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Organisational cybernetics: A systems thinking method used for small and medium enterprises

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Orientation: Systems thinking stems from the Twenties and has constantly developed over the years in assisting sectors in operations, management and the environment in checking for interdependencies, interconnections and coherence in all aspects of the elements inputted. In particular, the viable systems model in organisational cybernetics of systems thinking can be considered as a tool used for validating elements and being goal-oriented in nature.

Research purpose: The purpose of this research is to showcase the role and influence that the viable systems model in organisation cybernetics has in a study conducted on small and medium enterprises.

Motivation for the study: In the business world, there is a profound need for organisations to ensure that process flows are maintained to achieve sustainability. The systems thinking approach ensures that process flows are maintained; however, they have proven to be robust in validating elements and achieving goals. In this regard, this study encourages organisations to embrace and utilise systems thinking approaches to improve productivity and, ultimately, sustainability.

Research design, approach and method: In conjunction with the mixed methodology approach, namely the Statistical Package for Social Sciences for quantitative research and NVivo for qualitative research, the viable systems model in organisational cybernetics was used in this empirical study.

Main findings: The core element of 'strategy' and the subelements of 'change', 'purpose' and 'leadership' were investigated. It was found that 'change', 'purpose' and 'leadership' were the main contributors towards achieving sustainability. Furthermore, a systems thinking model – the viable systems model – was used successfully to indicate the interdependencies to purport the goal of achieving sustainability. Ultimately, it was found that 'strategy', 'change', 'purpose' and 'leadership' were required to achieve a 'sustainable business strategy'.

Practical/managerial implications: Leaders should consider the use of systems thinking as a tool to ensure the output of a robust process flow, increased productivity and good governance in their organisations.

Contribution/value-add: The viable systems model in organisational cybernetics proved to be successful in checking for interconnections, interdependencies and coherence of the elements used in the research study. Researchers in today's era should consider the use of systems thinking in future research studies.

Keywords: Viable systems model; systems thinking; organisational cybernetics; management; strategy.

Introduction

The history of the development of systems thinking commenced in the Twenties. Up until the Sixties, the system thinking concepts were focused on extensively. From the Seventies to the Nineties, numerous tools and methodologies were developed, while in the recent era, chaos and complexity is more prevalent (Arnold & Wade 2015:3; Mingers & White 2010:1156). Among the numerous definitions and interpretations by Barry Richmond, Peter Senge, Sweeney and Sterman, Hopper and Stave and so forth, systems thinking is simply defined as a goal-oriented system (Arnold & Wade 2015:2). Three aspects are involved to further define and accomplish systems thinking, namely elements, interconnections and a goal or function (Arnold & Wade 2015:3). Figure 1 explains these aspects and how systems thinking is fully defined from a visual perspective:

Note: Additional supporting information may be found in the online version of this article as Online Appendix 1 and Appendix 2.

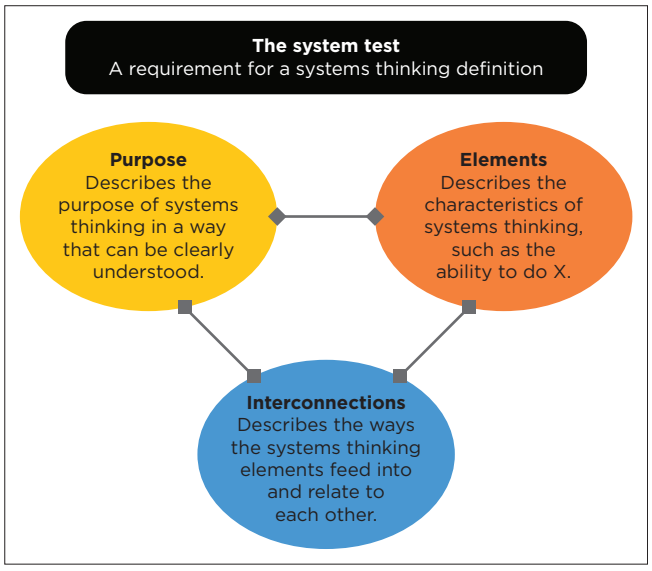
- Firstly, the elements offer a description of the characteristics of the system to perform a task.
- Secondly, the interconnections show the connections and relationships of the elements.
- Thirdly, the purpose describes the output result which is the goal.

Systems thinking has proven its effectiveness and value addition in complex issues by causal effects in indicating a broad instead of partial view. Furthermore, systems thinking has shown its value in recurring and exacerbated problems. In addition, systems thinking's effectiveness and usefulness were shown in areas where the action has affected the natural or competitive environments. Moreover, systems thinking has proven its value in solving problems where solutions are complex and easily noticeable (Aronson 1996:1).

In support of this theory, Sheffield, Sankaran and Haslett (2012:126) claimed that systems thinking tamed complexity in project management remarkably; however, the authors' study indicated that managers did not apply the systems thinking tools in the daily activities of small and medium enterprises (SMEs). The primary reason being that there are different types of systems thinking approaches which managers are not entirely familiar with in their entirety. The next section discusses systems thinking approaches in more detail.

Literature review

According to Jackson (2016:44), there are 10 different systems thinking approaches that are categorised into four types, namely: (1) goal seeking and viability, (2) exploring purposes, (3) ensuring fairness and (4) promoting diversity. Table 1, which is adapted from Jackson (2016:44), indicates the variety of systems thinking approaches. Under the categories listed, the types of system thinking approaches in Table 1 will be discussed briefly in the next section, followed by a more detailed explanation of the related theoretical and philosophical aspects of the chosen model used for the formulation of the conceptual framework in this study.



