questions on what "uncertainty" and "ambiguity" could mean to this end; he questioned if it relates to what is going on in the "real- world" or do they highlight very different opinions

✉ R. Siriram
Raj@alpha-concepts.com

C. Du Plessis
Chantelle.Coetzee@nwu.ac.za

[1] School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand, Johannesburg, South Africa

[2] School of Industrial Engineering, North-West University, Potchefstroom, South Africa

on what is occurring and the right way forward, which is something that might be very difficult to overcome. To this end, Jackon (2020) suggests that we adopt a richer philosophical discussion on complexity. Furthermore, he suggests the approach followed by Rescher (2019), who makes a distinction between "ontological" and "cognitive" complexity. Rescher (2019), cited by Jackson (2020, p. 2), highlighted that "Ontological complexity is the complexity that exists in the real world. It derives from the quantity and variety of the elements of a system and the elaborateness of their interrelationships. It seems all the time to be increasing. According to Rescher (2019), the complexity of reality is cognitively inexhaustible". In terms of "cognitive" complexity, Rescher (2019), also cited by Jackson (2020, p.2) "Cognitive complexity, by contrast, derives from the different ways the world is viewed. This form of complexity is also increasing". Rescher (2019) sees that, in practice, ontological and cognitive complexity as intimately related. Given these views on complexity, firms operating in VUCA environments need to be able to deal with these types of complexity to remain relevant and competitive.

Therefore, it is important to develop competitive capabilities (CCs) to react to these changes. However, a different approach is required, an approach that enables a holistic view of the firm and its environment (Akhtar et al. 2018). Jackson (2003, p. 4) defines holistic (holism) as a "system which is more than the sum of its parts, and it is interested in the parts of the system and particularly the networks of relationships between the parts, but primarily in terms of how they give rise to and sustain in existence the new entity that is the whole". ST is a thought process that promotes thinking from a holistic perspective, as it enables an understanding of complexity as a combination of various relationships and connections (Checkland 1999; Akhtar et al. 2018; Siriram 2020). As a result, it enables a holistic understanding of the firm (Johanessen et al. 1999). ST is about both understanding the parts and their interrelations amongst themselves and their environment(s) and, most importantly, about how these interrelations are mediated and modulated. "Modern firms have become complex entities, primarily because of globalization, technological advancements, digital connectivity along with other factors like economic, political, and social" (Akhtar et al. 2018, p.767) and, as such, subjected to intense variety. To better understand this complexity and variety, it is prudent to refer to Ashby's law of requisite variety (Ashby 1956), which states that a viable system can handle the variability of its environment. In line with Ashby's law, others like Checkland (1999) and Schiuma et al. (2012) argued that ST enables the firm to develop capabilities that catalyze it to engage in turbulent, complex, fast-paced, and uncertain environments. Therefore, this again reinforces the adoption of a ST approach for firms to operate in such turbulent, complex, fast-paced and uncertain environments.

Systems thinking (ST) has received much attention over the last several decades (Siriram 2020; Schiuma et al. 2012). ST contributions to the following fields are noted: digital technologies, (Doan 2021); technological disruptions, (Kim et al. 2021); corporate sustainability, (Ahlström et al. 2020); design thinking, (Buchanan 2019); value improvement in manufacturing, (Williams et al. 2013); organizational performance, (Skažauskienė 2010); strategic value assessment, (Pagani & Fine 2008); innovation, (Galanakis 2006); and creating new products and services, (Pourdehnand & Robinson 2001) and improving the front-end of product development (Yamamura et al. 2019). This list is by no means comprehensive but gives a wide range of ST applications.

Notwithstanding these valuable contributions, Ackoff (2006) positioned that few organizations are adopting ST and provided two reasons for the slow adoption. Ackoff (2006) posited firstly that organizations fail to make changes to move the organization forward, mainly because of the repercussions when it comes to holding people accountable for

mistakes; therefore, they do nothing. Secondly, systems thinkers do not communicate to potential users in a language they understand. Others, like Siriram (2020), positioned that there is a lack of evidence linking ST to a firm's competitive capabilities (CC), which led to competitive advantages (CA); therefore, some firms may resist the adoption of ST. Hayes et al. (1996), in defining capabilities, make a distinction between ability and competence. Ability is being able to do something, however imperfectly or inefficiently. However, when one gets to be able to do something efficiently and consistently well so that others can be asked to pay for performing such services, this ability becomes a capability. Hayes et al. (1996) further point out that if you get so good at doing something and better than everybody else, the capability becomes a distinctive capability. In terms of this paper, we refer to distinctive capability as a CC. Porter (1985) positioned CAs as stemming from cost leadership and differentiation. That is, products and services are designed and placed in the market according to a strategy: cost leadership, differentiation, a combination of both or even confrontation. This is, however, dependent on the product and/or market characteristics. Siriram (2020) further reinforced that CA stems from the goods and services the firm produces. However, CC stem from the goods and services that the firm produces.

Siriram (2020) adopted two dimensions of CA from (Tracey et al. 1999), namely CC and quality of products. CCs are the firm's ability to address rapidly changing internal and external environments (Teece et al. 1997; Teece 2007, 2018) and are necessary for CA. Capabilities include skills and knowledge linked through business processes, enabling the firm to produce goods and services (Liedtka 1996), which is necessary to develop CA. Others, like Akhtar et al. (2018), also alluded to the tangible benefits of ST; they proposed linking ST to firm performance (FP), where FP indicates the firm's efficiency and effectiveness. Zaidi and Othman (2014) measured FP in terms of financial metrics (Market share growth, sales growth, profit, and return on investment (ROI)) and non-financial metrics (innovation, quality, customer experience and CC's).

Notwithstanding the differences in how one measures FP, there is a requirement for some measurement of FP and more direct linkages from ST to CC and FP so one can better articulate the benefits of ST to CC and FP. To further reinforce the argument on CC and FP, it is prudent to refer to the resource-based view (RBV) of the firm, where it has been highlighted that the difference in performance between different firms can be attributed to capabilities (resources) (Carmeli & Tishler 2004). From the RBV, FP rests on the ability of the firm to develop firm-specific capabilities to create CA (Ray et al. 2004). Therefore, CC may be seen as a necessary ingredient for FP and CA. Moreover, in the RBV, FP rests at a firm level rather than an industry level (Ray et al. 2004); this implies that firms need to develop firm-specific resources to create CC; however, when developing such CC, firms must be cognisant of the external influences. Ireland et al. (2003) further argued that firms that can stabilize and grow resources better than other firms are able to outperform other firms. More specifically, these resources should be valuable, rare, imperfect, and non-substitutable (VRIN) (Spanos & Prastacos 2004; Teece 2018). CC lie beyond products and markets and relies on the firm's idiosyncratic and difficult resources (Teece et al. 1997). In other words, resources that the competitors cannot easily copy, such resources include the development of ST as a CC.

Moreover, Oduro et al. (2023, p.4) positioned that firms "must be able to leverage, bundle and structure resources and capabilities to achieve competitive advantages". To this end, Hamel and Prahalad (1989) due consideration must be given to how these resources complement and integrate with existing factors such as infrastructure, current resources, firm culture, climate and so forth. Hence, given this stance from an RBV, it makes logical sense to adopt an ST thinking approach to developing CC. This

is because ST enables a holistic view of the wider systems environment, and it focuses on both an understanding of the parts as well as the interaction of the parts and how these interrelations are mediated and modulated.

Firms are socially constructed entities subjected to change over time and space (Fligstein 1996). ST enables an understanding of connections and relationships in social systems such as firms (Bertalanffy 1968; Checkland 1999; Metcalf & Benn 2013; Shortell & Singer 2008). However, while ST has been around for decades, insufficient tools and techniques are purposefully designed to deal with complex socio-technical problems (Karam et al. 2020). ST tools are limited because some tools measure, at best, only one or two ST skills (Dolansky & Moore 2013; Hopper & Steve 2008; Plate 2008) and many current tools are designed for specific domains such as education to test student ST skills (Frank 2010; Camelia & Ferris 2016). Firms are prone to socio-technical problems and, as such, require tools and techniques to deal with such problems. Akhtar et al. (2018) recognized that while there has been research on the implications of ST on firms, few empirical studies are proving the implications. To this end, Akhtar et al. (2018) also state that very few studies have focused on ST from an FP perspective. The limited contributions linking ST to FP are recognized (Kim et al. 2014; Jaaron & Backhouse 2014; Reardon et al. 2015; Siriram 2020; Skažauskienė 2010; Sun et al. 2014). Therefore, the contribution made in this paper is to explore how ST links to CC (which sets the firm to create CA) and improves FP (which is a measure of a firm's efficiency and effectiveness both from a financial (market share growth, sales growth, profit and ROI) and non-financial perspective (innovation, quality, customer experience, CC's).

