



The Influence of Creative Problem-Solving on the Longevity of Small and Medium Enterprises

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Abstract

This research modeled the influence of critical thinking, creative thinking, organizational innovativeness, creative problem-solving abilities (CPS), and internal business performance factors on the longevity of small and medium enterprises. A total of 105 manufacturing and 99 construction small and medium enterprises (SMEs) were compared using a survey. Inferences were drawn using structural equation modeling. Confirmatory factor analysis revealed that latent variables within the creative problem-solving model overall demonstrated moderate ability to predict longevity. However, the creative problem-solving structural equation models for both sectors showed that creative thinking strongly increased critical thinking, which increased SMEs' longevity. For the manufacturing sample, creative thinking also increased organizational innovation, which increased longevity. The stronger manufacturing sector also demonstrated more significant paths and larger beta coefficients overall. Respecifying the structural model by introducing the business performance measure increased the size of the model coefficients. Creative problem solving, however, only exerted a weak direct influence on longevity for both sectors. Creative thinking skills strengthened critical thinking, which in turn increased the longevity of SMEs. More emphasis on creative thinking could also improve innovation skills and longevity. Better creative thinking could also improve creative problem solving. Optimizing business performance factors (sales growth, after-tax return on assets, profits after tax, market share, liquidity, customer loyalty, and image) appeared necessary for this process to be most effective. SME managers need creative thinking, critical thinking, innovative thinking, and creative problem-solving abilities. Identifying such creative problem-solving skills and leveraging them can enhance the competitive performance and longevity of individual SMEs.

Keywords: Creative problem solving, creative thinking, critical thinking, organisational innovation; business performance; managerial cognitive competencies, longevity

1. Introduction

Small and Medium Enterprises (SMEs) are acknowledged globally for their substantial contributions in the areas of employment, promotion of exports, output, and nurturing entrepreneurship. However, if SMEs are to assist with job creation and economic growth, they will have to remain competitive and survive amid the challenges they face. SMEs face various problems and challenges that threaten their survival; therefore, SMEs need specific managerial competencies to properly fuel the economy. The lack of business skills, including business process management skills required to manage SMEs through their growth and transition severely limits the growth of SMEs in South Africa (Jacobs, 2016).

Moreover, Valente, Salavisa & Lagoa (2016) also showed that countries, where workplaces foster advanced work-based cognitive skills tend to exhibit higher economic growth. Managers, therefore, require this competency and skill to promote innovation in business. Thus, creative problem solving (CPS) in the context of leadership can enhance the kinds of thinking skills leaders need to resolve complex problems (Puccio, et al., 2007).

Meurling (2004) pointed out that leaders should be engaged, passionate, and enthusiastic about new developments, resembling creativity and innovation. In addition to the above, Puccio et al. (2007) stated that creative problem-solving focuses on stimulating creative thinking in problem-solving by integrating critical thinking. And so, it seems that SME managers may need creative problem-solving abilities to solve survival challenges. In addition, SME managers might be trained in that aspect.

Creative problem-solving training (Isaksen, Dorval & Treffinger, 2000) is a cognitive training method for developing critical and creative thinking abilities. Creative problem solving is displayed in the mental skills of data conceptualisation, analysis, synthesis, and evaluation, and in gathering information through direct observation, experimentation, or reflection. It allows for the training of leadership and teamwork skills (Sousa et al., n.d).

Therefore, given the rate at which SMEs are failing, expecting them to fuel the country's economy is unrealistic job creation will not be achievable. Nonetheless, entrepreneurial skills such as creative problem-solving have not been adequately highlighted as a prerequisite for emerging and experienced entrepreneurs to ensure productivity, effectiveness, and sustained competitive advantage in new venture development, growth, and success (Agbim, 2013). The literature review supports the notion that this phenomenon has received insufficient theoretical understanding or empirical investigation. The current study aimed to close the identified research gap by investigating entrepreneurs' creative problem-solving capabilities in South Africa.

2. Literature review and hypothesis development

This literature review formulates the theory underlying this study. Furthermore, this section will review existing literature regarding the managerial cognitive ability, creative problem solving, creative thinking, critical thinking, innovative thinking, and business performance of SMEs. First, there will be an explanation of managerial cognitive ability, followed by a description of creative problem solving and the relationship between all the variables under the phenomenon of creative problem solving(CPS), such as creative thinking, critical thinking, and innovative thinking.

2.1. Managerial cognitive ability

Helfat & Peteraf, (2015) introduced the concept of ‘managerial cognitive capability, which highlights the fact that capabilities involve the capacity to perform not only physical but also mental activities. Managerial cognitive capability is the capacity of an individual manager to perform one or more of the mental activities that comprise cognition (Helfat & Peteraf, 2015). Such capabilities provide a foundation for management to seize opportunities and respond to emerging threats. Moreover, managers with cognition capabilities can compile accurate analysis that impacts predictions and performance (Caughron et al., 2013; Partlow et al., 2015). Cognitive capability can structure business concepts and strategies and improve organizational performance (Kor & Mesko, 2013). Thus, managerial cognitive competencies are vital for addressing the challenges common to most SMEs and are a critical factor contributing to the performance and survival of small-scale businesses.

2.2. Creative problem-solving (CPS) and its relation to creative thinking, critical thinking, and innovation

CPS process functions can guide the thinking and acting of creative people; its content functions have the potential to help people clarify opportunities or predicaments, transform ideas into solutions, and implement change. Florida & Goodnight (2005) referred to creative people as the ‘creative capital’ that can make things happen in today’s organisations. In essence, CPS is a creativity currency that, with a little effort, can be used to promote thinking skills, maximise creativity, and increase the bottom line.

According to Puccio et al. (2007), CPS focuses on nurturing creative thinking in problem-solving and includes critical thinking. In addition to creativity, business leaders require critical thinking skills because they make significant decisions every day, such as recruiting and dismissing, reviewing financial reports, participating in board meetings, and handling public relations crises. Business leaders use critical thinking skills to make tough decisions (Rider University, 2020).

It is also crucial for organisations to be creative and innovative to gain efficiency and success (Slåtten & Mehmetoglu, 2015). Therefore, selecting the right manager who will have the leadership skills and determination to lead a significant innovation initiative is one of the most important decisions a CEO or business owner must make (Deschamps, 2005). Considering the above discussion, a choice was made to determine the influence of creative problem-solving skills in SMEs facing complex survival challenges. The current study was directed by the following objectives:

- To determine whether creative thinking, critical thinking, and innovative culture influenced creative problem-solving within SMEs in South Africa
- To determine whether creative problem-solving influenced longevity or survival within SMEs in South Africa.