Source: Arnold, R.D. & Wade, J.P., 2015, 'A definition of systems thinking: A systems approach', *Procedia Computer Science* 44(1), 669–678. https://doi.org/10.1016/j.procs.2015.03.050

FIGURE 1: The systems test.

Goal-seeking and viability

Hard systems thinking is an approach used to solve real-world problems. Accordingly, the name was generically formed by Checkland in 1981, and the approach was developed during and immediately after World War II. This approach is affiliated with systems engineering, operational research and systems analyses. Consequential variants from hard systems thinking emanated, namely policy analysis, cost–benefit analysis, plan–programme–budget systems and decision science.

The hard systems thinking approach struggles to deal with highly complex problems that managers face. These problems refer to the conduciveness of varying interpretations; therefore, the approach does not bode well in objectivity. Typically, mathematical modelling is needed; however, the problem of bias remains prevalent, which makes the approach difficult to use as the hard systems thinking approach relies on the goal to be established before the actual use thereof (Jackson 2016:60).

Systems dynamics is an approach used to solve strategic problems using a digital computer to unlock complex secrets of nonlinear systems. This systems thinking approach can also be used liberally by manually drawing elements that feedback to each other by virtue of causal-to-effect multiloops visualisation. Accordingly, this approach, which was developed in 1958 by Forrester and called 'industrial dynamics', eventually became popularised by Senge in 1990, who called it 'the fifth discipline'.

Systems dynamics models are claimed to be imprecise, which hinders the ability to provide accurate predictions of system states. The impreciseness renders decision-making limited; hence, it does not attract managers to use the approach. Moreover, the model is understood to be unfavoured especially when initial conditions are not grasped or when variables are not analysed to predetermine the impacts that they have on each other (Jackson 2016:79).

TABLE 1: Types and categories of systems thinking approaches.

Category	Type
Goal-seeking and viability	Hard systems thinking
	System dynamics: The fifth discipline
	Organisational cybernetics
	Complexity theory
Exploring purposes	Strategic assumption surfacing and testing
	Interactive planning
	Soft systems methodology
Ensuring fairness	Critical systems heuristics
	Team syntegrity
Promoting diversity	Postmodern systems thinking

Source: Adapted from Jackson, M.C., 2016, *Systems thinking: Creative holism for managers*, John Wiley & Sons, Ltd

Organisational cybernetics is an approach used to solve for viability. This approach was formulated by Stafford Beer in 1974 by using cybernetics in the organisational domain. The viable system model (VSM) introduced by Stafford Beer uses the concepts of a black box, variety and negative feedback in organisations delineated by complexity, probability and internal regulation.

Although there is minor criticism about organisational cybernetics, the approach has been considered inopportune, as it offers increasing control and consolidation of positions for the user to misuse. However, the matter of control, consolidation and power can also be considered a matter of advantage, as the use of the approach will be dependent on the actual situation. Organisational cybernetics is a systems thinking approach that extends generality in any type of organisation, system and systems of varying hierarchical levels in a business. Through its generality, management scientists and managers are attracted to the approach (Jackson 2016:107).

Complexity theory is an approach used to solve complex situations comprising chaos. Complexity theory, which was developed by Gleick in 1987, was profound in systems thinking in the field of management and subsequently was popularised during that era. The primary focus of the model is on randomness, disorder and irregularity. The model accepts aspects affiliated with unpredictability, change and instability to provide a solution that was thought of as neither available nor even a possibility.

The model is used for short-term planning but simply lacks the long-term approach that managers need to maintain sustainability. The chaos and complexity theory is believed to require improvement to establish its validity and scope in systems that occur in natural settings. In addition, the cardinal problem with the application of the complexity theory to management is that there is a difference between social and natural systems. It is understood that in natural systems it is easier to determine the arising of strange attractors, while social systems are affected by probabilistic elements and innumerable variables manifesting themselves. These complications make the approach undesirable for the long term (Jackson 2016:129).

Exploring purposes

Strategic assumption surfacing and testing (SAST) solves problems related to planning, policies and decision-making. This approach was concluded by Mason and Mitroff in 1981 to solve 'wicked problems' encountered by managers. It was further deemed that the wicked problems featured unstructured factors, which lack clarity about environmental uncertainty, societal limitations, conflict and purpose. The SAST's prerogative is to ensure problem-solving is performed in a structured manner.

The SAST's drawback involves the lack of empirical evidence when compared with other conventional methods, as claimed by Jackson in 1989 and 2016, respectively. The approach has been criticised for focusing on clarifying purposes and finding sophisticated ways rather than finding the best solution possible for the existing problems. Moreover, SAST is only successful in its execution if the participants are willing to have their assumptions exposed and put forth to the test (Jackson 2016:151).

Interactive planning deals with complexity, diversity and change that managers contend with presently. This approach was proposed by Ackoff in 1974 in the world of management sciences (Ackoff 1974:22). Interactive planning was asserted to be an overarching cause of social systems and operational research. The approach is used by managers in the systems' age and for those seeking improvement in social systems.

This systems thinking approach is known for its abilities to solve conflicts; however, the critics of Ackoff posit that there remain random cases of irresolvable conflicts, which deems the approach unfavourable to managers. In general, managers seek models that provide easy solutions for complex problems. Furthermore, Jackson mentioned that critics believed the approach is regulative (Jackson 2016:175).