This research aims to explore how ST links to CC and improves FP. The approaches in terms of measuring FP differ among the different authors (Akhtar et al. 2018; Zaidi & Othman 2014). In this paper, we will use FP as an all-encompassing inclusive measure of efficiency, effectiveness, financial and non-financial metrics and CC as a measure of the firm's competitiveness. In terms of this definition of FP, it is viewed as a state-space dynamical system, which is a set of all possible states of the system where all the state variables completely describe the system. For example, in terms of FP, all the state variables are important; they are not mutually exclusive. These include the variables of efficiency and effectiveness as well as financial metrics (Market share growth, sales growth, profit, and ROI) and non-financial metrics (innovation, quality, customer experience and CC's).

The central question posed is as follows: How does the adoption of ST enable a firm to develop CC's and improve FP? To answer this research, question the following sub-research questions are posed:

a) How does the adoption of ST enable a firm to develop CC's and improve FP?
b) What are the challenges facing firms in the adoption of ST?
c) What can firms do to improve the adoption of ST?
d) What are the benefits of ST specifically in terms of the firm's CC and FP?
e) What are the opportunities for further research and important lessons for researchers and ST practitioners?

The rest of the paper is structured as follows: next follows the literature survey, followed by the research methodology, research results and analysis, discussion and implications, limitations, and further research areas, and finally, the conclusions are provided.

Literature Survey

The Wider Systems Environment and Firms' Organizational and Environmental Evolution

Firms do not exist in isolation; they are part of a wider systems environment (Akhtar et al. 2018; Johanessen et al. 1999; Siriram 2020). Firms are connected to other firms, and this connectedness leads to complexity (Checkland 1999; Siriram 2020; Shortell & Singer 2008). In this complex environment, firms are uncertain and experience rapid change and confusion, and, as a result, face difficulty in predicting the future (Akhtar et al. 2018; Pascale 1999; Tetenbaum 1998). Complexity arises from independent entities in the system, which behave and interact according to their objectives (Fabac 2010). To better understand the complexities in the wider system, firms need to develop ST capabilities (Sterman 2000). ST takes a panoramic view of interactions, creating a wider understanding of the firm's organizational environment (Ackoff 1999). Moreover, ST plays a significant role by providing tools and techniques to solve complex problems (Hossain et al. 2020; Jaradat et al. 2018).

The ST approach views the organization holistically (Bertalanffy 1968; Checkland 1999; Johanessen et al. 1999). It helps identify patterns which enable the firm to develop more effective operational ways to manage the organization (Akhtar et al. 2018; Skaržauskienė 2010). In terms of this research, patterns are the interconnections between the different parts of the system, both internal and external to the firm, specifically how ST links to the firm's CC and FP. For firms to be competitive, they need to become efficient and effective in operating and competing (Akhtar et al. 2018; Fligstein 1996; Siriram 2020); hence, identifying linkages for efficiency and effectiveness is important. Changes in the competitive environment force firms to adopt strategies (Yamashita & Spataro 2004) to improve efficiency and effectiveness (Sohail et al. 2006).

There are many ways in which firms can measure firm effectiveness. Cameron (2015) states that there is no single correct definition of firm effectiveness. It is grounded in the values and assessment of the evaluators. Some researchers use FP instead of firm effectiveness (Akhtar et al. 2018). Firm effectiveness is not only a financial measure but also perceived in line with the services rendered and the success level achieved (Akhtar et al. 2018). Others view effectiveness as the measure of how firms meet their targets (Daft 1995; Yukl 2008; Papadimitriou 2007). Yukl (2008) sees effectiveness as how firms survive and can perform their mission and maintain financial resources and asset value. Papadimitriou (2007) views effectiveness as how firms engage with stakeholders, which is critical to the firm's survival, and Cameron (2015) views effectiveness as a means to produce value for customers.

Other researchers focus on the value concept at a holistic firm level rather than specific measures (Williams et al. 2013), such as firm effectiveness. In this paper, it is not the intention to be fixated on the terminology of either efficiency, effectiveness, performance, value, etc., but rather to explore how ST enables firms to develop CC and improve FP so they can better compete and deliver value to customers. The introduction has already pointed out that research linking ST to CC and FP is limited.

Systems Thinking Applications Linking Competitive Capabilities and Firm Performance

Williams et al. (2013) use a generic value improvement model (*g*-VIM), taking a holistic approach using soft and hard systems approaches in a repetitive manufacturing process to develop CA's. Williams et al. (2013. p.1012) point out that "The internal influences component of the *g*-VIM contains indirect elements which are more generic to the business environment such as culture, leadership, business strategy, and core competencies which are the process inputs that can be changed and controlled but not as easily as the direct inputs". Williams et al. (2013) combine ST approaches with other quality management and lean manufacturing methods to develop a holistic approach to developing CA and producing quality products. Pagani and Fine (2008) use ST dynamic models as well as incorporating causal loop mapping as an approach to develop a more informed strategic value assessment model incorporating value chain concepts into concurrent engineering models to develop a better understanding of the competitive dynamics in the telecommunications industry. Kim et al. (2021) use ST approaches to enable firms to shape business models and future strategies, guiding creative and strategic thinking in the automotive sector; they showed that ST approaches guide firms in terms of critically reviewing business models and paving the path to the future with a better economic outlook.

Notwithstanding the limited literature evidence presented in terms of linking ST to FP (Kim et al. 2014; Jaaron & Backhouse 2014; Reardon et al. 2015; Siriram 2020; Skažauskienė 2010; Sun et al. 2014). It may be positioned that there is some evidence that ST has demonstrated value in terms of how firms can create value in terms of the broader organizational context, develop CC and improve FP. Next, examining what factors are necessary to link ST to CC and FP is prudent.

Factors Necessary for Linking Systems Thinking to Competitive Capabilities and Firm Performance

In line with Stafford Beers viable systems model (Beer 1981), Siemens (2005) emphasized that firms operate in dynamic environments, which are constantly changing; they react to environmental changes and need to develop capabilities to adapt accordingly. In today's business environment, firms need to explore and exploit capabilities to be sustainable; this concept (exploration and exploitation capabilities for achieving sustainability) is referred to as the firm's ambidexterity (Vahlne & Johnsson 2017). Ambidexterity is related to the firm's ability to adapt to environmental and technological changes (Tushman & O'Reilly 2002). Turner et al. (2013) emphasized that firms need highly effective systems and processes to support the exploration and exploitation of the business environment. This is identified as the first failure point. Firms that are unable to change systems and processes and adapt to changing environments are not effective in exploring and exploiting capabilities to achieve competitiveness (Gilbert 2005). Firms need to develop ST capabilities which impact organizational processes that enable individuals to make their judgements regarding adaptability and alignment to environmental changes (Tushman & O' Reilly 1996) and, in so doing, affect the organization's performance (Karam et al. 2020). Therefore, the first factor necessary to align ST to CC and FP is the firm's ability to be flexible and change systems and processes (Turner et al. 2013).