As SMEs strive for survival, the creative problem-solving ability is vital for managers or business owners to attain skills that will equip them to address their challenges. Thus, creative problem-solving training (Isaksen, Dorval & Treffinger, 2000) is effective for developing critical and creative thinking abilities. Creative problem-solving is displayed in the mental skills of data conceptualisation, analysis, synthesis, and evaluation, and in gathering information through direct observation, experimentation, or reflection. It allows for the training of leadership and teamwork skills (Sousa et al., n.d).

Creative problem-solving furthermore uses a series of tools and structures with which to resolve ill-defined challenges that do not have a single possible solution or challenges that

have not produced satisfactory results when using other problem-solving methods. It includes the steps of problem-finding, fact-finding, problem definition, solution-finding, and decision implementation. Each of these steps has two elements: one divergent, in which the group tries to find the maximum possible number of alternatives, and another convergent, in which only one option (or just a few) is selected. The process continues until a system of organisational innovation is developed (Sousa et al., n.d). The following sections attempt to show the relationships between creative problem solving, creative thinking, critical thinking, innovative culture, internal business performance, and longevity. A conceptual model is then proposed for the influence of creative problem factors on the longevity of small-medium enterprises in the South African context.

2.3. Creative thinking is related to critical thinking.

Creative thinking and critical thinking are complementary cognitive processes that are important for dealing with complex challenges. Furthermore, creativity is now recognized as being crucial to our ability to deal with contemporary social challenges (Glăveanu, 2020); hence, it has become a core goal across all levels of education (Snyder, Hammond, Grohman & Katz-Buonincontro, 2019). Another cognitive process that is complementary to and interdependent with our ability to think creatively is critical thinking (Silva & Iturra, 2021). The development of critical thinking skills is considered essential for building responsible citizens who can reflect on and evaluate the enormous amount of information that is now available (Hyytinen, Toom & Shavelson, 2019; Behar-Horenstein & Niu, 2011). Accordingly, this has also become a key goal of higher education (Liyanage, Walker & Shokouhi, 2021).

It is widely recognized that creative thinking and critical thinking are complementary abilities (Facione, 1990; Halpern, 2003; Paul & Elder, 2006). Creative thinking involves both a divergent phase in which different ideas are generated and a convergent phase that involves the synthesis and evaluation of ideas (Qiang et al., 2020). This is modulated by distinct processes such as flexibility or persistence and potentially leads critical thinking to play differentiated roles in each of the phases (Zhang, Sjoerds & Hommel, 2020). It is considered difficult to consider creative thinking in the absence of critical judgment or thinking (Silva & Iturra, 2021). The creative thinking of SME managers is thus related to critical thinking.

H1: Creative thinking has a relationship with critical thinking.

2.4. Creative thinking is related to Innovative thinking.

Creativity serves several purposes. It not only combats stagnation but also facilitates growth and innovation. While creativity is crucial to generating ideas that are both unique and original, they're not always inherently useful; nevertheless, innovative solutions can't exist without a component of creativity. Boyles (2022) further argues that for something to be innovative, it must be novel and useful.

In times of crisis, innovation has been identified as a powerful trigger for the resilience of small businesses and the economic development in both, especially the manufacturing and service sectors (Forsman, 2011; Ucaktürk et al., 2011; Nah and Siau, 2020). Furthermore, creativity can involve the adjustment or refinement of existing procedures or products and the identification of opportunities and solutions to problems. It involves new ideas. Any application of new ideas is based on innovation (Nieuwenhuizen & Groenewald, n.d.). It refers to the creation of something new, for example, a new business by developing a new product or service, building an organisation by financial manipulation, reshaping an existing business, creating a business that will survive on its own, and building a financial fortune as a

testimony to the entrepreneur's skill (Schein 1985). Therefore, it is proposed that the creative thinking of SME managers is related to organizational innovativeness.

H2: Creative thinking has a relationship with innovative thinking.

2.5. Creative thinking is related to creative problem solving.

According to Boyles (2022), creative problem-solving is less structured than other innovation processes and encourages the exploration of open-ended solutions. It also focuses on developing new perspectives and fostering creativity in the workplace. Its benefits first include finding creative solutions to complex problems. The use of research may insufficiently illustrate a situation's complexity, and while other innovation processes rely on this information, creative problem-solving can yield solutions without it. Secondly, business is constantly changing, and business leaders need to adapt. Thus, creative problem-solving helps overcome unforeseen challenges and find solutions to unconventional problems. Thirdly, in addition to providing solutions, creative problem solving can spark innovative ideas that fuel innovation and drive company growth. These ideas can lead to new product lines, services, or a modified operations structure that improves efficiency (Boyles, 2022).

H3: Creative thinking has a relationship with creative problem solving.

2.6. Creative thinking is related to longevity.

Kacker (2005) argues that today's organizations are knowledge-based, and their success and longevity depend on creativity, innovation, discovery, and inventiveness. The entrepreneur must demonstrate strong leadership by shaping business strategy and motivating employees via creative thinking (Darling et al., 2007; de Jong and Den Hartog 2007). Also, a leadership style modelled on democracy and participation facilitates creativity (Nystrom 1979). Moreover, a leader's vision is an essential factor in managing creative individuals (Locke and Kirkpatrick 1995; Frisch 1998; Becherer et al. 2008).

H4: Creative thinking has a relationship with longevity.

2.7. Critical thinking is related to innovation.

Whitney (2015) suggested that innovators should apply critical thinking principles to identify the problem to be solved accurately; failure to do so builds a faulty foundation upon which the remaining innovation process steps sit precariously. In addition, critical thinking is used to form associations between content, effectively linking ideas/processes/solutions together. This helps to generate innovative uses for existing technologies, and modifications to existing technologies that can improve their effectiveness (Paul et al., 2013)

H5: Critical thinking has a relationship with organisation innovation.

2.8. Critical thinking is related to longevity.

To improve business performance, critical thinking is the process of analysing and reviewing the outcomes of our cognitive processes and thoughts on how we may make great choices or acceptably solve issues, among other things (Amankwah-Amoah et al., 2021).