Soft systems methodology (SSM) aims to solve a complex problem from diverging views of its definition. The approach was founded by Checkland in 1972 and has evolved since, concentrating on soft issues related to the definition of the problem (Checkland 1972:92). Soft issues aiming to solve 'what should be performed' and 'how to do it' remain the key focus in SSM.

Soft systems methodology is deemed to be subjective because the approach ignores restrictions on discussions. Soft systems methodology is known to operate at the idea level by changing people's worldviews; however, the approach is condemned because it ignores organisational, economic and political structures, which are the primary foundations for worldviews (Jackson 2016:206).

Ensuring fairness

Critical systems heuristics (CSH) shows and challenges the actual and proposed system designs. The approach was developed by Werner Ulrich in 1983, which is an emancipatory approach that ensures decision-making and planning is performed robustly (Ulrich 1983:20). This approach can also enable designs from soft and hard system thinking to produce the result desired.

The CSH is understood to be a powerful approach; however, there is a limitation involving material conditions related to beliefs and values. In relation, political and economic factors determine the beliefs and values that give rise to contradiction. Another issue identified is the lack of engagement of society and organisation of the approach to engage associated forces within that prevents participative decision-making and rational arguments (Jackson 2016:227).

Team syntegrity was designed on the premise of, and after, organisational cybernetics by Stafford Beer in 1990 (Wheeler 1990:893). This approach entailed the provision of a protocol and theory for people working in a group who share common knowledge related to a specific topic. Team syntegrity supports nonhierarchical decision-making, which is decomposed into effective and participative forms.

Jackson (2016:248) stated that the approach was unable to guarantee its efficacy in practice in the real world. In addition, Jackson explained that other critics did not believe that the approach was viable, simply because of the time taken out of team members' daily activities to collaborate and put problem-solving at the forefront of their job duties.

Promoting diversity

Postmodern systems thinking involves the perusal of all systems thinking approaches discussed thus far, namely goal-seeking and viability, exploring purposes and ensuring fairness. However, the difference that distinguishes postmodern systems thinking is the term 'postmodernist'. This involves systemic modernism and critical modernism, which among the discourse where the former is responsible for increasing systems performance and the latter ensures that any consensus or result is performed rationally without encountering distortions (Jackson 2016:44).

As explained here, the various types of systems thinking approaches were discussed. Table 2 shows the summarised characteristics of the types of systems thinking methodologies, namely functionalist, interpretive, emancipatory and postmodern (Jackson 2016:44) under which the system thinking approaches lie.

The consensus for the choice of the appropriate systems thinking approach is explained further. With reference to Table 2, the functionalist methodology related to systems thinking was developed by Frederick Taylor in 1914. This methodology is known to operationalise a system by contending with complex and linear mechanisms comprising starting points, boundaries and finishing points (Porter & Gordoba 2009:326). Ultimately, being characteristically goal-oriented, the functionalist paradigm in particular *organisational cybernetics* is considered the most suited systems thinking methodology for this research study (Jackson 2016:85). It is therefore imperative to primarily understand cybernetics, which will then fuse into the concepts of management cybernetics and organisational cybernetics, respectively. The sections that follow explain these concepts further.

Cybernetics

Cybernetics originates from 'kybernates', a Greek word meaning 'the art of steermanship'. This implies the control of a ship, which invariably refers to control of a machine (Jackson 1991:92). Similar to systems analysis, systems engineering and operational research, cybernetics has an equally long history dating back to 1947, where Wiener first used the method in a field study (Jackson 1991:91). Cybernetics commenced by adopting physics as its foundation; however, it does not have any dependence on the laws of physics nor the properties of matter (Ashby 1961:1). It was asserted that cybernetics deals with all forms of behaviour which are reproducible, determinate and regular (Ashby 1961:1).

According to Geroulanos and Weatherby (2020:3), cybernetics diffuses studies that intend to provide knowledge and intellectual skills. Geroulanos and Weatherby claimed that cybernetics offered a framework for structured thinking, science and technology, and policy formulation for manufacturing and technology, government decision-making and international relations (Geroulanos & Weatherby 2020:4). In addition, cybernetics has proven to be successful in explaining organisational failure, which makes the phenomenon robust and instils confidence in its usage in the business world (Snyder, Olsen & Song 2020:1). Cybernetics is understood to be a powerful tool often used by managers. This concept leads us to explore what management cybernetics entails.

Management cybernetics

Management cybernetics is the process whereby the manager steers the business in accordance with the desired expectations

TABLE 2: Methodologies of systems thinking approaches.

Methodology criteria	Functionalist	Interpretive	Emancipatory	Postmodern
Objective	Improves goal-seeking and viability	Exploration of purpose	Ensuring fairness	Promotion of diversity
Characteristics	Objective	Subjective	Conflict, contradiction and domination	Encourages stakeholder participation for execution of plans
Methods	Hard system thinking, system dynamics, organisational cybernetics, complexity theory	Interactive planning, strategic assumption surfacing and testing (SAST), soft systems methodology (SSM)	Critical system heuristics, team syntegrity	Postmodern systems thinking
Assumption	Scientific method can be used for system engineering	Understanding of the system by exploration of peoples' perspectives by creation of social realism	All elements are treated the same. Change can be used to free the majority who are deprived	In diversity, problem situations are discussed.
Advantages	Provision of a rigidly accurate model	Acknowledgement of multiple opinions of the people involved in the system	Addresses disadvantages, oppression, and inequalities	Priority is on improvement
Disadvantages	Suits the researcher but does not consider participants' perspectives	Formulation of a robust intervention strategy is difficult	Idealistic social reform. All wrongs are made right simultaneously	Biased by focusing on diversity and conflict

Source: Adapted from Jackson, M.C., 2016, Systems thinking: Creative holism for managers, John Wiley & Sons, Ltd

and goals (Gill 1998:1). The author used two examples of management cybernetics to indicate how a manager executes this process, namely the black box, and Ashby's law of requisite variety. Gill (1998:1) explained the black box to be a system of complexity where it was accepted that managers of an organisation, regardless of the size, will not be able to understand and will be unaware of each and every process involved. The author further buttressed that the black box consisted of inputs and outputs, which were controlled by the manager to achieve optimal performance. This was performed through monitoring, providing feedback and optimisation.