The firm's ability to adapt and change is, to a large extent, dependent on the firm's culture and climate, which is seen as the firm's ability to either lead or resist the adoption of new ideas (inclusive of newer technologies and innovations) which is also inclusive of either leading or resisting the adoption of ST (Siriram 2020). The firm's culture strongly influences FP (Cameron & Freeman 1991; Gomez 2004). Siriram (2020) showed that ST influences the firm's culture and climate, specifically institutional efficacy and self-efficacy. ST takes on the human dimension early in the analysis (Siriram 2020), and firms are becoming more dependent on individuals (Andreadis 2009) because individuals are involved in the firm's organizational and environmental evolution (OEE) (Siriram 2020), which encompasses complex operational technologies, economic, political, and sociocultural environments (Andreadis 2009). Hence, individuals affect the firm culture and climate; therefore, firms that involve individuals in management processes and decision-making are more likely to achieve higher levels of performance (Sundaray 2011). Individuals should be able to engage in turbulent and complex environments; this ability is developed through ST (Checkland 1999; Schiuma et al. 2012). Karam et al. (2020) highlight that complex problems and system skills are important in turbulent and complex environments; this is because of the increasing complexity, and decision-making is a complex and vital process. Therefore, firms need individuals who can successfully deal with complex system problems (Karam et al. 2020). The second factor is the firm's culture and climate, which is required to embrace ST. The third factor is to develop and expose individuals to complex decision-making. In doing so, they are better positioned to guide the firm in complex, turbulent and uncertain environments. Moreover, this exposure will better position individuals to guide the firm's culture and climate.

ST also enables firms to devise strategies (Gharajedaghi 2011) and deal with problems associated with strategies (Akhtar et al. 2018). Firms with clear goals and objectives perform better than others (Chun & Rainey 2005; Lemieux-Charles et al. 2003). One of the problems associated with strategy is that it can be ambiguous and does not give clear direction to individuals, so they are unclear about what is required of them (Chun & Rainey 2005). The strategic behaviour of firms is influenced by individuals (managers) who adopt ST as a mechanism to alter the firm's organizational environment so that other individuals (managers and employees) can adapt to changing circumstances (Anderson 1999). Therefore, firms need to be consistent with their vision and mission and be able to adapt and respond timeously to environmental changes (Denison & Mishra 1995; Fey & Denison 2003). Therefore, strategic planning is important for individuals because it gives direction so that individuals have a clear indication of what is required of them (Chun & Rainey 2005). Therefore, the fourth factor is that strategic planning is foundational for linking ST to CC and FP.

ST is complementary to other concepts like six sigma, lean, total quality management (TQM), design thinking etc. Williams et al. (2013) give evidence of how ST and other concepts (SIPOC, Supplier-Input-Process-Output-Customer; lean; Six Sigma, TQM) are used in conjunction to develop CA and produce quality products. Siriram (2012) used ST in conjunction with the analytical hierarchical process (AHP) for business process model prioritization. Siriram (2017) used ST in conjunction with numerical evaluation techniques in a project management environment. Karam et al. (2020) used ST in conjunction with multi-criteria decision-making for recruitment. Soft ST and hard systems are complementary approaches because most problems consist of both a technical dimension and a human dimension activity, and combining both enables a better solution (Crawford & Pollack 2004; Shi 2011; Williams et al. 2013). Flood and Carson (1993), cited by Blanchard and Fabrycky (2006), proposed that in systems problems, the correct methodology

should be used because soft problems may be perceived differently by different people. These problems are less structured, fuzzy, or messy, while hard problems, on the other hand, although difficult to understand and deal with, are definable; therefore, choosing the correct approach is vital. Therefore, there is merit in using ST in conjunction with other approaches. Hence, the fifth factor is that using ST in conjunction with other concepts, models, and tools is necessary for linking ST to CC and FP.

Outcomes of the Literature Survey

The outcomes of the literature survey indicate that firms exist in a wider systems environment, and as such, firms must understand this wider environment. It was further identified that the linkage from ST to a firm's CC and FP must be further explored, and in so doing, this may uncover what factors are necessary to link ST to CC and FP. The literature survey enabled the researchers to create a reference framework for studying the links from ST to firm outputs, specifically CC and FP; a similar process was followed by others (Larsen et al. 2021). The literature survey also gives perspectives in terms of understanding firm-level outputs which relate to value outcomes, customer experience, firm profit and growth opportunities, efficiency, effectiveness, CAs, etc. This is especially important as some researchers (Siriram, 2020) have indicated that ST adoption is constrained because firms do not see the value of ST articulated in firm-level outputs which link to CC and CA. Furthermore, five factors were identified as necessary for linking ST to CC and firm performance namely: (a) flexibility in terms of changing systems and process, (b) the firm's culture and climate, which is required to embrace ST, (c) exposure of individuals to complex decision making, (d) strategic planning as it gives individuals direction, (e) and ST is used in conjunction used with other tools. The five factors also established the basis for establishing the research codes and themes. Moreover, the literature survey set the basis for setting up the research aim, central questions and sub-research questions. It also enabled establishing the guidelines for the interview questions.

Research Methodology

Research Design

A qualitative exploratory methodology is adopted, aiming to generate data from relevant respondents' experiences and provide answers to questions (Mason 2018; Saunders et al. 2009). Using interviews to gather data is suitable when seeking in-depth knowledge of a particular situation or process (Saunders et al. 2009; Yin 2003). Interviews also allow for focus on the research topic and permit the interviewee to provide explanations and personal views (Yin 2003).

A literature survey was conducted to identify the factors that affect the adoption of ST; it is noteworthy to recognize the work in this area by Siriram (2020) and Ackoff (2006), who specifically focused on linking ST to a firm's outputs. Malterud's Systematic Text Condensation (STC) was used as a research methodology(Malterud 2001, 2012). STC enables phenomenological ideas, offers a pragmatic and interactive approach, and offers inter-subjectivity, reflexivity and feasibility while ensuring methodological rigour (Malterud 2001, 2012). STC is a descriptive and explorative method for analyzing qualitative data focusing on participants, meaning and experience and has been used in medical research (Malterud

2001, 2012) and project management research (Larsen et al. 2021). The researchers in this paper also find this methodology suitable for this research. STC is also used by other researchers in qualitative research and is considered well-defined (Sari et al. 2017; Sagsveen et al. 2018). STC is an inductive approach; the findings from the literature survey provide a lens for guiding the interview process and the preliminary template for the coding procedure (Larsen et al. 2021). The STC method enables an interactive balance between the interviews and the literature survey, where the interviews also guide further literature studies (Fereday & Muir-Cochrane 2006; King 2004; King et al. 2002).

Methodology for Structured Text Condensation (STC)

The first part of the methodology that was followed for STC involved reviewing the literature and identifying the first-order codes. Science Direct was used to identify research papers focused on ST approaches to CC and FP. The titles of the articles selected included the words ST and combinations of the phrase's organizational performance, business performance improvement, strategic value assessment, organizational effectiveness, organizational value, CC, quality of products, innovation, technological disruptions, and design thinking. Thereafter, the abstracts of the articles were read, and those specifically focused on using ST to improve CC and FP were selected; this resulted in 22 articles. STC was then used to derive the initial first-order codes and identify the second-order themes and aggregated dimensions. These first-order codes were then used to analyze the interview transcripts.

Empirical Data Collection

Semi-structured interviews with participants who were exposed to ST were conducted. The criteria used to select participants for this research were based on four criteria adapted from Momeni and Martinsuo (2019) and Zerjav et al. (2021). Firstly, participants were knowledgeable and experienced in ST. Secondly, they had to have senior decision-making experience. Thirdly, they were willing to participate in the research and share their experiences, insights, challenges, and opinions about the adoption of ST in firms. Fourthly, they had to have exposure to ST initiatives either at an organizational-wide level or be exposed to specific interventions where ST was utilized. Table 1 shows the list of interview participants. Table 2 reflects the demographics of the participants, their basic characteristics (Gender) and information on their competencies and performance (years of experience, management experience, education, functional area, and industry exposure). In terms of gender participation, 70% male and 30% female this is representative of the ICT sector in South Africa. Regarding years of experience, all participants have more than 10 years of experience; management experience is also at the higher end, with 20% between 6 and 10 years and 70% more than 10 years. In terms of education, 100% of participants have postgraduate qualifications; regarding functional experience, there is a fair and acceptable distribution across the different functional areas. Regarding industry experience, all participants have multiple industry experiences. These demographics eliminate any bias when it comes to sample representation, and even though the small size, the results can be generalized in terms of the ICT sector in South Africa. Some may question the generalization of the results because of the small sample size; however, this is noted, and it must be recognized that sound research methodology was followed and saturation in terms of participant responses was reached. In qualitative research, when it comes to the number of