Thus, critical thinking within teams improves organizational performance (Natale and Ricci, 2016). Therefore, for organizations to remain competitive, it is argued, a considerable need exists for a labour force of critical thinkers who can link knowledge with business strategy. (Wade and Tavis, 1993). Research by Kreitzberg and Kreitzberg (2009) on "Critical Thinking: A Business Survival Skill for the 21st Century", concluded that businesses that want to profit from better critical thinkers need to hire people who have this

proficiency. They must develop it in people who are so inclined but lack knowledge and experience.

H6: Critical thinking has a relationship with longevity.

2.9. Critical thinking is related to creative problem solving.

Critical thinking is the process of reflection and reasoning that one needs to discover situations, deal with difficult issues to make a hypothesis, and integrate all the information obtained through inquiry, which leads to the development of results that justify the conclusion. (Moein et al., 2020). Furthermore, critical thinking is used for problem solving, decision-making, and deduction. (Butler, 2012). In addition, critical thinking can be used in problem-solving and decision making in any social, clinical, ethical, managerial, or political context (Isaken, 2011). The research by Moein et al. (2020) showed that there was a significant relationship between critical thinking with creative problem-solving.

H7: Critical thinking has a relationship with creative problem solving.

2.10. Creative Problem Solving is related to innovation.

Huhtala and Parzefall (2007, p.299) mention, “to remain competitive in the global market, organizations must continuously develop innovative and high-quality products and services and renew their way of operating.” They also maintain that companies increasingly rely on employees’ continuous ability to innovate. Any effective innovation initiative or process will use CPS at the front end. Furthermore, CPS is a conceptually simple process but critical to any innovation process. (Baumgartner, 2010). Also, creative problem solving is a method of finding innovative approaches for problem resolution.

Cardoso Sousa et al. (2009) suggest that the outcome of the innovation may be a process, product, or service. One should undertake innovation through the creative inputs of the individuals and(or) management. Also, developing organizational innovation and creativity is complex and non-linear, with ups and downs, which can only give rise to a culture of innovation with the management’s total commitment. (Cardoso Sousa et al., 2009). It thus appears that a relationship exists between creative problem solving and innovation.

H8: Creative problem solving has a relationship with innovation.

2.11. Innovative thinking is related to longevity/survival.

Innovation has become a necessity for all contemporary enterprises that want to survive in a world characterized by competition, technological change, and recurring crises. The concept of innovation refers to the use of new technology or new management practices in an organization to achieve a targeted improvement in its operations (Tornatzky et al., 1990).

The published research indicated the positive impact of innovation capabilities on SME performance (O’Cass & Sok, 2014; Oura et al., 2016; Zhang, et al., 2018). Zulu-Chisanga et al. (2016) argued that the efforts exerted to develop different innovations are the primary reason for the improvement in SMEs’ financial indicators.

From an SME perspective, innovation commonly indicates new products or processes that address customer needs more competitively and profitably than existing ones (O’Regan & Ghobadian, 2006; Zahra et al., 1999). In addition, previous studies have also indicated a positive correlation between innovation capabilities and SMEs’ performance (O’Cass & Sok, 2014; Oura et al., 2016; Zhang et al., 2018). Freeman (2004) added that distinct SMEs’ performance is an outcome of the effective implementation of innovations.

H9: Organisational innovation is related to longevity.

2.12. Creative Problem Solving is related to longevity.

Puccio, Murdock & Mance (2006) report several studies concerned with the impact of CPS on organizational effectiveness which revealed aspects like cost reduction, high revenue solutions, or a culture that inspired innovative design concepts. High revenue solutions would mean that the organization is continuously performing, leading to longevity. Therefore, if CPS is successful in an organization, it will allow for the creation of a culture of innovation within the organization, committing more and more of its constituents, as more development projects become profitable innovations (Basadur and Paton, 1993; Isaksen et al., 2000).

H10: Creative Problem Solving has a relationship with longevity.

2.13. Business Performance is related to longevity.

Uddin and Kanti (2013:166) explain that SMEs' success is dependent on multi-dimensional aspects, with some internal and some external. Furthermore, factors influencing SMEs' growth and longevity, according to Hove and Tarisai (2013:57) include a business plan, marketing strategy, mission/vision, and finance. According to Al-Hyani (2013:1), the most common constraints hindering SME growth and survival include a lack of financial support and qualified human resources, competition barriers, and unyielding business rules and regulations. Manzano et al. (2012:1) maintain that the most significant variables that explain growth experience, are the leader's resilience level, and understanding of the business environment.

H11: Business performance has a relationship with longevity.

3. Proposed conceptual model

The proposed conceptual framework for this research is presented in Figure 1, which denotes a single integrated model of the influence of cognitive competencies (critical thinking, creative problem solving, and innovative thinking) on longevity with the link to business performance.