In addition, disturbances involving either internal factors such as management directives or external factors such as industrial action or climate change exacerbated the complexities (Gill 1998:2). The cardinal advantage of the black box is that it can be decomposed into subprocesses and delegated to subordinates to handle. In this cascading way, middle and lower-level managers of the hierarchical chain will manage their respective departments or divisions, which gives the top management level a strong ability to achieve the desired output levels.

Gill (1998:2) explained Ashby's law of requisite variety as the process where both the organisation and the manager balance variety. As further explained by the author, variety is the measurement of numerous different states of a system. The balancing of varieties shows the amplification and attenuation of variables in the system. Quite simply put forth, the three segments, namely the marketplace (environment), organisation and management, make up the explanation of Ashby's law of requisite variety. The management-to-organisation loop is known as the internal controls, while the marketplace-to-organisation loop is regarded as the external controls. Each of these loops works on the methodology of amplification (increase) and attenuation (decrease) to acquire a balance of variety, which Ashby has proven. However, management cybernetics was deemed to be constrained by the machine metaphor. The compelling need to break away from traditional management thinking sparked the concept of the VSM of organisational cybernetics (Jackson 2016:85). The VSM is explained in the next section.

Organisational cybernetics: The viable system model

Organisational cybernetics stems from the underpinning of cybernetics (Jackson 2016:85). Accordingly, Stafford Beer introduced the VSM in the Fifties, which is theoretically based on variety, cybernetics, recursive systems and neural networks (Metaphorum 2021). Interestingly, Leonard (2009:229) maintained that the VSM possessed many advantages, which are as follows:

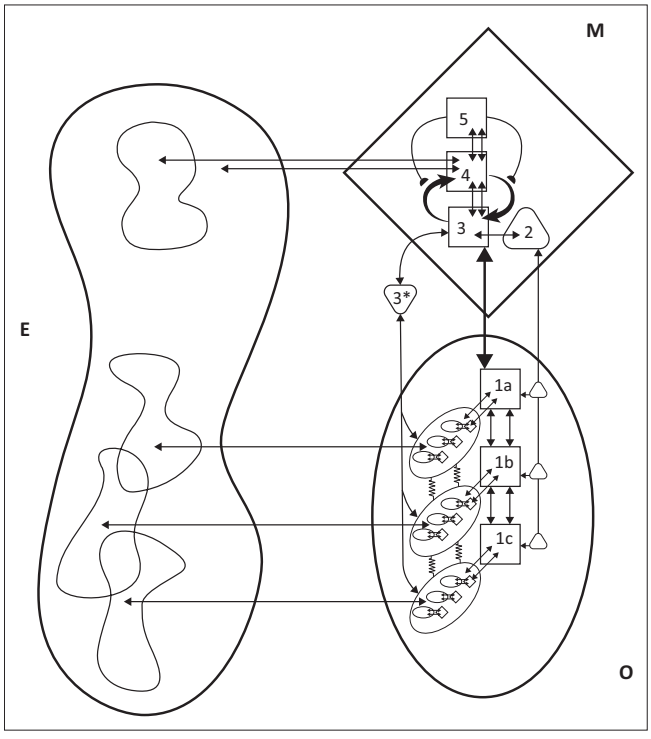
- The method has not been rejected to date.
- There is an increase in its applications.
- Its foundation is aligned to robust mathematical and theoretical frameworks.
- It can be used in any business type, category and sector including political, private and public.
- The model provides an all-encompassing view of an organisation's system.
- The model has a simple platform that handles complexity. The model also handles internal and external complexities by using Ashby's law of requisite variety.
- The model facilitates the structure development of an organisation through its conceptual framework offerings.

The VSM shown in Figure 2 is based on the functionalities of three components (Jackson 2016:89; Metaphorum 2021), namely:

- Operation.
- Management.
- Environment.

Upon analysing the VSM in detail, it is evident that five systems are found within (Jackson 2016:93; Metaphorum 2021), which are as follows:

- **System 1,** which is further decomposed into 1a, 1b and 1c, is known as the operational units.
- **System 2** is a management system that deals with problems and conflicts. This system ultimately solves these issues.
- **System 3** is a management system responsible for ensuring synergy, which is broken down into symbiosis and collaboration.
- **System 4** is a management system that scans the external environment and ensures that rapid changes can be contended with and guidance is provided to ensure that



Source: Metaphorum, 2021, *Viable System Model*, viewed 18 January 2021, from http://metaphorum.org/viable-system-model.

FIGURE 2: The viable system model.

normal operations prevail in the midst of multiple mapped-out paths.
- **System 5** is a management system that provides closure of the entire system. It governs all systems by developments of policies to be followed. It is known for its bureaucratic methods.