Table 1 Interview Participants

Participant	Relevant role and expertise	Date and duration ofinterview
1	A senior manager works in an international company,exposure to systems thinking across multipleindustries, more than 10 years of experience,actuarial science background	1 June 2022 1.35 hours
2	General manager projects worked in aninternational electrical engineering, heavy industrialenvironment and ICT, more than 35 years experience,engineering background.	26 August 2021 1.21 hours
3	Senior sales manager projects worked in aninternational electrical engineering, heavy industrialenvironment and ICT, more than 35 years experience,engineering background.	27 August 2021 1.35 hours
4	Senior business development manager projects,worked in an international electrical engineeringheavy industrial environment and ICT, more than 20 years of experience, and engineering background.	28 August 2021 1.25 hours
5	Senior business development manager projects worked in an international electrical engineering heavy industrial environment and ICT, more than 20 years' experience, engineering background.	28 August 2021 1.15 hours
6	General manager project sales worked in an international electrical engineering heavy industrial environment and ICT,more than 30 years' experience, engineering background.	29 August 2021 1.35 hours
7	Director tendering and estimating, worked in an international electrical engineering heavy industrial environment and ICT, more than 35 years' experience, engineering background.	30 August 2021 1.65 hours
8	General manager projects, worked in an international electrical engineering heavy industrial environment and ICT, more than 35 years' experience, engineering background.	31 August 2021 1.45 hours
9	Projects director, worked in an international electrical engineering heavy industrial environment and ICT, more than 35 years' experience, engineering background.	1 September 2021 1.25 hours
10	General manager projects, worked in an international electrical engineering heavy industrial environment and ICT, more than 35 years' experience, engineering background.	1 September 2021 1.35 hours

Table 2 Demographics of Participants

#	Variables		*N*	%
1.	Gender	Male	7	70%
		Female	3	30%
2.	Years of experience	< 10 years	0	0
		11-20 years	1	10
		20-30 years	3	20
		>35 years	6	60
3.	Management experience	0-5 year	1	10
		6-10 years	2	20
		>10 years	7	70
4.	Education	Bachelor's degree.	0	0
		Post graduate degree.	10	100
5.	Functional area	Senior manager specialist functional area.	4	40
		General management.	4	40
		Director.	2	20
6.	Industry	Single industry.	0	0
		Multiple industries.	10	100

participants, researchers vary. Dworkin (2012) stated that a minimum of 5 participants in a qualitative study has been proven to attain saturation, which also reduces the risk of repetitive data. Murray et al. (1995) suggested that participants range from 10 to 30; notwithstanding this, the interview process will be terminated once saturation is reached (Francis et al. 2010; Hennink & Kaiser 2022). The approach selected in this paper was based on the work by Siriram (2022c) where 10 participants using purposeful sampling were also used.

All interviews were recorded and transcribed verbatim. Once the interview transcripts were transcribed, they were checked to identify and correct any mistakes or gaps (Momeni & Martinsuo 2019). To ensure communicative validity, the transcripts were circulated to the relevant participant concerned to ensure the transcript was a true reflection of the interview (Momeni & Martinsuo 2019). Similarly, pragmatic validity was ensured by asking follow-up questions where the responses from the participants were more generic (Zerjav et al. 2021). Transgressive validity was achieved by seeking contradictions and tensions during the interview process (Zerjav et al. 2021). The data analysis was conducted abductively, which allowed iterations of the data and the literature survey (Momeni & Martinsuo 2019; Malterud 2012). To further ensure validity and reliability, close collaboration was maintained between the participants and the researchers; that is, face-to-face interviews were conducted, and credibility was further ensured by the researchers' experience in conducting research on similar research topics and methods (Momeni & Martinsuo 2019). Purposeful sampling increased the transferability of the findings (Momeni & Martinsuo 2019). To ensure dependability, the records, transcripts, and data logs were stored systematically, and the confidentiality of the participants was protected (Momeni & Martinsuo 2019). To ensure the comprehensiveness of the findings, the post-interview transcripts were compared against other participants to identify consistency across the different participants (Zerjav et al. 2021). Triangulation of data from recorded interviews, transcripts, and researcher field notes also ensured data integrity and reliability (De Vos et al. 2011). Comparing the post-interview transcripts against the different participants was also a means

to ascertain that the participants understood the questions and the background concepts. Further, during the interview, the background concepts like ST, CC and FP were clearly articulated. As already pointed out, pragmatic validity was ensured by asking follow-up questions where the responses from the participants were more generic (Zerjav et al. 2021); this also ensured that the participants understood the questions and background concepts.

Data Analysis

The interview responses were categorized using first-order codes, which were then grouped using affinity grouping, this is reflected in Table 3.. Key words were identified in the interview responses. These key words were then categorized into themes. From Table 3., for example, the keywords holistic, connectivity, stakeholders and multiple viewpoints, dynamism and globalization are grouped under the theme Context; these keywords were coded as h. Similarly, Table 3. is completed. When analyzing the interview transcripts, new first-order codes were identified, and the initial list was amended to include the additional first-order codes (King et al. 2002). The new first-order codes further guided the literature survey process, making the literature survey and the analysis of the interview transcripts an interactive process (Malterud 2012). An analysis of the complete set of first-order codes ($n=22$) resulted in the codes being interrelated and hence could be grouped into five preliminary categories (second-order themes). The five preliminary categories (second-order themes) were further categorized into five main categories (aggregated dimensions) in Fig. 1; a similar approach was followed by Larsen et al. (2021). Fig. 1 and Table 3. reflect the first-order codes.

The context defines the ST opportunity space, which consists mainly of the environmental, political, and analytical determinants and the objectives and needs. The context sets premises for taking cognizance of the wider systems environment but also has a way of shaping the opportunity for adopting ST at the wider organizational level. Structures point to the need for clarity in the firm and the alignment to the firm strategy goals,

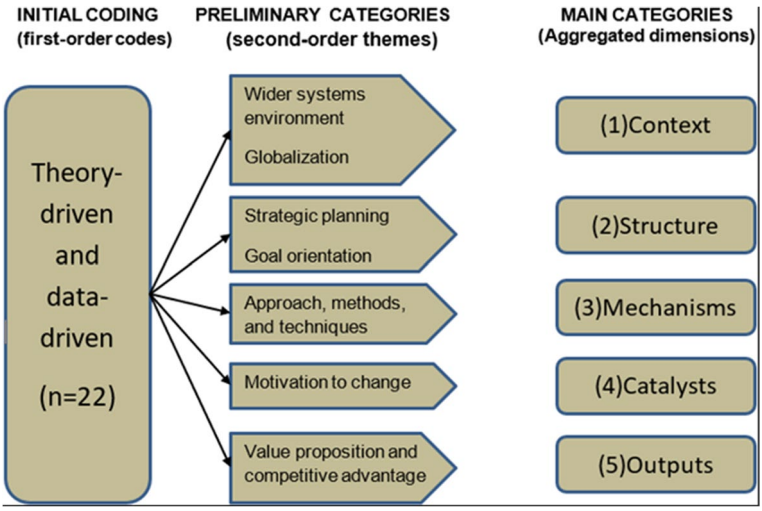

Fig. 1 Coding structure

Table 3 Integrated first-order codes (affinity grouping)

Integrated codes affinity grouping									
Context	codes	Structure	Codes	Mechanisms	Codes	Catalysts	Codes	Outputs	Codes
Holistic, connectivity, stake holders and multiple view- points, dynamism, globalisation	h	Scenarios alternative choices	a	Casual loops	l	Innovation, creativity, climate, sustainability, wider organizational adoption, continuous improvement	e	Produce better value components, products and services, value outcomes and competitive advantages	b
Complex system, business uncertainty, change and adaptability	c	Strategic objectives, planning, strategic levers, strategic behaviour, structure, vision, mission	o	Strategic value Assessment and value creation mechanisms, practial used case industry examples	v	Business models, diversification	f	Customer and customer experience	x
Competitive and technology dynamics, Competitiveness, competitor threats, explore opportunities, technological disruptions	d	Paradigm shift, resistance to change, rigid organizational structure	m	System dynamics, capabilities and dynamic capabilities, internal and external competencies	s			Profit and growth opportunities higher productivity, organizational efficieny effectiveness and firm performance, cost effectiveness,firm performance, system performance, profit and growth opportunities, respond to market opportunities	p
		Balanced decision making, alignment, knowledge sharing, problem solving, systems and processes, management processes and leadership structure	k	Trade-off, risks	t				

Table 3 (continued)

Integrated codes affinity grouping									
Context	codes	Structure	Codes	Mechanisms	Codes	Catalysts	Codes	Outputs	Codes
		Communication and culture, awareness, change mangement, institutionalisation, and learning processes	g	Integration, complimentary with other approaches	w				

objectives, and needs, while mechanisms describe the necessity for human involvement in the firm's culture and climate and the involvement of individuals in the decision-making process. Catalysts include the actions and inter-relations as well as the ability and capacity to adapt to changing circumstances. The last category refers to the outputs which relate to the deliverables at a firm level.