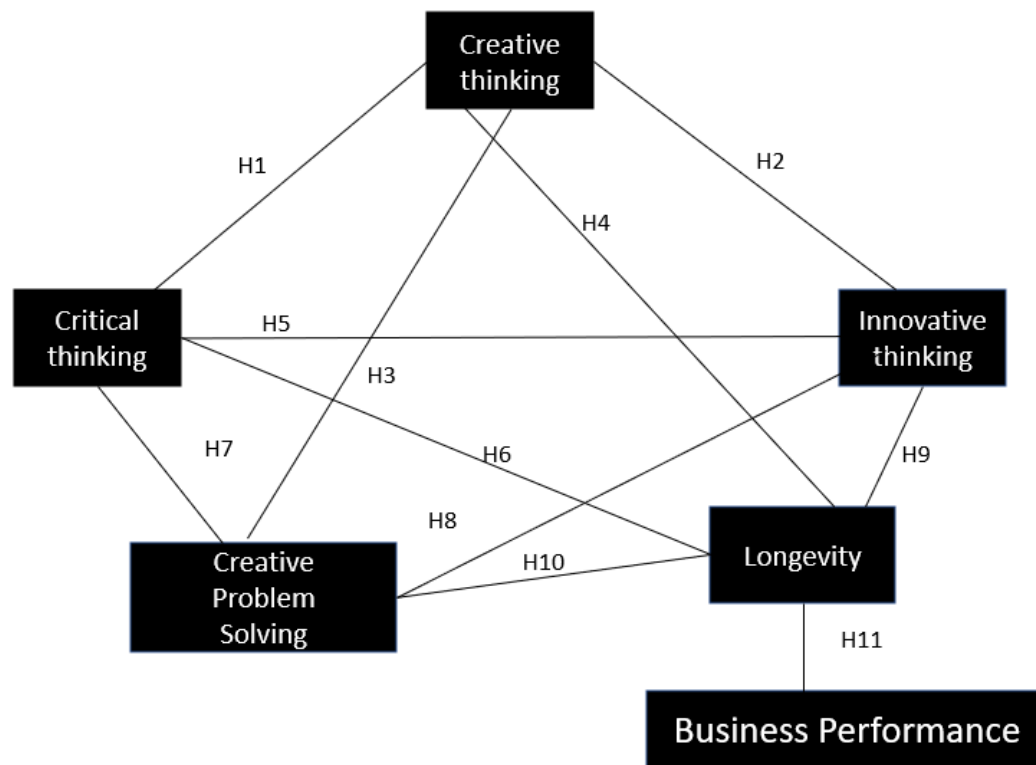


Figure 1. Proposed Creative Problem-Solving Model

4. Method

The following measures were identified to operationalise the variables for the creative problem-solving model.

4.1 Creative thinking

Ziska and Bisschoff (2014) developed and assessed a tool to measure the creativity of university students. In doing so, a literature study of creativity was embarked upon to identify the underlying variables used to measure creativity. Cronbach Alpha coefficients were calculated, exceeding the minimum coefficient of 0.70. This instrument was used to measure the creativity of SME managers/business owners.

4.2 Critical thinking

Yoon's measure of Critical thinking (YCTD) was developed to assess critical thinking. Each item of the YCTD presented was evaluated for its reliability using the Cronbach alpha coefficients in a study conducted by Shin et al. (2015). The reliability coefficients ranged from .83 to .85 among the items. Therefore, this instrument was selected to measure the critical thinking of SME managers/business owners.

4.3 Creative problem solving

The Ideation-Evaluation Preference Scale measures divergent thinking attitudes on two subscales: (a) preference for ideation or preference for generating ideas; and (b) preference for evaluation; premature judgment (Basadur and Finkbeiner, 1985). The reliability for these

subscales ranged from .68 to .83 (Basadur et al., 2002). This instrument was used to measure the creative problem-solving ability of SME managers/business owners.

4.4 Organisational innovativeness

According to Ruvio et al. (2013), organizational innovativeness (OI) is a central concept in academic research and managerial practice. In many cases, OI has been operationalized as the number of innovations organizations adopt. Ruvio et al. (2013) defined OI as creativity, organisational openness, future orientation, proactiveness and risk-taking. Reliabilities for Ruvio's measure of OI ranged between .80 to .84. Therefore, this instrument was selected to measure the innovative culture of SMEs.

4.5 Business performance index

Business growth is aligned with profitability and remains the key measure of business performance in the South African business sector (Garg et al., 2014). A modified version of the Garg et al. (2014) measure of business performance factors was used to evaluate the role of internal business performance on the creative problem-solving ability of SMEs. According to Garg et al. (2014), research, a high correlation existed between subjective and objective measures of business performance. Therefore, a modified version of their business performance index was used which included the important dimensions of business growth and profitability.

4.6 Business sector

The business sector was recorded as an independent variable. The researcher compared the creative problem-solving model between the current best (Manufacturing) and worst-performing (Construction) SA business sectors in 2021. It was hoped that this comparison would throw more light on the complexities of the creative problem-solving process within the sample of SMEs. Among the demographic variables recorded were the Gross yearly turnover (Rands) and the Number of employees. It was important to sample participants' knowledge about decision-making processes within their companies. Therefore, the job level and function of each respondent were recorded.

4.6.1.1 Dependent variable

The dependent variable was the longevity or age of each SME recorded in months.

5. Data collection

Primary data were gathered through a survey form circulated amongst 206 SMEs in South Africa to fulfill the sampling objectives of the study. The survey was conducted from January to August 2021. The final questionnaire was in English and was distributed through email to 3000 SMEs enlisted in the IFeedback database. The follow up was done three times. After cleaning and preparation of the data, 206 respondents were obtained, segregated between 99 construction and 105 manufacturing SMEs. The equivalent sizes of the samples made a comparison of the sector's data possible. Analysis of the job functions of respondents revealed that most were owners followed by managing directors, directors, and CEOs across a wide spectrum of business types. This satisfied the requirements for being at the strategic level of the organization and respondents were judged competent to make comments about the various measures being tapped. by the questionnaire (depicted in Figure 2).

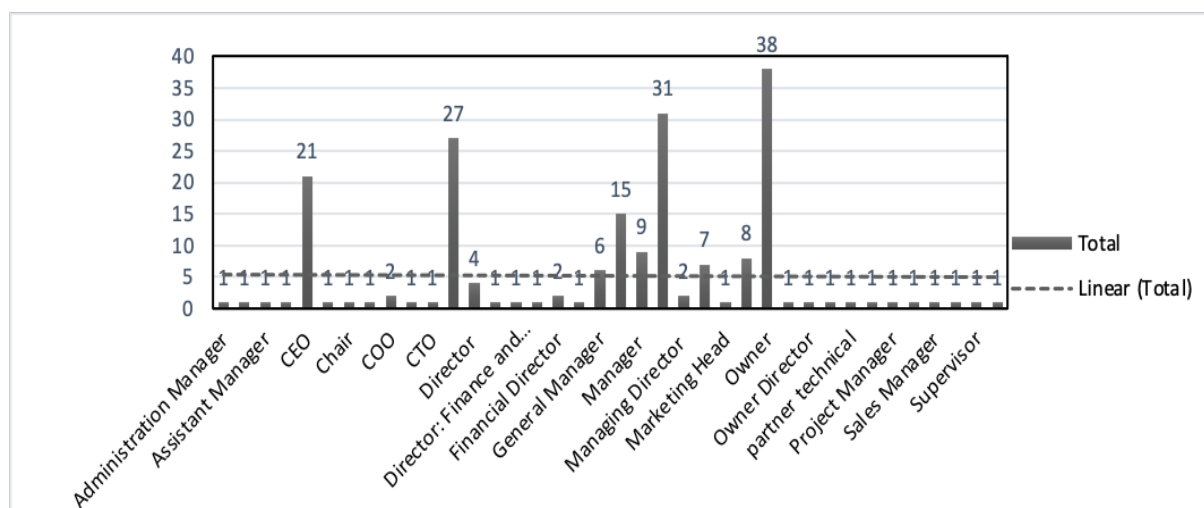


Figure 2. Position of respondents.