In summary, the methodology of the VSM operates on the operational units, namely system 1a, system 1b and system 1c, being autonomous and the management systems 2, 3, 4 and 5 (the metasystem) ensuring that there is coherence. The VSM is known to be recursive, which essentially means that every system will eventually break itself down into smaller systems until a suitable answer is achieved (Vahidi, Aliahmad & Teimouri 2019:300). Finally, the VSM measurement of performance is defined by three levels of achievement, namely actuality, capability and potentiality (Jackson 2016:99). In addition, latency and productivity are factorised within the calculations to determine the performance.

According to Jackson (2016:99), *actuality* refers to what is happening at the present moment, using the existing resources and being susceptible to existing constraints; *capability* refers to what could be achieved under the same resources and constraints, while *potentiality* refers to what could be achieved by developing resources and minimising constraints but remaining feasible. This is the fundamental and primary prerogative of the VSM to reflect a viable system.

Apart from the multitude advantages of the VSM claimed by Leonard (2009:229), the model was favoured over nonviable system models because of its structured ability to determine interrelationships among parameters and areas for decision-making to occur within controlled limits (Gallego-García, Reschke & García-García 2019:14). In addition, the VSM is posited to additionally possess traits of problem-structuring methods that provide an advantage to the user (Harwood 2019:1198). Structuring a problem provides easy identification and consequently easy solvability by the VSM. Therefore, the VSM has been selected for this study.

In this study, the element of strategy and subelements of change, purpose and leadership were fed into the VSM to ascertain the results of the qualitative aspect of this empirical research. Strategy is explained as the execution of devised operational and tactical plans of an organisation (Skripak et al. 2016:315). This phenomenon comprises numerous elements which vary among organisations. Furthermore, the element 'strategy' comprises its components, namely 'planning', 'control', 'cost management', 'performance management', 'performance evaluation', 'product differentiation', 'competition', 'marketing', 'financial management', 'low price' and 'business development'.

Change has been classified by many researchers in a myriad of ways. The most prominent types were those described by Gersick (1991:10) as gradual or revolutionary, by Dunphy and Stace (1988:318) as incremental and transformational, by Levy (1986:6) as either first- or second-degree and lastly, by Miller (1984:1161) as evolutionary or revolutionary. Change in a business environment is implied by internal policies and external regulations. Businesses feel the changes of the macro-economic environment, which are beyond control, and the micro-economic environment, which are controllable.

Purpose is observed as a key element and a necessity for the creation of a meaningful organisation in a competitive environment and collectively in periods of uncertainty and inconsistency (Rey, Bastons & Sotok 2019:4). Interestingly, Henman (2020:1) advocated that both the organisation and the individuals' purpose must be aligned and synchronised to meet the common objectives.

Leadership is a management function whereby the leader ensures provision of focus, direction and motivation to subordinates to achieve organisational goals (Skripak et al. 2016:169). The reality of leadership is that the phenomenon is practised in a myriad of styles in the economic environment, educational sectors, industrial areas and sports fields (Shao, Feng & Hu 2017:903).

Furthermore, leadership was discovered to boost employee engagement with management, insofar as a positive outcome was realised (Popli & Rizvi 2016:965). Therefore, leadership can be considered a vital component in the running of an organisation. Technically, operationally driven enterprises require leadership. Allio (2015:6) buttressed that strong leadership is required to ensure that elements are used for strategy formulation. The input of the element and subelements into the VSM will ultimately be performed to check for interconnections and interdependencies of the elements within the system. Moreover, the findings will either confirm the literature study or show any incoherence among the elements.

Research methods and design

According to the pragmatic worldview, the mixed methods approach is deemed to be the most appropriate and best suited. The mixed methods research approach comprises quantitative and qualitative research (Creswell 2014:43). Delving deeper into this approach, the process involves data converging via the triangulation methodology. Accordingly, this research approach's design concentrates on three models in social research. The first model is the convergent parallel design, where quantitative and qualitative data are collected, integrated, and interpreted simultaneously. The second model is the explanatory sequential design, whereby the quantitative research is conducted first, followed by the qualitative research. This method is widely used in quantitative orientation fields. The last model is the exploratory design, where the qualitative research is conducted prior to the quantitative research. This approach is often used to build up a research instrument by utilising the qualitative research

method followed by using the quantitative research method to quantify the data by means of statistical computation and techniques. In addition, it was claimed that the prerogative of performing quantitative and qualitative was to gather data to answer the research question.

This study focused on the mixed methods approach, whereby closed-ended questions (Online Appendix 1) and open-ended questions (Online Appendix 2) were used to collect the data. Thereafter, the data were analysed using NVivo (QSR International, Doncaster, Australia) for the qualitative aspect and the Statistical Package for Social Sciences (SPSS; IBM Corporation, Armonk, New York, United States) for the quantitative aspect to check for divergence and convergence (Creswell 2014:269). The sampling involved probabilistic sampling, further entailing simple random sampling surveys being conducted; thereafter, interviews ensued with some of the selected participants concurrently. According to Creswell (2014:204), the random sampling method provides an independent and fair chance for selection of participants. It must be observed that the representativeness of samples will be dependent on the size, rate of response and methodology of sampling (Acharya et al. 2013:330). Interestingly, the sample size can be determined by three factors, namely: (1) margin of error, (2) confidence level and (3) estimated response rate. In addition, the VSM was used to check for interconnections and interdependencies.