As an example, consider Table 4 Question 1; "*How does the adoption of ST enable a firm to develop CC and improve FP?"* Consider Participant 1's response to this question from Table 4. In the first response in row one, the first-order codes h, p,p, t,t, p,p are extracted from Participant 1's response. These first-order codes are then grouped and categorized into the preliminary categories (second-order themes) and main categories (aggregated dimensions). For example, a "1" appears in the column marked *context* (wider systems environment and globalization). This indicates that the keyword *'holistic'(h)* appeared only once. Next, consider the column-marked *mechanisms* (approaches, methods and techniques); a "2" appears in this column because the keyword *'trade-off (t)* appears twice as per the first column, first-order codes. Similarly, Table 4 is completed. Continuing in this manner, the frequency of second-order themes is summated, and the total percentage for each second-order theme is calculated for all participants. The calculated percentage is the frequency of occurrence of a theme, indicating its ranking.

Research Results and Analysis

This section is structured along each of the main categories namely context, structure, mechanisms (inclusive of approaches, methods and techniques), catalysts and outputs.

Context

In terms of context, the participants reflected on how firms co-exist with their environment. Firms exist in a complex, uncertain, fast-paced environment, and they are prone to outside influence; therefore, they must adapt to survive. Operating in such an environment requires complex thinking abilities gained through ST. The views of the participants are reflected as follows:

Participant 2, Chief Executive: "*Today's business environment is highly competitive with new competitors new technologies entering our business environment. It is therefore necessary to keep an eye on the bigger picture and not get lost in the detail. ST enables our firm to explore opportunities, evaluate threats and make informed discussions from a wider environmental* context." Participant 4, Senior Manager 2: "*ST allows an organization to see beyond what is obvious and be able to deal with complexity, including wicked problems"*. Participant 9, Executive Director "*holistic, understanding that you are participating inside a larger system."*

Notwithstanding the importance of the wider systems environment the importance of cross-functional knowledge and integration within the firm was also emphasized. Participant 1, Senior Manager 1, "*A lack of understanding around a) cross-functional knowledge within the firm to understand all aspects of the operating model and how these interrelate, and b) the importance of ST and therefore willingness to participate in facilitated discussions."* Participant 7, Functional Specialist 1: *"ST is a way of thinking*

Table 4 Coding of interview transcripts

			2nd order Themes				
Participant no.	**Q1 How does the adoption of systems thinking enable a firm to develop competitive capabilities and improve firm performance?**	1st order Codes	Context: (Wider systems environment and globalization)	Structure: (Strategic planning goal orientation)	Mechanisms: (Approach methods and techniques)	Catalyst: (Motivation to change)	Outputs: (Value proposition and competitive advantage)
1	Adoption of systems thinking facilitates a holistic identification of priority areas to develop or improve whereby the greatest impact on firm performance can be achieved. A detailed understanding of all key drivers of firm performance is essential; priority areas will be selected where there is an appropriate trade-off between: 1) the level of effort required to affect/change the driver and 2) the expected level of output as a result of this change. This trade off needs to be evaluated within the context of the broader business operating model.	h,p,p,t,t,p,p	1		2		4

Table 4 (continued)

			2nd order Themes
2	Today's business environment is highly competitive with new competitors, new technologies entering our business environment. It is therefore necessary to keep an eye on the bigger picture and not get lost in the detail. Systems thinking enables our firm to explore opportunities, evaluate threats and make informed discussions from a wider environmental context.	d,d,h,d,h	5

Table 4 (continued)

			2nd order Themes
3	It allows stakeholders to frame their organization as a system of decisions that are interdependent and to understand the impact of decisions within the broader context of environment and wider systems within which the organization operates. This makes a firm less reactive and more globally focused when creating and executing strategy, meaning it relies less on responding to competitors but develops capabilities by responding to the needs arising out of trying to solve systemic problems rather than localized, symptomatic ones. This opens up new markets and potentially spaces unseen by traditional market competitors.	h,h,h,c,d	5

Table 4 (continued)

			2nd order Themes		
4	ST allows an organization to see beyond what is obvious and be able to deal with complexity including wicked problems. ST allows organizations to delve down to not only experience events but be able to comprehend the trends, structures that drive the behavior and mental models held by the organization. This appreciation is key for organizations to comprehend the nature of problems at play in a dynamic setting, understanding, and solving these complex problems develops a competitive edge	c,o,h,k,c,b	3	2	1
5	Systems thinking helps identify and define problematiques (problem/solution contexts) with the use of its tools and methods that are multidisciplinary in their approach.	h,h	2		

Table 4 (continued)

		2nd order Themes
Often the challenge in business is the facilitation of capturing a problem or state of things considering differing multidisciplined perspectives. Systems thinking, its methodology, tools and approach is proven in successfully handling complex problems that are particularly "messy" in nature	h,h	2
This holistic problem-solving approach allows emergence of solutions that would otherwise be unapparent with traditional problem-solving approaches that are often reductionist in their approach.	h	1

Table 4 (continued)

			2nd order Themes	
6	Systems thinking avoids an over simple view of organisations and the way they interact, both internally and externally. It recognises the complex interactions which take place, as systems have many interconnections and activities which take place over substantially different timescales. Their nature also varies – from 'hard' interactions such as moving physical items, to soft ones, where people will discuss what decision to make in an ill-defined situation. The Cynefin model typifies these complexities. Systems thinking also helps to identify controllable factors from external ones. Whilst one can never remove risk in business operations, systems thinking helps to quantify it, identify likely activities of competitors and markets, and improve the business's responsiveness and hence, competitiveness	h,h,c,h,c,t,t,h,d	7	2

Table 4 (continued)

			2nd order Themes		
7	Systems thinking is a conceptual framework and provides the required understanding and systemic view of the entire supply chain of the business (manufacturers to customers). It enables the firm to analyze its business processes and approaches from a holistic perspective and further stimulates create ideas on how to improve the supply chain to gain competitive advantage. This will support the firm's strategic intents in terms of acquiring the knowledge capital (know how) to improve the quality of products and service delivery, and thus increasing productivity.	h,h,b,o,p	2	1	2

Table 4 (continued)

			2nd order Themes		
8	Systems thinking provides a firm with a holistic view of how they fit into the outer system. This perspective allows the firm to recognize the various actors/ stakeholders/ competitors/ variables in the network such that the firm:	h,h	2		
	1. Is aware of who is participating in the system				
	2. Is able to address the elements which may arise as a result of the connections within the system.	h	1		
	3. Understands the causality in the system so that they know what knock-on effect certain decisions may have.	h	1		
	4. Can leverage the network or connections to create competitive advantage.	h,b	1	1	
	Understands the leverage points and bottlenecking points in order to optimize the firms performance.	p		1	

Table 4 (continued)

			2nd order Themes		
9	Firms are normally myopic when it comes to re-evaluating their strategic and tactical choices in a world that is increasing in complexity and sophistication. When a Firm utilizes the paradigm of systems thinking, they are able to understand themselves as a system inside an even bigger systems environment rather than just using known internal and external factors to determine the resultant changes or adaptation required to the business strategy and goals.	o,c,c,c,o	3	2	
	This insight affords companies the capability to review internal competences and external competencies required to address the changing market landscape according to the systematic consequences it could have upstream (suppliers) and downstream (customers) and horizontally (market, competitors).	s,c,h	2		1

Table 4 (continued)

			2nd order Themes				
	This results in unlocking new business opportunities and the people/competencies required to address these. The firm can express a vision of where they are going and how they are going to get there. It helps the firm understand the limitations inherent and unaddressed inside the business that are obstacles or constraints. Lastly, it provides the tools to build a business architecture that enables the design and implementation of new systems and the fixing or removable of broken systems	d,s,o,s	1	1	4		
10	Systems Thinking (ST) – begins with a holistic contextualization of an enterprise in question as a whole which paves a way for sustainable solutions. This entails:	h,e	1			1	
	1. a complete scan of the voice of the various actors	h	1				
	2. checking the systems at place						