6. Analysis

The descriptive analysis was used to examine the characteristics of the sample before exploring the causal relationships between variables and testing the research hypotheses of this dissertation using quantitative analysis techniques and inferential statistics. In addition, reliability tests were done using Cronbach's alpha to see if multiple-question Likert scale surveys were reliable (creative thinking, critical thinking, innovative thinking, creative problem solving, and business performance).

Exploratory factor analysis (EFA) served as a quantitative tool for examining relationships between variables, identifying underlying patterns, and deriving a reduced set of unidimensional measures. In research, the Kaiser-Meyer-Olkin (KMO) test was used to determine the sampling appropriateness of data for factor analysis.

And before starting with factor analysis, Bartlett's test of sphericity's significance was tested to provide the probability that the correlation matrix has significant correlations among at least some of the variables in a dataset, a prerequisite for factor analysis to work. SEM (structural equation modelling) was used as a method of evaluating hypotheses. And lastly, a comparison between the construction and manufacturing sectors using the Kruskal-Wallis non-parametric one-way analysis of variance test was intended to shed light on why construction performance was poor compared with manufacturing and whether this could be attributed to the CPS variables.

7. Results

The primary goal of descriptive analysis is to examine the sample's characteristics before looking at the causal linkages between variables and verifying the research hypotheses with quantitative analysis and inferential statistics.

7.1 Descriptive statistics (Age, Turnover, headcount)

Table 1. Descriptive statistics (Age, Turnover, headcount)

Statistics		Current estimated yearly gross turnover (Rands)	Number of employees in the organisation	Longevity (months)
N	Valid Missing	204 0	204 0	204 0
Mean		65 816 041.72	106.55	257.25
Median		10 000 000.00	17.50	195.60
Minimum		30 000	1	1
Maximum		2 000 000 000	8000	2000

7.2 Descriptive statistics – Construction and manufacturing sectors

The descriptive statistics of the variables are given in Table2 for the South African construction and manufacturing sectors. For construction, the highest average rating was for critical thinking (4.21), while the lowest average rating was for creative problem-solving (3.90). For manufacturing, the highest average ratings were for critical thinking and organisational innovation (both 4.02), while the lowest average rating was for creative problem-solving (3.75). The mean value for the BPI was also somewhat low for both sectors.

Table 2. Descriptive Statistics: Construction Sector

	N Statistic	Mean		Std. Deviation Statistic	Skewness Statistic	Kurtosis Statistic
		Statistic	Std. Error			
BPI	99	4.08	.092	.911	.003	-.343
Critical Thinking	99	4.21	.056	.558	.037	-.187
Creative thinking	99	4.12	.074	.732	-.352	-.536
Innovative thinking	99	4.14	.073	.729	-.548	.110
Creative Problem Solving	99	3.90	.075	.749	.019	-.857

Table 3 gives descriptive statistics for the manufacturing sector. The highest average was for critical thinking (4.02) while the lowest average score was for creative problem-solving (3.75).

Table 3. Descriptive Statistics: Manufacturing Sector

	N Statistic	Mean		Std. Deviation Statistic	Skewness Statistic	Kurtosis Statistic
		Statistic	Std. Error			
BPI	105	3.90	.096	.986	-.359	-.249
Critical Thinking	105	4.02	.056	.571	-1.258	7.204
Creativity	105	3.96	.057	.587	-.286	.923
Innovation	105	4.02	.060	.620	-.259	.526
Creative Problem Solving	105	3.75	.060	.617	.208	-.555

The Manufacturing and construction samples were combined to increase the sample size to 204, and the means were ranked to demonstrate their levels of competence within the sample of small and medium enterprises.

1. Creative problem Solving. (This was rated as the weakest Creative Problem-Solving model Variable). (Mean value 3.90)
2. Business Performance Index (mean value 4.08)
3. Creative thinking (Mean value 4.12)
4. Innovative thinking (mean value 4.14)
5. Critical thinking (This was the strongest Creative Problem-Solving variable (Mean value 4.21))

Independent samples nonparametric Kruskal-Wallis tests comparing mean scores for the construction and manufacturing samples for each of the Creative problem-solving measures

failed to reveal differences between the sectors except for the Critical Thinking measure. This was $x=4.02$ for Manufacturing, and $x=4.21$ for Construction (Kruskal-Wallis= 5.7; df 1; $p < 0.05$).

8. Tests of sampling adequacy

The Kaiser-Meyer-Olkin (KMO) test was used to determine the sampling adequacy of data for the purpose of factor analysis used for the structural equation modelling. According to Kaiser, KMO results between 0.7 to 0.79 are middling. Good results for the KMO range from 0.8 to 0.89. Results for the construction industry ranged from 0.843 to 0.908, while results for the manufacturing industry ranged from 0.725 to 0.893. Thus, all the measures demonstrated suitable sampling adequacy. Bartlett's (1951) test of sphericity was significant ($p < 0.001$) for all the creative problem-solving measures for both sectors. The data were therefore considered suitable for factor analysis.

9. Goodness of Fit statistics for the individual Creative Problem-Solving measures

For convenience, the creative problem-solving measures were assigned abbreviated labels. (CT=creative thinking; CRT= critical thinking; INN= organizational innovation; CPS= creative problem solving; BPI=business performance index). Reliability analysis showed that all the CPS (creative thinking, critical thinking, innovative thinking, and creative problem-solving measures demonstrated acceptable Cronbach Alpha reliability coefficients ranging from 0.884 to 0.949 for the construction sample and 0.763 to 0.928 for the manufacturing sample.

EFA generally supported the original factor structures of the CPS measures. These results confirmed the robustness of the measures for use within the South African context. The EFA revealed that the cumulative variance explained was as follows for the construction industry. For the latent variable, BPI, 2 factors explained 69.5% of the variance; for critical thinking, 7 factors explained 64.5% of the variance; for creative thinking, 4 factors explained 59.7% of the variance; for organizational innovativeness, 4 factors explained 68.1% of the variance; for creative problem solving, 3 factors explained 53.5% of the variance. For the manufacturing industry, EFA revealed that the cumulative variance explained for a latent variable, BPI, 2 factors explained 69.7% of the variance; for critical thinking, 6 factors explained 57.6% of the variance; for creative thinking, 6 factors explained 56.9% of the variance; for organizational innovativeness, 4 factors explained 62.2% of the variance; for creative problem solving, 4 factors explained 47.9% of the variance.

