

Beyond the crisis: corporate entrepreneurship in the South African mining industry

W GCAZA

(Graduate School of Business Administration, WBS,
University of Witwatersrand)
[wezo.g@wits.ac.za]

B URBAN

(Graduate School of Business Administration, WBS,
University of Witwatersrand)
[Boris.urban@wits.ac.za]

Abstract

The mining industry in South Africa faces unprecedented challenges where it has been proposed that this sector can only become sustainable if it focuses on developing new innovative processes to overcome constraints and creates a competitive advantage through corporate entrepreneurship activities. Firms that exhibit entrepreneurship are typically viewed as dynamic, flexible entities prepared to take advantage of new business opportunities, where they explore new business domains and new ways of conducting business.

This study empirically tests levels of entrepreneurship amongst firms in the South African mining industry and identifies potential links to different types of corporate entrepreneurship strategies that are used to ensure sustainability.

Results from a survey support the hypothesis insofar a significant and positive relationship is observed between the entrepreneurial dimensions of innovativeness, proactiveness and corporate strategies of internal corporate venturing, cooperative corporate venturing, strategic renewal, as well with organisational rejuvenation and business model reconstruction.

Key phrases

corporate entrepreneurship; entrepreneurial orientation; innovation; mining sector

1. INTRODUCTION

Calls for nationalisation, weak returns on investment, together with spiralling costs and labour unrest have resulted in a crisis of confidence in the South African mining industry (Hope 2014a:1; Van der Merwe & Van Rensburg 2012:61). Moreover, high commodity prices have

put the mining industry under the spotlight and the sovereign debt contagion has led to investors bailing out on mining equities. The volatility in the mining industry reflects structural changes due to costs based on decreasing ore grade and rising operating costs, ongoing disruptions to production due to safety stoppages and industrial action, increased taxes, remoteness of certain areas, corruption, and an increase in capital expenditure to bring supply to the market (Hope 2014a:16; Moato 2012:3; PWC 2012:2).

The South African mining industry has additionally been faced by challenges such as the miners' strike at Marikana in South Africa at the Lonmin mine. In August 2012, South African police, in an attempt to break an illegal strike at platinum mine in the country's northwest, shot and killed thirty-four miners in broad daylight. The standoff between the South African state, the multinational Lonmin Company, and striking miners at its Marikana mine, opens up questions about the global political economy (Magaziner & Jacobs 2013:137).

The Marikana strike created a wave of strikes throughout the mining industry, throwing mining houses into disarray and affecting other mining companies including Goldfields, Anglo Ashanti and Anglo America (Du Plessis 2011). Communities are seeking not only more basic economic returns from mining companies, but they also demand investments in education, infrastructure, and increased job opportunities (Ho 2010; Moato 2012). South Africa was further downgraded as an investment destination by Moody's investor services to a negative outlook citing high labour costs and increased concerns about South Africa's future political stability as the main problems (Lindow & Oosterveld 2012).

Against this backdrop and considering the magnitude of problems that the mining industry faces, it has been proposed that this sector can only become sustainable if it focuses on developing new innovative processes to overcome constraints and creates a competitive advantage through corporate entrepreneurship activities (Bouwer 2012:81; Hope 2014b:76; Urban & Oosthuizen 2009:171).

Leading strategic thinkers are moving beyond the traditional product and service innovations to pioneering innovation in processes, value chains, business models, and across different functions of management. Thus, corporate entrepreneurship (CE) and innovation are concepts that have captivated the interest of executives in many corporate boardrooms (Kuratko, Morris & Covin 2011; Urban 2010). Firms that exhibit CE are typically viewed as dynamic, flexible entities prepared to take advantage of new business opportunities when

they arise, and they explore new business domains, as well as new ways of conducting business within existing domains (Kuratko, Hornsby & Covin 2013).

Entrepreneurial behaviour by management and employees has been linked to a firm's competitive advantage and sustainability across different industries and contexts (Groenewald & Van Vuuren 2011; Ireland, Covin & Kuratko 2009). One way of becoming more dynamic and innovative is by adopting an entrepreneurial orientation (EO), where firms with higher levels of EO differ from other firms in terms of manifesting characteristics such as innovation, risk taking and pro-activeness (Lumpkin & Dess 2001). Mining remains a great example of where innovation can have a significant and far reaching impact. There is rigour and science behind innovation now, which requires internal processes and strategies to be geared towards innovative, entrepreneurial thinking (Bouwer 2012:81).