In line with the mixed methodology approach, this study entailed a combination of quantitative methodology by conducting a research survey and qualitative by selecting purposeful sites or participants (Creswell 2014:239). The research population comprised SMEs in KwaZulu-Natal (KZN). Interestingly, the South Africa, Small Business Institute (2018:4) claimed that there were approximately 250 000 formal SMEs in South Africa, while there was a difference when compared with the 390 115 formal and informal SMEs in KZN as claimed by the South African Small Enterprise Development Agency (2019:19). The latter was supported by the 488 000 SMEs claimed to be in KZN by Statistics South Africa (South Africa, Statistics South Africa Citizen Satisfaction Survey 2018:19). The population of SMEs in KZN was confirmed to be categorised by sector, which is reflected accordingly in the Economic, Development, Tourism and Environmental Affairs Annual Report 2018–2019 (South Africa, KwaZulu-Natal Province: Economic, Development, Tourism and Environmental Affairs 2021:7). The report indicated that formal SMEs received recognition of existence by simply being registered; hence, the confirmation of easy categorisation and identification was made possible. Therefore, it can be deduced that the legal registration of SMEs made the target population selection factual.

In this study, the target population of 488 000 (South Africa, Statistics South Africa Client Satisfaction Survey 2018:19), a confidence level of 95%, margin of error of 5% and a 50% response rate were used, which indicated a sample size of 384 respondents (Taherhoost 2017:238). Prior to the data collection, a Level 2 ethics approval was obtained from the University's Department of Management Sciences – Faculty Research Ethics Committee. Upon completion of the data collection, a total of 200 responses were obtained within a capped period of 30 days, which accounted for > 52% of the target sample size. The Cronbach's alpha coefficient values of 'elements of strategies' was 0.782, which is above the 0.7 threshold. In addition, the Cronbach's alpha value of 'benefits of strategies' was 0.637, which is deemed acceptable (above 0.6). To ensure validity in this research, each participant received a letter of information that explained the overview of the research. The participants also received the consent letter and questionnaire. Moreover, the participants were required to read the letter of information and complete the consent form and questionnaire. To ensure reliability, pretesting was conducted in this research, comprising a group of 15 participants. They were excluded from the sample size of 384 participants. Furthermore, the grounded theory was employed on a target of 20 individuals (Creswell 2014:239), whereby the participants were interviewed to investigate opinions about productivity, strategy development and sustainability in KZN. The SMEs in KZN were chosen as the preferred province; however, because of its large number of SMEs, the researcher chose to cover the following areas of KZN and has broken down the areas into North Coast, South Coast, Upper Highway and Central Durban. The research obtained information from SMEs based on these locations. Organisations from the private sector were targeted, which comprised the transportation, construction, manufacturing, customer services, banking, motor vehicles, telecommunication and retail industries. Managers and directors were chosen for this research as they were believed to have a clearer insight into the activities of the organisation, therefore providing holistic information.

Data analysis

While SPSS and NVivo proved to be valid and reliable in this study, organisational cybernetics VSM software – Vensim™®© Personal Learning Edition version 8.2.0 (Ventana Systems, Inc., Harvard, Massachusetts, United States) – was utilised to check for interconnections and interdependencies of the elements within the system. The findings confirmed the literature study and showed coherence among the elements and subelements. The findings ratified the qualitative aspect of the study.

Figure 3 indicates the element 'strategy' and its components, namely: (1) 'planning', (2) 'control', (3) 'cost management', (4) 'performance management', (5) 'performance evaluation', (6) 'product differentiation', (7) 'competition', (8) 'marketing', (9) 'financial management', (10) 'low price' and (11) 'business development', were inputted into the software along with the subelements 'change', 'purpose' and 'leadership'. It must