Confirmatory factor analyses for the creative problem-solving measures showed a somewhat less than optimal fit between the measures items and their latent variables (CPS, CT, CRT, INN, BPI) for both sectors. The criteria, which were used to establish the goodness-of-fit of the models were the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). Additionally, the Standardised Root Mean Square Residual (SRMR) and the root mean squared error of approximation (RMSEA) were reported. The confirmatory factor analysis for the CPS measures showed a somewhat poor fit between the items and the latent variables (CPS, CT, CRT, INN,BPI) for both Manufacturing as well as Construction sectors.

For example, the Chi square values for the latent variables were all statistically significant ($p < 0.001$) for both manufacturing and Construction sectors. The RMSEA values were significant for all latent variables for both sectors ($p < 0.001$). For the construction sector these were: CT= 0.139, CRT =0.131, INN=0.162, CPS =0.153, BPI= 0.202. For the

manufacturing sector these were: CT= 0.113, CRT =0.124, INN=0.153, CPS =0. 163, BPI= 0.175). It should have been expected that these values would be below 0.08.

The CFI values for the construction sector were: CT= 0.61 CRT =0.74, INN=0.69, CPS =0.69, BPI= 0.86. For the manufacturing sector these were: CT= 0.70, CRT =0.67, INN=0.67, CPS =0.44, BPI= 0.86). These were somewhat below the expected level of 0.95. The SRMR values for the construction sector were CT= 0.607 CRT =0.10, INN=0.11, CPS =0., BPI= 0.108. For the manufacturing sector these were: CT= 0.09, CRT =.10, INN=0.11, CPS =0.16, BPI=0.115.). Thus, somewhat above the expected levels of 0.08.

The Tucker Lewis indices were also somewhat below the accepted limits (expected TLI> 0.95). For the construction industry, these were CT= 0.57, CRT =0.72, INN=0.66, CPS =0.33., BPI= 0.80. For the manufacturing sector, these were CT= 0.68, CRT =0.64, INN=0.63., CPS =0.33, BPI= 0.85.

Model goodness fit indices below 0.95 minimum cut-off point reveal the need for improvement. According to Suhr (2006), a desirable goal is to have a 20:1 ratio for the number of subjects to the number of model parameters. However, a 10:1 may be a realistic target. If the ratio is less than 5:1, the estimates may be unstable. The current study had six variables (parameters) in the CPS model. A 20:1 ratio would have required 120 cases for each sector. The current study samples fell below this but should still have been sufficient. According to Huber (2019), to make the SEM analysis meaningful, larger sample sizes are needed to obtain reliable parameter estimates, however, different suggestions regarding appropriate sample size; have been given by different authors. A common rule of thumb is to have a sample size of more than 200, although sometimes 100 is seen as adequate. Other authors propose sample sizes relative to the number, of parameters being estimated. Such ratios of observations to free parameters ranging from 5:1 up to 20:1 have been proposed. Taking Huber's criteria of 5:1 into account means that the sample for this study should have been sufficient.

10. Goodness of fit for the Creative Problem-Solving model

The Confirmatory factor analysis measurement model showed a less than optimal fit for both sectors. Therefore, the structure of the model should be reviewed to determine what additional variables could determine the longevity of SMEs and to improve the fit of the model.

According to the accepted cut-off point, the standardized root mean square residual should have been around 0.08 to present a good fit. The SRMR for each of the individual sectors was too high (0.86). This meant that the CPS model was a poor fit. However, the Coefficient of Determination of around 0.60 (60%) for the combined as well as the separate sectors showed a more reasonable fit.

An acceptable value for the SRMR would be less than 0.05 with a larger index indicating a worse fit. For the current results, the SRMR fit statistic of around 0.8 for the CPS model showed a poor fit as indicated in Table 4. The results suggest that the CPS model was under identified, meaning that it lacked some key variables necessary to improve its ability to predict longevity. Even including the BPI in the SEM for the CPS model did not greatly improve the ability of the model to predict longevity. It seemed clear from these results that additional key variables should be included in the model to improve its ability to predict Longevity.

Table 4. Model goodness of fit statistics: SEM

	Construction Sector	Manufacturing sector
SRMR (Standardized root mean squared residual)	0.867	0.813
CD(coefficient of determination)	0.648	0.604

11. Structural equation models

The hypothesis diagram depicted in Figure 1(Proposed Creative Problem-Solving Model) includes ten hypothesized relationships between variables. The beta coefficients were strengthened through introducing the BPI factors into the SEM analysis. It was hypothesised that the relationships between the skills contributing to the survival of SME were mediated by one construct, namely creative problem solving. The diagram in Figure 3, shows results for the construction sector with 4 beta coefficients above 0.40. A strong path was demonstrated between creative thinking, critical thinking, and creative problem solving (beta coefficients of 0.78 and 0.46 respectively). There was an identifiable path of influence from creative thinking to critical thinking (0.78); from Critical thinking to Organisational Innovation (0.60); from Organizational Innovation to Creative problem solving (0.40); and a weak link between CPS and longevity (-0.21). It might be possible that the effect of the CPS measure on longevity might have been absorbed by the other variables through covariance effects. A path also existed between Creative thinking, organizational innovation, and Creative problem solving. Evident from these results for the construction sector is a strong path between creative thinking, critical thinking, and longevity.