2. STUDY OBJECTIVES

Firms facing rapidly changing, fast paced, volatile environments react and are best served by implementing a CE strategy (Urban 2013). Research illustrates the need for firms to be entrepreneurial by highlighting that environmental uncertainty, dynamism and heterogeneity often precipitate the need for a CE strategy (Kuratko, Morris & Covin 2011; Van Vuuren, Groenewald & Gantsho 2009). An environment characterized as dynamic creates opportunities for CE initiatives, where managers react by investing in and leveraging their resources innovatively (Uzkurt, Kumar, Kimzan & Sert 2012).

The unpredictability of these changes can also influence the firm's levels of EO. A firm's competitive advantage often depends on identifying new and emerging opportunities in the marketplace where traditional strategic thinking based on stable industries has long ceased to be as effective (Covin & Lumpkin 2011:855). The problem, however, is that mining companies are often bureaucratic and non-supportive of innovation and creativity (Temane 2012), particularly due to structural impediments and lack of institutional imperatives to engage in entrepreneurship (Urban & Oosthuizen 2009:172).

The objective of this study is to empirically determine levels of EO amongst firms in the South African mining industry and identify potential links to different types of CE strategies that are typically used to ensure sustainability. Firms with higher levels of EO would reflect consistent behaviour required to enact a CE strategy in terms of entrepreneurial processes and behaviour throughout the organisation (Ireland *et al.* 2009). For CE to become a meaningful strategy it cannot be confined to a specialist function within the organisation, but

rather requires support through an entire pro-entrepreneurship organisational architecture that contains key attributes that individually and collectively encourage entrepreneurial behaviour (Anderson, Covin & Slevin 2009:221).

Despite the weight of positive empirical findings and observations that CE is a strategic imperative for firms (Kuratko *et al.* 2013:46), there is a danger that mining firms in South Africa are lagging behind (Urban & Oosthuizen 2009:175), and subsequently a study of this nature aids in understanding these imperatives. The study starts by briefly reviewing past research on strategy, CE and EO in order to operationalise the constructs under investigation. The research methodology is explained in terms of sampling, instrument design, and data analysis. The results are discussed in terms of previous theory and interpreted from an industry specific perspective. Both theoretical and practical implications are drawn from the empirical evidence and recommendations for future research are made.

3. LITERATURE OVERVIEW

3.1 Corporate entrepreneurship and strategy

Innovation is primarily concerned with introducing something new to the market place, which is typically manifested through corporate venturing where entrepreneurial efforts lead to the creation of new business ventures within corporate organisations (Morris, Kuratko & Covin 2008:23). Corporate entrepreneurship (CE) is a term used to describe entrepreneurial behaviour inside established organisations, with similar terms often used interchangeably such as, intrapreneurship, corporate venturing and organisational entrepreneurship (Morris *et al.* 2008:21). A longstanding literature has conceptualised CE as a multidimensional phenomenon which incorporates the behaviour and interactions of the individual, organisational, and environmental elements within organisations (Covin & Lumpkin 2011; Dess, Lumpkin & McGee 1999; Hayton, George & Zahra 2002).

Entrepreneurship and its relation with strategy is studied extensively within organisations and has been conceptualised as a fundamental posture, instrumentally important to strategic innovation, particularly under shifting external environmental conditions (Ireland *et al.* 2009; Knight 1997). At the level of the organisation, entrepreneurship can provide direction to the firm's entire operation, serve as an integral component of a firm's strategy, and may serve as the core component of its corporate strategy (Morris *et al.* 2008). The organisational-level outcomes of adopting a CE strategy are competitive capability and strategic repositioning, where previous research suggests that exploiting entrepreneurial opportunities enables firms

to both strengthen existing competitive capabilities and build new competitive capabilities (De Jager & Steyn 2013; Ireland *et al.* 2009).