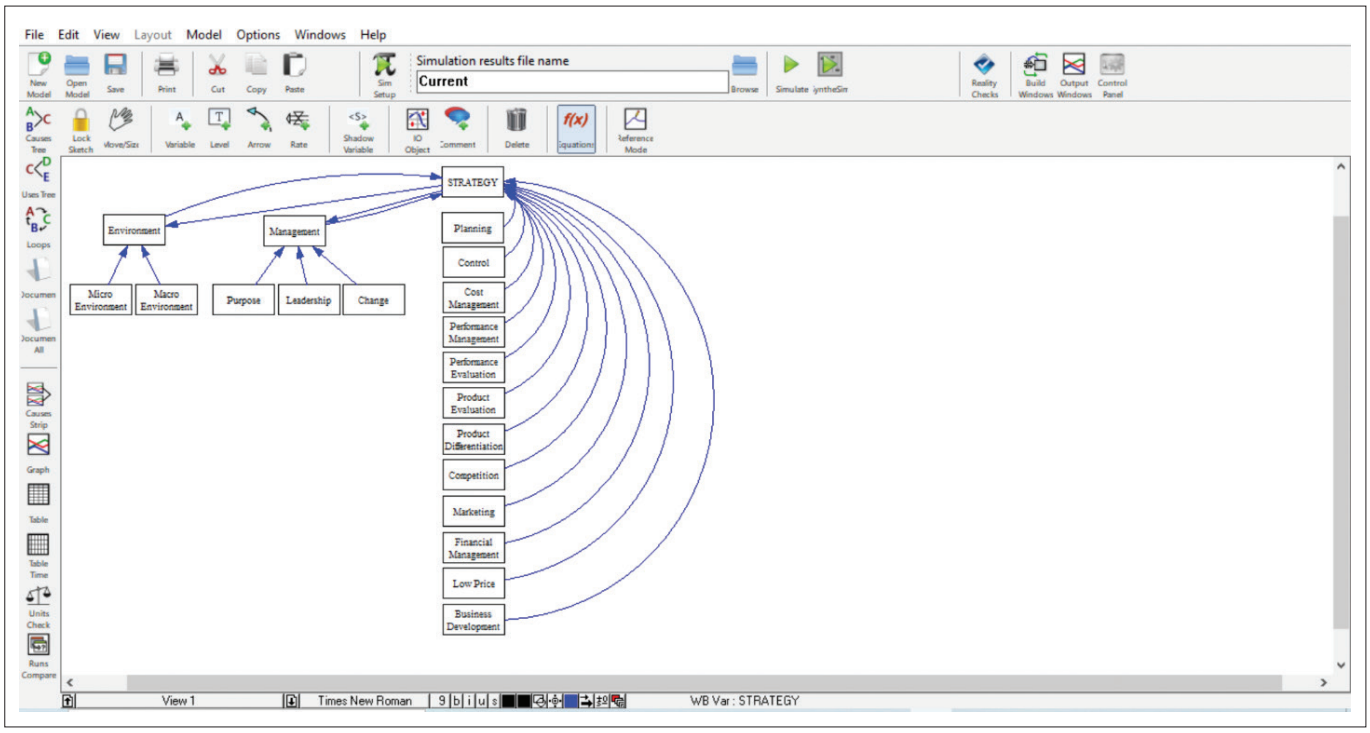


FIGURE 3: The strategy, change, purpose and leadership model (Vensim™®© version 8.2.0).

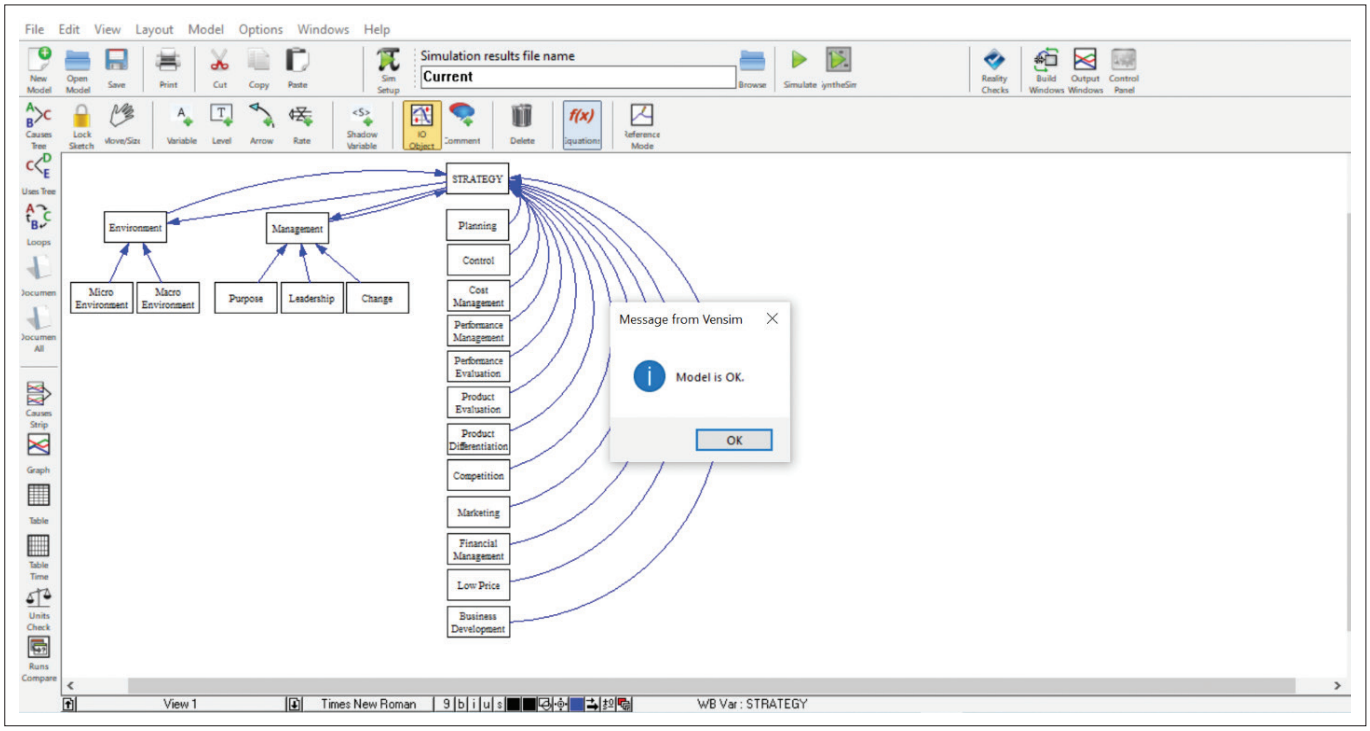


FIGURE 4: The strategy, change, purpose and leadership model – run successfully (Vensim™®© version 8.2.0).

be observed that 'strategy' is classified under 'operations' while 'change', 'purpose' and 'leadership' are classified under 'management'.

To determine the appropriate execution of the model, the software must indicate an onscreen notification to confirm the aforementioned. Consequently, Figure 4 indicates that the model was indeed run successfully and that the elements and subelements showed relationships. The next figure shows these interconnections and interdependencies.