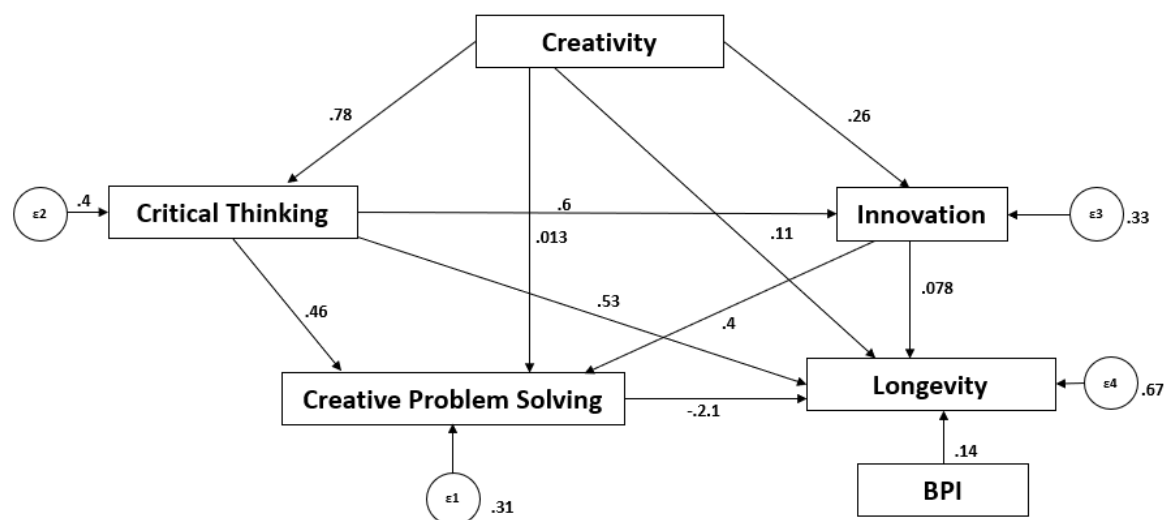


Figure 3. SEM Results: Construction Sector

The hypothesis diagram in Figure 4 for the manufacturing sector shows that with the addition of the BPI factors, for manufacturing, there were more strong and significant linkages between creative thinking, critical thinking, organisational innovation, creative problem-solving, and Longevity. As with construction, the key finding is a strong path of influence existed between creative thinking, critical thinking, and longevity. The identifiable paths were as follows: between creative thinking and critical thinking (1.0); Critical thinking and Innovation (0.63); Innovation and Creative problem solving (0.39).

A weak link existed between creative thinking and longevity (-0.19) and business performance and longevity (-0.12). Moreover, with the introduction of the Business Performance Indicator, the Beta coefficients are increased. Findings here are generally strong for all creative problem-solving variables. Therefore, one might hope that, if the Goodness of fit data were better for the CPs variables, the model would have been even stronger. In addition, the Beta coefficients for the better performing manufacturing sector appeared to be higher than those for the construction sector. The results thus differentiated between the two sectors. The model for the manufacturing sector shows 5 beta coefficients above 0.40.

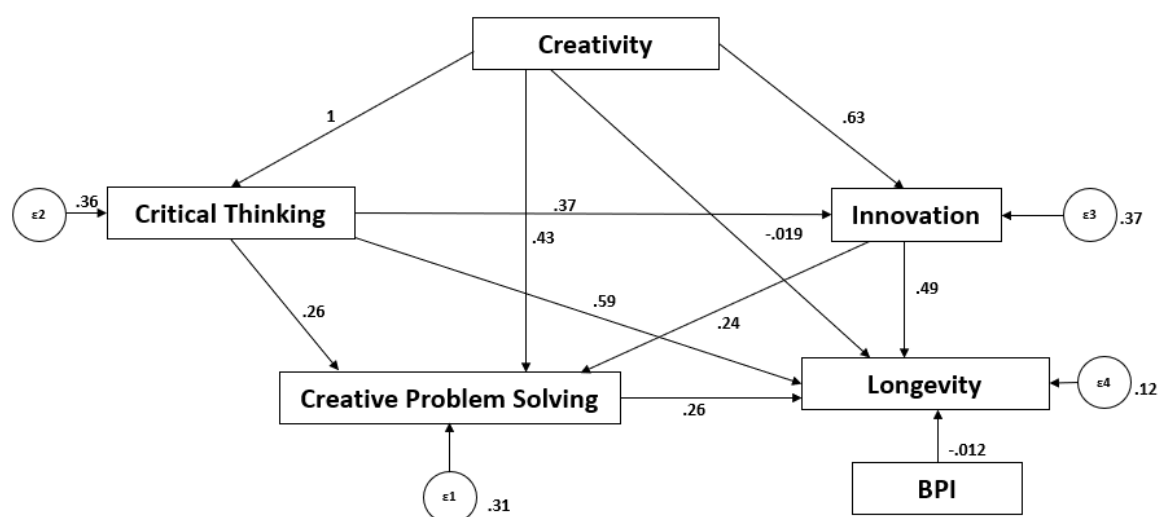


Figure 4. SEM Results: Manufacturing Sector

12. Discussion

Results of the current research support previous findings that work-based cognitive skills predict economic growth. and are critical for problem-solving (Valente, et al., 2016; Frederiksen, 1983). This research has linked creative thinking with divergent thinking. This is the ability to produce new approaches and original ideas by forming unexpected combinations from available information and by applying such abilities as semantic flexibility, and fluency of association, ideation, and transformation (Guilford, 1959, as cited in Cropley, 2006, p. 1). Divergent thinking brings forth answers that may never have existed before and is often novel, unusual, or surprising (Cropley, 2006). On the other hand, convergent thinking or critical thinking is defined as the ability to apply conventional and logical search, recognition, and decision-making strategies to stored information to produce an already known answer (Cropley, 2006).

The results of the current study have supported a synergistic relationship between creative and critical thinking resulting in a possible benefit for longevity. The previous research findings of Natale and Ricci (2016), Wade and Tavis (1993), and Kreitzberg and Kreitzberg (2009) lend support to this.

Furthermore, a relationship has been demonstrated between creative thinking, organizational innovation, and longevity. Previous research findings suggested that creativity and innovation are the lifeblood of small entrepreneurial businesses (Zimmerer and Scarborough, 1996). For the stronger manufacturing sector, a relationship was also identified between creative thinking and creative problem solving. However, for the weaker sector, an indirect relationship was found between creative thinking, critical thinking, and creative problem

solving. This is in support of the creative cognition view that, to generate original and appropriate solutions within a specific context, convergent/analytical and divergent/creative abilities intertwine (Cropley, 2006; Ward, 2007; Gabora, 2010). Sternberg et al. (2009, p. 430) further support the problem-solving process as a cycle using cognitive abilities to recognize the problem through to creating a solution, evaluating the resolution, and going back to understanding a new challenge. Thus, the evidence suggests that a creative process should precede the analytical during problem solving and that their effects are interdependent.