The increased use of CE strategies by firms is fuelled by the increasingly globalised markets that are forcing business decision makers to revisit their innovation strategies and models. Corporate venturing in particular, is one of the fastest-growing strategies for re-modelling the closed, linear approach to corporate innovation into an open, collaborative model with new research and development partners (Kuratko *et al.* 2011). Corporate venturing is typically manifested through:

- **Internal corporate venturing**, which is concerned with exploiting new business opportunities, development of new competencies, promoting an innovative corporate culture, and creating a culture of risk-taking through exploration and learning. This provides dedicated and hardworking employees the opportunity to put more effort into their work and to get better rewards for being innovative. Firms undertake internal corporate venturing to obtain higher returns on investments (Kuratko *et al.* 2011:86).
- **Cooperative corporate venturing** occurs when new businesses are created and owned by the corporation together with one or more external partnerships. Cooperative corporate venturing is undertaken for a variety of reasons that include complementing existing internal resources, such as the need to quickly gain technical capabilities to compete in rapidly changing markets and the desire to minimize fixed costs associated with capital assets (Kuratko *et al.* 2011:86).
- **External corporate venturing**, which occurs when new businesses are created by parties outside the firm and subsequently invested in or acquired by the firm. External corporate venturing is also a vehicle for firms to make investments in new high growth areas that are not part of its strategic portfolio (Kuratko *et al.* 2011:86).

There is growing literature that attempts to link the strategic management and CE constructs (Dess *et al.* 1999; Urban & Mumbrika 2013), where some researchers (Meyer & Heppard 2000), argue that the two constructs are inseparable, while others (McGrath & MacMillan 2000) argue that strategists must exploit an entrepreneurial mind-set to sense opportunities, mobilize resources, and act to exploit opportunities. Covin and Kuratko (2008) discuss strategic entrepreneurship within the realm of CE, where strategic entrepreneurship is conceptualized as the integration of entrepreneurial (i.e., opportunity-seeking behaviour) and strategic (advantage-seeking behaviour) perspectives in developing and taking actions

designed to create wealth. Such an integrated approach can typically take different forms, such as the following:

- **Strategic renewal** is defined by Kuratko *et al.* (2011:99) as “the adoption of a new strategy”. Similarly, Saez-Martinez and Gonzalez-Moreno (2011:44) describe strategic renewal as “the manner in which a firm transforms in terms of changing the focus of its operations or entire strategic approach”. Through strategic renewal organisations transform through ideas that serve as a foundation that they are built on. As a process organisations typically redefine their relationship with markets and industry competitors and as such this renewal process can occur when a firm develops a new strategy or when it employs measures to try and increase competitiveness through improved execution of an existing strategy. The environment plays a critical role in the decision to implement strategic renewal as a strategy since firms enter into new ventures in anticipation or in response to an environmental change (Uzkurt *et al.* 2012).
- **Organisational rejuvenation** is defined by Kuratko *et al.* (2011:99) as “the enactment of a major, internally-focused innovation aimed at improving strategy implementation”. Organisational rejuvenation is an internally focused innovation aimed at improving strategy. During a corporate rejuvenation initiative, the critical task for management is to provide vision and lobby for employee commitment by clearly defining long term goals that relate to the core of the business. The process of organisational rejuvenation requires skills to manage across interfaces of various organisational functions. Knowledge and competence become assets to a firm in the process of organisational rejuvenation because the managers are aware of the strengths and weaknesses that give will give the firm a strategic advantage.
- **Business model reconstruction** is defined by Kuratko *et al.* (2011:99) as “the design of a new or redesign of an existing business model”. Many researchers have attempted to capture the essence of business model reconstruction and all have come up with different viewpoints of what it entails. For instance, Drucker (1979) suggested that business model reconstruction addresses the fundamental question of who the customer is, what is the value of the product or service and how does the firm intend to earn wealth.

3.2 Entrepreneurial orientation

Research provides theoretical support for the EO construct, in both the fields of entrepreneurship and strategic management (Marino, Strandholm, Steensma & Weaver

2002). Widespread research confirms the three dimensions of EO, as innovativeness, risk taking, and pro-activeness (Covin & Lumpkin 2011:855):

- **Innovativeness** is the fundamental posture of an entrepreneurial organisation in terms of developing new products or inventing new processes. Innovativeness as an attribute describes a firm's willingness to add newness with added value.
- **Risk-taking** is associated with the firm's willingness to commit significant resources to opportunities and to take calculated business risks.
- **Proactiveness** is perseverance in ensuring initiatives are implemented, and is concerned with adaptability and tolerance of failure (Lumpkin & Dess 1996; Covin & Slevin 1989, 1991, 1997).