Table 4 (continued)

		2nd order Themes				
3. a review of the relevant systems of interest (SoI) in relation to wider systems including the systems hierarchy	h	1				
4. Checking the interfaces and therefore how to be better direct the interventions	h	1				
This approach therefore positions a firm for tailored and hence sustainable interventions that should improve its competitive edge and hence improve performance	e,b,p				1	2
Column total		43	6	9	2	11
Percentage		61%	8%	13%	3%	15%
Totals		71				

and making sense of complex situations from a holistic view rather than looking at individual parts." Participant 2, Chief Executive, "*to enable our firm to create more opportunities so that we can stay ahead of the competition."* Participant 8, Functional Specialist 2: "*ST should be used to create discussions with relevant stakeholders to make sense of a complex problem. That is where ST has the most value."*

In addition, the importance of leadership, ongoing communication, and the ability to look inwards and outwards was also emphasized. Participant 4, Senior Manager 2, said, "*System leadership will play a major role in improving the speed of adoption. It should start from the very top and with formal and non-formal communication."* Participant 6, Senior Manager 4, *"Ongoing communication is important – it must become clear to staff that senior management is committed and this is going to be the new way of life – not just another once-off 'project' where they can keep their heads down, and it will wash over in a month or two."*Participant 4, Senior Manager 2, positioned that ST enables the "*Discovery of the interconnectivity of 'parts' making the system (organization) comprehend the feedbacks that emerge from the interaction of 'parts' in a dynamic setting*." Participant 5, Senior Manager 3: "*The ability to design solutions addressing customer experience needs to adopt a holistic approach*." Participant 6, Senior Manager 4: "*The organization is looking for an awareness from top to bottom of as many aspects of the systems view of their world as possible – both internally and externally about competitors, suppliers, their market, etc."*

Structure

From a structural perspective, the biggest concern is that staff are unaware of ST as an approach and as such, this hampers the adoption thereof, and this is further compounded by internal processes being too rigid to accommodate the integration of ST into existing firm structures and processes and not to mention the resistance from senior management. The views of the participants are reflected as follows:

Participant 2, Chief Executive, said, "*One of the biggest challenges is that many of our staff are unaware of what ST is and the true potential of the approach. When confronted with ST initiatives, they react with cynicism*, e.g., *'we have tried this before', 'we are too busy with other projects we do not have the time for another initiative'. The other challenge is that our current business processes are too rigid, and it does not allow for rapid, fast-paced realignment."* Participant 4, Senior Manager 2: "*Ego is a serious barrier to adoption as top executives have a 'know it all' attitude which blocks any form of progress."* Participant 9, Executive Director: "*Most firms measure success and risk with financial instruments."*

Participant 6, Senior Manager 4, said, "*The objective should be for it to be institutionalized throughout the company, and realistically, this requires buy in and 'walking the talk' from the CEO down."* Participant 6, Senior Manager 4: "*The consequences of introducing this will be a very significant change in the way the organization operates, so change management skills are also essential. Extensive communication should also be undertaken while the change is taking place, so the employees who have not yet been affected will still be aware of what is going on."*

The importance of ST in the decision-making process and the ability to drive an innovative culture was also highlighted.

Participant 7, Functional Specialist 1, *"ST should be incorporated in decision-making processes to understand the consequences of the actions/decisions taken on the*

entire firm and thus ensure the system behaviour is more predictable." Participant 2, Chief Executive, *"ST should be used to drive an innovative culture; it should be used to foster creativity to drive our thinking towards exploring new business opportunities*, *to explore new ways of conducting business*, *creating a culture that facilities growth and opportunity."*

Moreover, the ability of ST to create a learning organization which enables introspection and self-reflection was also highlighted and ST is also seen as a holistic enterprise effort to influence performance positively.

Participant 8, Functional Specialist 2, *"It creates a learning organization because ST will introduce new variables which the organization has not thought about before. This will ensure new thoughtful discussions are created in the organization."* Participant 9, Executive Director, "*Build an empathetic organization which is focused on introspection and self-reflection-based decision making rather than leveraging just experience and historical models"*. Participant 10, Senior Manager 5: "*ST is designed to be a holistic enterprise effort as such*, *it allows for non-traditional voices to add on or to input into the innovation funnel and hence aid decision making – consequently*, *it should impact performance positively."*

Mechanisms, Approaches, Methods and Techniques

The importance of ST in terms of creating an architecture that is conducive to the integration of new systems into existing environments was highlighted. It also emphasized ST ability to take cognizance of the activities which improve business responsiveness and competitiveness. The views of the participants are reflected as follows:

In terms of mechanisms, approaches, methods, and techniques. Participant 9, Executive Director, highted the importance of ST methodologies: *"It provides the tools to build a business architecture that enables the design and implementation of new systems and the fixing or removable of broken systems."* Participant 6, Senior Manager 4: "*ST also helps to identify controllable factors from external ones. Whilst one can never remove risk in business operations*, *ST helps to quantify it*, *identify likely activities of competitors and markets*, *and improve the business's responsiveness and*, *hence*, *competitiveness."*

Emphasis was also placed on making ST more relevant through the provision of practical user cases which is relevant to the audience that is being impacted by the ST initiatives. It was also highlighted that ST is complementary to other initiatives a should not be used in isolation from other tools.

Participant 1, Senior Manager 1 "*…. Introduce the importance of ST with a practical use case relevant to the industry under consideration to ensure the audience has a true appreciation for the applicability in their area of expertise.* Participant 2, Chief Executive: "*ST is an approach that should be integrated with other approaches that we embark on*, e.g., *lean*, *business process management*, *organizational transformation*, *etc. We need to explore how ST complements these initiatives and how they can work together to enable our firm to create more opportunities so that we can stay ahead of the competition."* Participant 3, Manager, *"Experiment with the methodology. Run fast fail and safe-to-fail experiments with real firm problems that will let people get a feel for the methodology."* Participant 9, Executive Director "*Using ST to create a business competence."* Participant 4, Senior Manager 2: "*Illustrate the value of a ST approach to practical problems. Thereafter*, *employees will*

be more interested to learn and apply the methodology." Participant 9, Executive Director "*Using ST to create a business competence."* Participant 4, Senior Manager 2: "*Illustrate the value of a ST approach to practical problems. Thereafter, employees will be more interested to learn and apply the methodology."*

Catalysts

From a catalyst perspective, the significance of using ST as an approach to create an innovative culture and continuous improvement stands out. The views of the participants are reflected as follows:

Participant 2 "Systems thinking should be used to drive an innovative culture it should be used to foster creativity to drive our thinking towards exploring new business opportunities, to explore new ways of conducting business, creating a culture that facilities growth and opportunity.". Participant 9, Executive Director, "*Leveraging ST to build a continuous improvement and continuous optimization competence."* Participant 5, Senior Manager 3: "*Markets are more dynamic …. Business needs better ways to identify opportunities and solutions."* Participant 10 *"Systems Thinking (ST) – begins with a holistic contextualization of an enterprise in question as a whole which paves a way for sustainable solutions. This approach therefore positions a firm for tailored and hence sustainable interventions that should improve its competitive edge and hence improve performance"*.

Outputs

The participants also highlighted the importance of linking ST to firm level outputs. The benefits of using ST as an approach to take a holistic view in terms of priorities to drive FP were apparent. The impact that ST can have on products and service delivery was also emphasized, and ST valuable contribution to creating new opportunities to improve the firm's competitive position was also noted. The views of the participants are reflected as follows: Participant 1, Senior Manager 1,

> "*Adoption of ST facilitates a holistic identification of priority areas to develop or improve whereby the greatest impact on FP can be achieved. A detailed understanding of all key drivers of FP is essential."* Participant 8, Functional Specialist 2, highlighted the importance of ST providing the firm with a holistic view "*Understand the leverage points and bottlenecking points to optimize the firm's performance*," Participant 7, Functional Specialist 1, "*improve the quality of products and service delivery, and thus increasing productivity."* Participant 2, Chief Executive, said, "*The benefits lie in profitable growth, creating new opportunities and new value propositions that enable us to be better than the competition. It enables us to be able to add more value to our customers by being more cost-effective and proposing more innovative solutions to our customers."* This view was also reinforced by Participant 3, a manager who linked ST to spotting new opportunities faster than traditional approaches. Participant 4, Senior Manager 2, also emphasized the importance of ST as an enabler for organizational effectiveness, which leads to more efficient and effective use of resources. Participant 8, Functional Specialist 2, positioned that ST initiatives lead to

"Increased information flow within an organization, which can lead to an increased rate of response to the market. This creates a CA."