The overall result of the Vensim™®© software (Figure 5) indicated that the element 'strategy' was related unidirectionally to its associated components. This relationship is defined as a one-way causal effect and a collective comprisal of the element. While the subelements 'change', 'purpose' and 'leadership' were related

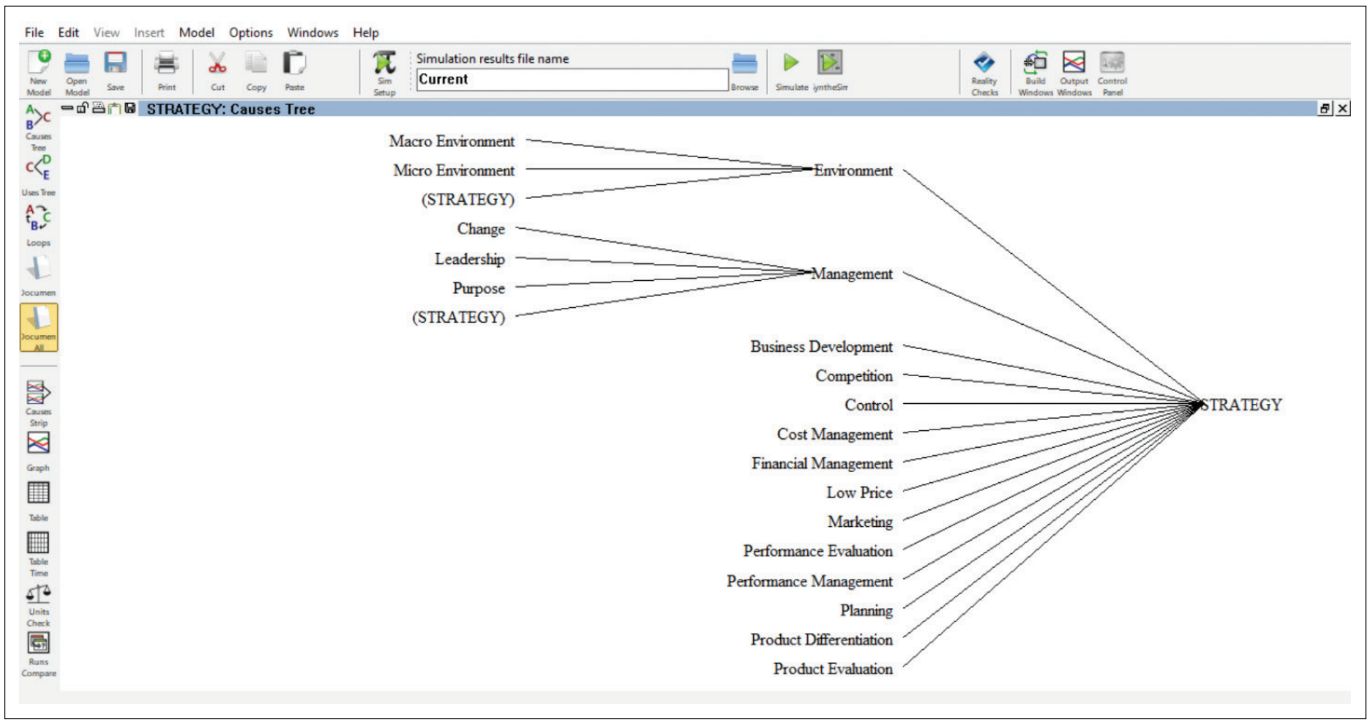


FIGURE 5: Causal tree – relationships of the elements and subelements (Vensim™®© version 8.2.0).

bidirectionally to 'strategy'. This relationship is defined as a two-way reliance and dependency on the element and subelements to ascertain its cyclical recurrence to produce a continuous systematic output (Jackson 2016:93; Metaphorum 2021).

Conclusion

In accordance with the research conducted, a systems thinking model, namely the Vensim™®© software (version 8.2.0), was used to check the interconnections and interdependencies of the elements of the study. The model was claimed to be robust in showing and validating constructs and problem structuring techniques (Harwood 2019:1198). In the study, the VSM worked successfully, thereby confirming the coherence of the element 'strategy' and the subelements 'change', 'purpose' and 'leadership'. The model comprised the operations, management and environment components which reflected the attributed elements. Thereafter, the model was run to check for errors. This ultimately confirmed no errors and the relevance and validity of the element and subelements used to formulate a sustainable business strategy.

Among the various types of systems thinking approaches discussed in this study, and specifically under the category of goal-seeking and viability, it remains factual that the VSM has proven to be acceptable in checking for interconnections and interdependencies of the elements. Furthermore, the model has showcased its relevance in this study by outputting the results successfully. It cannot be argued that systems thinking is indeed a powerful tool to peruse in the world of business and should ideally be embraced by organisations worldwide by SMEs to improve on the effectiveness of service offering and product provision.

Recommendations

While it remains conclusive that the VSM successfully contributed towards checking the elements for interconnections and interdependencies and thus achieving business sustainability in the study conducted, further research may be considered as follows:

- Due consideration can be given to other system thinking approaches such as hard systems thinking, system dynamics and complexity theory to perform a similar study of this nature and a comparative study to further determine the appropriateness of the approach.
- While there are advantages and disadvantages in using all systems thinking software, further exploratory research can be conducted to confirm which systems are used most frequently in the world of business.
- While systems thinking approaches are used in the private business sector, it would be worth conducting further research to check its frequency of use in the government sector.
- As this research was conducted in the field of management sciences, further research can be conducted in using systems thinking approaches in other industries and education fields.

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Authors' contributions

V.B. wrote the article. M.S.B. provided the researcher with supervision.

Ethical considerations

Ethical clearance to conduct this study was obtained from the Durban University of Technology Faculty of Management Sciences Research Ethics Committee (FREC).

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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