These three dimensions have been extensively documented and according to Lumpkin and Dess (1996), all three dimensions are central to understanding the entrepreneurial process, although they may occur in different combinations, depending on type of entrepreneurial opportunity the firm pursues. Covin, Green and Slevin (2006) configure EO as a formative construct and propose that as a construct EO cannot be decomposed into its constituent elements, that is firms can only be labelled as entrepreneurial if they simultaneously exhibit risk taking, innovativeness, and pro-activeness.

The EO scale was initially developed by Khandwalla (1977), refined by Miller and Friesen (1983), and Covin and Slevin (1989), and has been found to be highly valid and reliable at cross-cultural levels (Knight 1997). A review of the literature on EO, suggests this concept is best understood as a complex mix of personal and situational factors and in addition to individual and firm differences, forces operating within other larger cultural contexts also determine levels of EO (Lumpkin and Dess, 2001; Urban & Mumbrika 2013).

Although the literature suggests that EO and the CE constructs relate to one another in many conceptual ways, firms that concentrate on either competitiveness (strategy) or opportunity generation (entrepreneurship) only to the exclusion of the other leads to the increased probability of stagnation, decline, and ineffectiveness and possibly even complete failure (Covin & Kuratko 2008).

This inter-relatedness means that firms often need to look inward for strategic opportunities and adopt a degree of EO in their CE strategies which promotes an entrepreneurial posture that simultaneously captures existing organisational competitive advantages (Ireland *et al.* 2009).

Consequently, by bringing together the EO and CE literatures, and in accordance with the study objective, a hypothesis is formulated to reflect the inter-relatedness of these constructs. Considering the dearth of empirical testing of EO and the limited use of CE strategies by firms in an emerging market context (Urban & Mumbrika 2013), a single broad spanning hypothesis is formulated which allows for general explanations of how EO may be associated with the different CE strategies:

Hypothesis 1: At the firm level there is a positive association between the levels of the EO dimensions of innovativeness, risk taking, and pro-activeness and the prevalence of the different CE strategies.

4. RESEARCH METHODOLOGY

The research design was quantitative and cross-sectional. In line with the study objective which was to provide an empirical account of CE and EO, a survey was used which relied on primary data sources from the mining sector. By focusing on a single industry sector, a greater homogeneity of context is achieved which addresses the concerns of broad applicability versus perfect suitability for narrower groups.

Studies across industries often produce results that apply to all while they at the same time apply to none (Davidsson 2004), since they only capture a tiny fraction of each firm's manifestation of CE and EO. Accordingly, the context of the study was the South African mining industry sector.

4.1 Sampling and data collection

The population for the study was identified as mining firms listed on the Johannesburg Securities Exchange (JSE) as well as on the alternative exchange division of the JSE (JSE 2013).

From this population a sampling frame of South African junior mining companies was selected as these firms allowed for filtering out of the largest mining houses, and presumably eliminated some of the typical organisational inertia characteristics of large firms, such as bureaucratic structures, which may bias EO indicators (Urban & Mumbrika 2013). Research in the field of entrepreneurship tends to focus on small firms as far as venturing is concerned or on large firms in the case of CE (Urban & Mumbrika 2013).

However, small firms can adopt entrepreneurial behaviour long after their creation by constantly scanning the environment for new opportunities and consequently, the EO

construct is salient not only for large firms but also for small and medium-sized firms (SMEs), under different stages of economic development (Lumpkin & Dess 1996, 2001).

The South African Revenue Services defines junior mining companies as those that carry on trade of mining activities, either exploration or production, which is either an unlisted company as defined in section 41 or listed on the JSE (SARS 2013). A qualifying company must meet the following conditions which were adopted for the present study as the sampling selection criteria:

- The company is a resident in South Africa.
- The company is not a controlled group company in relation to a group of companies.
- The tax affairs of the company are in order and the company has complied with all the relevant provisions of the laws administered by the Commissioner.
- The company is a junior mining company.
- The company is not carrying on any impermissible trade.
- The sum of the investment income, as defined in section 12E (4) (c), derived by that company during any year of assessment does not exceed an amount equal to 20 per cent of the gross income of that company for that year.

Based on these selection criteria, five junior mining companies were identified where the target respondent or unit of analysis was the owner-manager as well as other key decision-makers in these firms. Owner-managers are typically well positioned in respect of overarching strategic endeavours of the entire firm (Morris *et al.* 2008:45).