Discussion of Results

In terms of how the adoption of ST enables a firm to develop CC and improve FP. First, participants emphasized the importance of ST providing context to the firm. This is necessary because it enables a better understanding of how the firm fits into the wider systems environment and is affected by internal and external factors. This stance was also supported by literature evidence (Akhtar et al. 2018; Johanessen et al. 1999; Siriram 2020), who positioned that the firm is part of a wider environment consisting of different entities which are connected. Second, they supported the outputs of ST specifically related to how ST enables the firm to realize improvements in FP, develop value propositions and create CA's; this stance was also supported by literature evidence (Akhtar et al. 2018) CA's (Siriram 2020; Williams et al. 2013). Third is the requirements for having the right mechanisms in place, that is, the appropriate approaches, methods and techniques that will enable the firm to institutionalize ST because not having the right frameworks in place will hinder the adoption of ST. Literature evidence supports the requirements for such tools and techniques (Karam et al. 2020).

Regarding the challenges facing the adoption of ST, the participants emphasized the importance of two factors. First, the importance of providing the right structure, which encompasses strategic planning and goal orientation, must be in place to ensure the contribution of ST to firms' strategy and goals. Often, this is an area that is neglected, which affects the adoption of ST, i.e., how ST links to the firm's strategy and goals and how ST helps the firm achieve strategic goals (Lemieux-Charles et al. 2003; Gharajedaghi 2011; Chun & Rainy 2005). The second is understanding how the different sections of the firm interact and how this interaction relates to the firm's operating model or value chain. Only once this understanding of the firm's wider environment (both from an internal and external perspective) is understood can one relate to how ST links to the firm's operating model and value chain (Akhtar et al. 2018; Checkland 1999). Support for the wider systems environment is also supported by literature evidence (Akhtar et al. 2018; Johanessen et al. 1999; Siriram 2020).

In terms of how firms should approach the adoption of ST, this relates to the mechanisms, i.e., methods, approaches and techniques required to facilitate the adoption of ST. There was strong support by the participants for a structure with the strategic orientation goals and objectives in place, followed by mechanisms that are approaches, methods and techniques, and lastly, having the right contextual framework that is an understanding of the wider systems environment. This view has also been supported through literature evidence (Akhtar et al. 2018; Hossain et al. 2020; Jaradat et al. 2018).

In terms of what firms can do to improve the adoption of ST? That is, what are the catalysts required for the adoption of ST? There was strong support by the participants for all the aggregated dimensions. From a structure perspective, strategic planning and goal orientation are necessary ingredients; there is support for both from the participants in terms of the need to have strategies in place (Chun & Rainey 2005) as well as how ST can help firms develop strategies (Gharajedaghi 2011). The participants also supported that ST frames the firm in a wider organizational context; there is also literature support in this area (Ackoff

1999; Akhtar et al. 2018; Johanessen et al. 1999; Siriram 2020; Sterman 2000). ST is also the catalyst for other initiatives like facilitating the motivation for change and having the right mechanisms in place to facilitate the adoption of ST; literature evidence in support of this includes (Hossain et al. 2020; Jaradat et al. 2018). Finally, once adopted, ST must demonstrate real value in terms of firm outputs, for example, benefits like creating new business opportunities, creating a culture that fosters growth and new business opportunities, and supporting the development of stakeholder relations with customers and suppliers. Literature evidence supporting these claims includes the need to foster a culture to drive the adoption of ST (Siriram 2020; Sundaray 2011; Williams et al. 2013), value propositions (Akhtar et al. 2018; Pagani & Fine 2008), CA's (Siriram 2020), CC (Akhtar et al. 2018; Siriram 2020) and FP (Akhtar et al. 2018; Kim et al. 2014; Jaaron & Backhouse 2014; Reardon et al. 2015), (Siriram 2020; Skažauskienė 2010; Sun et al. 2014).

In terms of the benefits of adopting ST specifically for firm outputs. There was strong support by the participants for firm-level outputs, specifically providing opportunities to develop value propositions that lead to CA's (Akhtar et al. 2018; Siriram 2020; Williams et al. 2013). Next was support for ST being able to provide a better understanding of the wider systems environment, especially in a global context (Akhtar et al. 2018; Johanessen et al. 1999; Siriram 2020), and finally, a structure that ST's ability to guide strategic planning and goal orientation, create awareness, create a learning organization, (Chun & Rainey 2005; Gharajedaghi 2011). Provide opportunities for creating a collaborative environment to better understand the firm in its wider context (Ackoff 1999; Akhtar et al. 2018; Johanessen et al. 1999; Siriram 2020; Sterman 2000). These benefits are also supported by literature evidence, and the literature evidence supporting the stance of the participants has already been discussed in Sect. 5 of the paper.

Furthermore, in-depth guidance to managers and researchers is provided through the research sub-questions, which, for ease of reference, are stated here.

a) How does the adoption of ST enable a firm to develop CC's and improve FP?
b) What are the challenges facing firms in the adoption of ST?
c) What can firms do to improve the adoption of ST?
d) What are the benefits of ST specifically in terms of the firm's CC and FP?
e) What are the opportunities for further research and important lessons for researchers and ST practitioners?

In terms of the first research question a) How does the adoption of ST enable the firm to develop CC and improve FP? This work addresses the requirement for managers and researchers to focus attention on three areas: First, ST provides guidance in terms of giving the firm context, that is, how the firm fits in the wider environment and how it is affected by external factors and how the firm also needs to co-exist with its environment. Second, ST initiatives must appropriately demonstrate benefits in firm-level outputs like performance, CA's, firm growth, profitability growth, etc. These linkages must be apparent. Third is having the right mechanisms in place, that is approaches, methods and techniques that will enable the adoption of ST and not hinder its adoption. This is also necessary to ensure that the firm can adapt and hence have flexible processes and systems.

In terms of the second research question b) What are the challenges facing organizations in the adoption of ST? Managers and researchers should take cognizance of at least two challenges facing the adoption of ST. First is that of structures, that is, the firm having the strategic goals and objectives, so individuals understand where the firm is going;

without this, most initiatives will fail, be it ST or other initiatives. Second is highlighting the importance that the firm is connected and is made of a larger value chain; this needs to be continually reinforced as individuals will revert to their comfort zones and forget about the bigger picture, which is that the firm is connected and part of the wider systems environment.

In terms of the third research question c) What can firms do to improve the adoption of ST? This specifically relates to all the main categories (aggregated dimensions) to be in place, i.e. (Ackoff 1999). context (Ackoff 2006), structure (Ahlström et al. 2020), mechanisms (Akhtar et al. 2018), catalysts and (Anderson 1999)outputs. Context relates to how the structure fits into the wider organizational context and systems environment. The structure includes the roadmap for the firm's strategic planning and goal orientation, having the right frameworks in place to ensure the right environment is in place that will favour the adoption of ST. Researchers and managers also need to focus on what catalysts need to be in place to foster the adoption of ST. Typical catalysts include creating a culture that fosters growth, new business opportunities, innovation, etc. Mechanisms, such as approaches methods, and techniques that support the adoption of ST, must also be in place. Finally, there must be clear linkages from ST to firm-level outputs.