This synergistic process was further confirmed by Puccio et al. (2007) who viewed problem solving as gathering data and assessing a situation. This process calls for a broad search for diverse and novel ideas (divergent thinking) and selecting options through an affirmative evaluation of alternatives (convergent thinking). These include both cognitive as well as effective skills. Puccio (2000) identified four problem-solving styles: Clarifier, Ideator, Developer, and Implementer (Puccio, 2000). Clarifiers prefer to define and structure the problem space.

Ideators prefer to generate ideas. Developers like to elaborate upon or refine ideas and solutions, and Implementers choose to incorporate a refined idea into a final product or solution. The current research lends support to the idea that Ideators and Developers exercise creative thinking. Clarifiers and Implementers may exercise critical thinking skills. Labrecque (2018) also saw creative problem solving as requiring separate divergent and convergent thinking styles. The first half of the process focuses on generating ideas, while the second focuses on evaluating the feasibility of the ideas. This proposal agrees with the current findings. According to Labrecque (2018), creative leaders help the organizations and individuals they influence to grow, deliberately facilitating productive change. Creativity is thus a core leadership competency.

13. Implications

This research has attempted to understand the relationship between SME sustainability and CPS by looking at SME survival and CPS from a new perspective. To be able to survive, it is crucial to consider creative thinking, critical thinking, and innovation in today's complex business environment. It is evident that all these variables are closely linked and have the potential to enhance the survival of SMEs in complex environments. Thus, creative thinking, critical thinking, innovative thinking, and creative problem solving could be viewed, developed, and used as unique resources to impart a competitive advantage to any SME and to increase longevity.

A firm's performance is determined more by its internal resources than the external competitive environment, and hence resources differentiating them from competitors become its competitive advantage (Alvarez & Busenitz, 2001). Mosakowski (1998) and Shane (2012) showed that the entrepreneur's tendency to participate in the creative process will affect their decision-making in utilizing resources and dealing with many sustainability problems. Some scholars, like Sarasvathy (2001) and Pacheco (2012), consider that successful entrepreneurs usually start with the resources that they have at hand and in their control, rather than from industry or market analysis. Strategists furthermore select the competitive position that best exploits their internal resources and capabilities relative to external opportunities.

14. Conclusion

Variables in the creative problem-solving model did not fully predict the longevity of the SMEs in the construction and manufacturing sectors. However, the lack of fit did not nullify the use of the creative problem-solving model but rather highlighted the need to re-examine the model to determine what variables could be added to it to improve its ability to predict the longevity of SMEs. According to Hove and Tarisai (2013:57), other factors of SME survival include the business plan, marketing strategy, mission and vision, and finance. Al-Hyani (2013:1) showed the most common constraints hindering SME growth and survival as lack of financial support and qualified human resources, barriers to competition, and rigid business rules and regulations.

Evidence for both sectors revealed the dominant effect that creative thinking exerted on critical thinking, which in turn influenced the longevity of the SMEs surveyed. It also exerted a dominant influence on other latent variables such as organisational innovation, and creative problem-solving. These results suggest that creative thinking should be given more prominence in business decision-making because it establishes a foundation on which to build a critical thinking process and longevity. Furthermore, results indicated that creative problem-solving ability demonstrated a weak direct relationship to longevity for both sectors. The effect of the creative problem-solving measure on longevity might have been absorbed by the other latent variables. It was, however, moderately related to creative thinking in the manufacturing sector.

Furthermore, a strong link existed between creative thinking, critical thinking, and creative problem solving in the manufacturing sector. This was aligned with the sector's performance in the South African economy, in which manufacturing has performed significantly better than construction. Overall, the better-performing manufacturing sector demonstrated stronger links between the latent variables. Results, therefore, suggested that SME longevity improved where better use was made of creative thinking, critical thinking, organizational innovation, and creative problem solving. The model was significantly strengthened by the introduction of the business performance index, suggesting that where robust business performance existed, the effects of creative solving were strengthened. However, this did not materially improve the goodness of fit of the creative problem-solving model, nor did it enhance the relationships between the latent variable of creative problem solving and longevity.

Critical thinking was rated the strongest problem-solving variable. Particularly for construction, it was the preferred method of problem solving over creative thinking and was the one latent variable that distinguished between the sectors. This was even though creative thinking dominated the creative problem-solving model in SEM analysis for both sectors. The business performance index was rated poorly overall, indicating the sluggish performance of the SME sectors. Results suggest this might have dragged down the beneficial effects of the other creative problem-solving variables, including creative problem solving, which was rated lowest overall.

A more robust business performance seemed to be associated with a stronger creative problem-solving model and thus influence longevity, although the non-parametric analysis of variance applied was not able to distinguish between the best and worst-performing sectors' business performance. Overall, the direct effect of creative problem solving on longevity was small. The results demonstrated the complexity of the problem-solving process in small businesses. The proposed model was a start in exploring this process.

15. Significance and implications of your findings

The SME managers/business owners can make use of the outcomes of this study to develop policy guidelines and frameworks to improve the competitiveness of their organizations. Furthermore, SME managers/business owners need to play a role in instilling an innovative culture that utilizes competencies to increase profitability and enhance business longevity.

16. The contribution of the study

There is no known current research into the combination of creative problem-solving competencies in the South African context. This study has presented an extensive approach to empirically examine the complex relationships between creative thinking, critical thinking, organizational innovation, creative problem solving, business performance, and longevity of SMEs in South Africa. It reveals that South African SME managers should combine creative thinking, critical thinking, innovative thinking, and creative problem solving when solving complex problems to remain competitive. In particular, the research has supported the important synergistic relationship between creative thinking, critical thinking, and longevity of small-medium enterprises across the best and worst-performing sectors.

17. Limitations and scope for further research

These study limitations are as follows: (1) the research was conducted during COVID-19, when the country was on lockdown and some businesses were not operational. Furthermore, the findings cannot be generalized as they are based on a study conducted in only one country, however, the creative problem-solving measures used were internationally validated. (2) The sample size was not large enough to generalize the findings to other business sectors. (3) the questionnaire survey was conducted online; not all respondents opened their emails or responded to the survey. Furthermore, the study was based on SMEs in South Africa, and therefore to generalize the findings, it must be conducted in other countries. In addition, future research could employ a bigger sample. Furthermore, variables such as leadership, the ever-changing technological environment, and geographical factors could be further explored to try and improve the model.

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