By employing a non-probability judgemental sampling technique, 186 potential respondents were surveyed in three South African provinces – the Free State, Gauteng, and the North West. It was not possible to use random sampling due to practical considerations, such as the incomplete details of the respondents in the sampling frame.

The questionnaire was distributed electronically via 'SurveyMonkey', which was selected principally because of its functionality and ease of use. A personalised e-mail accompanied each questionnaire, explaining the purpose of the study and assuring the respondent of the confidentiality of their responses. A follow-up request was sent out approximately two weeks after the initial request. A total of 57 completed responses were received representing a 30.6 percent response rate.

4.2 Measures

Based on previous research, suitable measures for the purpose of this study were identified where there is theoretical and empirical support for each construct as identified in the literature review section. The instrument consisted of three content sections, all of which were measured using a 7-point Likert scale, representing '1 = if you strongly agree with the statement and 7 = if you strongly disagree with the statement' and numbers '2' through '6' depending upon their best estimate of an intermediate position.

Section A of the instrument was designed to reflect the theoretical dimensions of corporate venturing, which included variables on (a) internal corporate venturing, (b) cooperative corporate venturing and, (c) external corporate venturing, which in total was made up of 9 items (Kuratko *et al.* 2011). Examples of questions for internal corporate venturing included questions such as: 'my firm exhibits high levels of internal corporate venturing' and 'my firm currently manifest internal corporate venturing initiatives'.

Section B of the instrument was designed to reflect the theoretical dimensions of strategic entrepreneurship which included variables on (a) strategic renewal, (b) organisational renewal and, (c) business model reconstruction, which in total was made up of 9 items (Kuratko *et al.* 2011). Examples of questions for strategic renewal included questions such as: 'my firm exhibits high levels of strategic renewal', 'my firm currently manifest strategic renewal initiatives' and 'in general, my firm is on the cutting edge when it comes to strategic renewal initiatives'.

Section C of the instrument was designed to reflect the EO dimensions of innovation, risk-taking and pro-activeness. Many alternative EO conceptualizations are to be found (Brown, Davidsson & Wiklund 2001), and have demonstrated some usefulness, however as Davidsson (2004) suggests using the existing EO measure has the advantage of theoretical backing, a multidimensional construct, and theoretically meaningful relationships established in previous studies, thus allowing for more refined knowledge to evolve.

Consequently, EO was measured with 9 items representing the three dimensions of innovativeness, pro-activeness, and risk taking. Even though previous studies have established EO scale validity in the South African context (Urban 2010), scale reliability was tested for this sample of respondents. Moreover, in terms of the ratio of respondents to the number of questionnaire items used in the survey, it was deemed insufficient to test the factor structure of these scales (Hair, Black, Babin & Anderson 2010).

Care was taken to ensure clarity in terminology and to ensure that the items of the questionnaire addressed each of the constructs in the hypothesis. In some instances, the wording of items was changed to reflect an SME context. Moreover, in order to ensure that the instrument demonstrated sufficient face and content validity, a preliminary analysis via a pilot test was undertaken ($n = 11$) using entrepreneurship experts in the field. This procedure ensured that the respondents had no difficulties in answering the questions and there was no problem in recording the data. In the final instrument, common method response bias was controlled for by safeguarding respondent anonymity, as well as ensuring that the questions were mixed-up randomly between the different sections in the instrument.

4.3 Data analysis

Data analysis was conducted, where descriptive statistics and correlations were calculated using the STATISTICA software system, version 10 (StatSoft 2011). This was followed by cluster analysis, where the main objective was to partition a set of firms employing certain strategies into two or more groups based on their similarities.

Thus, instead of viewing observations as unique, these firms could be viewed as members of clusters and could be profiled by their general characteristics. T-test comparison of clusters was used. Cluster analysis further helps with relationship identification. Once clusters had been defined and the underlying structure of the data represented in the clusters analysed then relationships among the observations that are typically not possible with the individual observations could be revealed (Hair *et al.* 2010).

5 RESULTS

5.1 Reliability of scales

Internal consistency was assessed and item statistics were calculated for each scale. The Cronbach alpha coefficients are reported in Table 1, all of which are deemed highly reliable at the 0.70 level and above (Nunnally 1978), while the average inter-item correlations all exceeded 0.30 indicating relative homogeneity amongst items and reflecting the same underlying construct (Hair *et al.* 2010).