In terms of the fourth research sub-question d) What are the benefits of ST specifically in terms of the firm's CC and FP? ST enables a holistic view of the firm it gives clarity in terms of how the different parts of the firm fit together. Moreover, it creates visibility in terms of how the different parts of the firm link to CC and firm performance. ST is a human-centric approach that catalyzes innovation through critical thinking, and as such, it creates the space for generating new opportunities and new value propositions that enable the firm to be better than the competition. ST creates visibility from a top-down and cross-functional perspective, and as such, it also paves the way for employees to see things in perspective both internally and externally, enabling better utilization of networks and relationships with competitors, suppliers, other stakeholders etc. It also enables the formation of new networks and relationships this is because once a holistic perspective of the firm is appreciated the importance of networks and relationships become apparent. ST enables the firm to be viewed in totality, enabling employees to better understand the interconnections within the firm as well as other firms and the broader environment. Through this kind of bigger picture view, ST creates a platform where everybody can pull in the same direction, and as such, the firm can function more efficiently and effectively because resources as better utilized. The efficient and effective use of resources can then lead to improvement in CC and firm performance.

In terms of the fifth research sub-question e) What are the opportunities for further research and important lessons for researchers and ST practitioners? For both researchers and practitioners, there is still a general unawareness of ST and its potential contribution. This is in line with research from Ackoff (2006) and Siriram (2020). There is an opportunity for further research in this area. From the work here still more research is required in terms of further understanding the linkage from ST to CC and firm performance. For example, more clarity is required in terms of the tangible and intangible measures for firm performance. Secondly, firms need to overcome the rigidity in business processes to enable the integration of ST into the current environment. Researchers should focus more on exposing ST to a wider audience. Ackoff (2006) also highlighted that system thinkers are narrowly focused within their domain discipline; therefore, researchers should consider publishing in other journals as well to broaden research and create visibility. Practitioners should also consider keeping an open mind and seek exposure to successful case studies which highlight the benefits of ST and its linkage to CC and FP. Another opportunity is

about how firms should approach the adoption of ST; there should be a clearly defined approach focusing on structure, mechanisms and context. Structures give clarity in terms of the firm's strategic goals, objects and needs. Mechanisms embrace the need for a human-centric approach, which is important in terms of the firm's culture and climate and assists in the decision-making process. Where context helps in understanding how the firm fits in a wider organizational or systems environment.

Furthermore it is also beneficial to take cognisance of Ashby's law, which states that a viable system can handle the variability of its environment. To this end ST enables the firm to develop capabilities that enable the firm to adapt and grow in such VUCA environments. In such an environment, firms need to explore and exploit capabilities to be sustainable. This concept of exploration and exploitation is referred to as the firm's ambidexterity (Vahlne & Johnsson 2017). Four factors are necessary to enable ST as an approach to improve firm CC and FP. The first factor is highly effective systems and processes to support the exploration and exploitation of the business environment (Turner et al. 2013). Firms that are unable to change systems and processes and adapt to changing environments will not be effective in achieving competitiveness. To this end, firms need ST capabilities which impact organizational processes so that they enable individuals to make decisions regarding the adaptability and alignment to environmental changes and, as such affect the firm's performance. Possessing capabilities that enable the firm to adapt systems and processes is seen as the first factor necessary to develop CC. The second factor is the firm's culture and climate, which is seen as the firm's ability to either resist the adoption of new ideas which is also inclusive of either embracing or resisting the adoption of ST (Siriram 2020). The third factor is developing and exposing individuals to complex decision making this will expose individuals to complex decision-making, so they are better positioned to guide and lead in complex, turbulent and uncertain environments. The fourth factor is that of strategic planning, firms with clear goals and objectives perform better than other firms (Chun & Rainey 2005; Lemieux-Charles et al. 2003). ST thinking enables firms to devise strategies (Gharajedaghi 2011) that deal with complex problems associated with strategies (Akhtar et al. 2018).

Conclusion

The aim of this research is to better understand how ST enables a firm to develop CC's and Improve FP? To this end, this research has contributed to knowledge by providing evidence on how ST adoption leads to improvements in developing firm's CC and improvements in FP. The theoretical contribution made in this research is the linkage between the concepts of ST, firm CCs and FP (Salamzadeh 2020; Belkin 2009). This research provides evidence of three linkages: first, ST provides context in terms of how the firm co-exists in the wider environment ad why this contextualization is important; second, ST must demonstrate benefits in firm-level outputs; and third, having the right mechanisms, approaches, methods and techniques, in place to support the adoption of ST. This area, to date, has been lacking, and the need for more research in this area has been echoed by researchers to mention at least, (Akhtar et al. 2018; Kim et al. 2014; Jaaron & Backhouse 2014; Reardon et al. 2015; Skažauskienė 2010; Siriram 2020; Sun et al. 2014). Therefore, based on these outcomes, it is clear that the aim of the research has been achieved. Furthermore, this research also

answers the CS: "How does the adoption of ST enables an organization to develop CC and improve FP?". This is achieved through answering the research sub-questions which have been already discussed in Sect. 5.

There are many benefits stemming from the adoption of ST and potential benefits in CC and FP. Therefore, firms need to embrace ST to realize the potential benefits. Firms need to overcome two challenges. These challenges are, firstly, the unawareness of ST and its potential in terms of realizing improvements in CC and FP.

Moreover, further implications for researchers and practitioners are that first, we are living in an environment that is rapidly changing, and to develop CC and improve FP in such an environment is a complex task. Hence, a different approach is required to address this complexity. First, from a sST perspective, researchers and managers must take cognizance that the firm does not exist in isolation; it is part of a wider system which includes other firms, namely competitors and customers. This environment is complex, rapidly changing, and uncertain, and as a result, firms face challenges in daily operations. Some researchers, like Jackson (2020), refer to this as exhibiting VUCA (volatility, uncertainty, complexity, and ambiguity). Given this VUCA environment firms need a different approach to develop CC to address these challenges. To this end, ST is proposed because it takes a holistic view of the firm and its environment. It also focuses on the interaction of the parts in the system and particularly on how this interaction gives rise to and sustains the existence of the system as a whole. ST embraces complexity and change and, as such, embraces a VUCA environment and, therefore is well suited to address how firms can improve CC and FP in such an environment.

Limitations of the Research and Further Research Areas

There are four limitations to this research. The first limitation is that the interview participants are from one country, South Africa; the South African sample could have a certain bias because of the economic, social, and political settings, which may differ from other countries. The second limitation is that the research focused only on one industry, namely the ICT industry. The third limitation is that whilst the focus of the interview was on the ICT industry, the participants had experiences over multiple industries. The participants, however, were asked to focus on their ICT experience. However, there could have been bias in the responses. The fourth limitation is that even though saturation has been reached in terms of the sample size and the research methodology is sound, the sample size is small, and some may question the generalization of the findings.

Therefore, future research directions could include at least the following:

a) Expand the research to include other countries; exploring the similarities and differences among researchers across different countries and regions would be interesting.
b) Expand the research to other industry sectors; here again, exploring the similarities and differences across different industry sectors would be interesting.
c) The approach in this research is qualitative; it is the first step in a series of analyses to enhance the linkage between ST, CC and FP. Further research should be geared towards a more quantitative approach to explore the linkages further and connect both qualitative and quantitative studies.

d) Explore how ST can enable firms to develop competitive capabilities to function in VUCA environments, the theoretical basis resting on the foundations of Ashby's law and the firms ambidexterity.

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Data Availability No datasets were generated or analysed during the current study.

Declarations

Competing Interests The authors declare no competing interests.

Conflict of interest None.

Ethical Considerations The researcher has obtained ethics clearance from the University of the Witwatersrand from the human resources ethics committee (HREC) non-medical.

Consent to Participate Participants participated voluntarily and were not pressured to take part in this study. Njie and Asimiran (2014) argue that people should never be forced to participate in a study and that participation should always remain voluntary. The participants had the opportunity to decide to participate without any consequences.

Informed Consent Informed consent conveys to the participant what the researcher expects from the participant and for the participant to partake (willingly) in the research (Zikmund et al. 2013). Before engaging in interviews with the participants, comprehensive information regarding the study's purpose, procedures, potential risks, and benefits was shared with them. Each participant was fully informed so that they understood what their participation entails, and informed consent was verbally given before continuing the interview.

Anonymity and Confidentiality The identities of the informants and the firms which they represent were confidential and anonymous throughout the research process. Information that could potentially identify the participants was removed or disguised in the research outputs. Interview transcripts and data logs were stored systematically and securely to protect the confidentiality of the participants.

Participants were notified that anonymity and confidentiality resulting in reports and publications would be maintained as the participants granted such consent.

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The data link will be published once the article is published.

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