5.2 Descriptive statistics results

Statistical measures of location spread and shape were calculated to reveal skewness, kurtosis, means, and standard deviations of the different variables, see Table 1. The relatively high mean scores (all are above the mid-point average) for both CE strategies and

EO suggests that the responses to these scales are positive and that there is overall agreement with perceived levels of these constructs. Additionally the standard deviations of all scores exceeds 1.00, suggesting relatively high variation across the responses.

In terms of the EO scale, the highest mean score was on the pro-activeness dimension (4.40), followed by the innovativeness dimension (4.32), and lastly risk-taking (4.03). In terms of CE strategies, strategic renewal had the highest mean score (4.66), followed by organisational rejuvenation (4.58), business model reconstruction (4.32), while internal corporate venturing, cooperative corporate venturing and external corporate venturing all had mean scores above the mid-point of 3.50.

TABLE 1: Descriptives and reliabilities for corporate entrepreneurship (CE) strategies and entrepreneurial orientation (EO)

Construct and dimensions	Mean	Median	Minimum	Maximum	Std. dev.	Skewness	Cronbach alpha	Average item correlation
CE strategies								
Internal venturing	4.27	4.33	1.00	7.00	3.33	-0.07	0.91	0.79
Cooperative venturing	4.26	4.00	1.00	7.00	1.46	-1.46	0.93	0.82
External venturing	3.88	4.00	1.00	7.00	1.42	-0.26	0.93	0.84
Strategic renewal	4.66	4.67	1.00	7.00	1.26	-0.33	0.94	0.84
Organisational rejuvenation	4.58	4.67	1.00	7.00	1.26	-0.42	0.90	0.73
Business model reconstruction	4.32	4.33	1.00	7.00	1.20	-0.21	0.91	0.72
EO dimensions								
Innovation	4.32	4.00	1.00	7.00	1.30	-0.11	0.88	0.41
Pro-activeness	4.40	4.50	1.00	7.00	1.30	-0.29	0.70	0.54
Risk taking	4.03	4.00	1.00	7.00	1.00	-0.16	0.71	0.37

Source: Based on survey results

5.3 Hypothesis testing

To test the hypothesis a correlation analysis was conducted. Pearson correlation coefficients are reported in Table 2, with the level of significance indicated by the asterisk in terms of the p -values. Based on the results in Table 2, the correlation coefficients vary considerably with several positive values present that are statistically significant. In terms of expecting a relationship between EO dimensions and CE strategies, internal corporate venturing was positively and significantly correlated with the EO dimension of innovativeness ($r = 0.70$, $p < 0.01$), as was strategic renewal ($r = 0.72$, $p < 0.01$), organisational rejuvenation ($r = 0.73$, $p < 0.01$), and business model reconstruction ($r = 0.69$, $p < 0.05$).

TABLE 2: Correlation matrix for study variables

Variables	1	2	3	4	5	6	7	8	9
Innovativeness	1								
Proactiveness	0.66*	1							
Risk Taking	0.44*	0.31	1						
Internal corporate venturing	0.70**	0.50	0.66	1					
Cooperative corporate venturing	0.61	0.45*	0.58	0.46*	1				
External corporate venturing	0.38	0.43*	0.27	0.31	0.44*	1			
Strategic renewal	0.72**	0.71	0.65	0.76**	0.63	0.68	1		
Organisational rejuvenation	0.73**	0.74	0.61	0.76**	0.65	0.70	0.61*	1	
Business model reconstruction	0.69*	0.65	0.70	0.71**	0.62	0.71**	0.59	0.63*	1

* $p < 0.05$; ** $p < 0.01$, two-tailed

Source: Based on survey results

Pro-activeness was positively and significantly correlated with cooperative corporate venturing ($r = 0.45$, $p < 0.05$), as well as external corporate venturing ($r = 0.43$, $p < 0.05$). No significant correlations between the EO dimension of risk-taking and any of the CE strategies was detected.

To further analyse the data and consistent with previous studies cluster analysis was used to empirically delineate between firms relying on different CE strategies (Galbraith, Rodriguez

& De Noble 2008). The process of clustering the data set was performed with the use of clustering algorithms that identified similar characteristics in the data set, and then filtered/partitioned these into two distinct clusters. Table 3 shows these clusters profiles in terms of their centroids for *k*-means clustering. Cluster 1 had 32 observations (56 % of the sample) and was named as the 'conservative firms cluster', based on their relatively low pro-activeness, risk-taking and innovativeness scores.

This cluster also scored low mean scores cross the different CE strategies, with external corporate venturing, strategic entrepreneurship, organisational rejuvenation and business model reconstruction, all having mean scores below 0.50. Cluster 2 with 25 observations (44 % of the sample) had relatively higher mean scores on all the EO dimensions and was named as the 'entrepreneurial firms cluster', as these firms seemed to display high entrepreneurial characteristics ion terms of innovativeness, risk-taking and pro-activeness.

**TABLE 3: Cluster profiles: Centroids for k-means clustering
(Standardised variables)**

Cluster	Internal venturing	External venturing	Cooperative venturing	Strategic renewal	Organisational rejuvenation	Business model reconstruction
1	-0.54	-0.55	-0.46	-0.44	-0.47	-0.34
2	0.87	0.89	0.74	0.71	0.75	0.51

Source: Calculated from survey results

In terms of CE strategies, external corporate venturing, business model reconstruction, strategic entrepreneurship and organisational rejuvenation, all displayed mean scores above 0.70, suggesting this cluster relied more on these strategies as a result of its EO profile.

To make further sense of the clusters, analysis of variance (ANOVA) was conducted on the two clusters against each of the EO sub-dimensions, followed by simple t-test to confirm the significance of the cluster group mean differences. The results of this t-test are displayed in Table 4, where the t-test values (-2.90, -3.66, -2.11) for the EO dimensions of innovativeness, proactiveness and risk-taking, respectively, were all statistically significant.

These significant results suggest that the differences in mean scores amongst all possible combinations of cluster categories differed significantly from one another. Additionally, a Scheffe post-hoc test was used where the results showed a pattern of monotonic increase, which suggests that the mean of respondents who had low perceptions of EO were not

significantly different from the mean of those respondents who identified low perceptions in terms of the prevalence of the CE strategies. Correspondingly, the mean of those respondents who identified a medium-high level of EO were also significantly higher in terms of perceptions of the prevalence of CE strategies at their firms.

TABLE 4: T-test comparison of clusters

EO measures (Standardised)	Mean of Cluster 1	Mean of Cluster 2	t-value	df	p	SD (C1)	SD (C2)
Innovativeness	-0.34	0.44	-2.90	57	**	0.94	0.82
Proactiveness	-0.40	0.54	-3.66	57	**	0.94	0.72
Risk Taking	-0.21	0.40	-2.11	57	*	0.80	1.19

* p <0.05; ** p <0.01

Source: Calculated from survey results

6. DISCUSSION AND IMPLICATIONS

This paper has contributed to the growing field of corporate entrepreneurship, by providing empirical evidence on EO and CE strategies where existing work has not yielded generalizable knowledge on these constructs in the South African mining industry context.

The empirical evidence emanating from this study provides support for the hypothesis insofar a significant and positive relationship is observed between the EO dimensions of innovativeness, pro-activeness and the CE strategies of internal corporate venturing, cooperative corporate venturing, strategic renewal, as well with organisational rejuvenation and business model reconstruction.

The study findings also have relevance as a firm's EO has been identified as a key construct in enhancing business performance, and as this study suggests, owner-managers need to be quick to react, be innovative and take risks in order to survive and be successful in today's competitive mining industry environment.

A key insight based on the results is that junior mining firms need to leverage the different CE strategies in a manner that influences the firm's levels of EO. Strategic actions should include increasing the firm's propensity to be innovative, proactive to market opportunities, and be willing to take risks when confronted by uncertainty.

Increasing EO requires developing new products or services, introducing new and more efficient processes and procedures, or simply creating added value for customers (Covin &

Lumpkin 2011). Particularly for resource-scarce SMEs, an EO might be essential to attract and integrate various forms of resources such as high-quality employees, recurring revenue from customers or financial resources from investors that otherwise may prefer the relative security of more established, larger firms. As such, an EO is often the most effective response for SMEs to overcome the liabilities typically associated with smallness (Urban & Mumbrika 2013).

The practical implications stemming from this study include:

- Actively cultivate EO which has been shown to be an important link to firm performance and it provides employees with a sense of innovation, risk taking and pro-activeness
- As the mining industry is experiencing volatility it is important for mining managers to find an efficient means of being more pro-active, innovative and able to take bold action in implementing new projects in an uncertain environment.
- Employing CE strategies must influence how the firm uses technology and innovation to achieve its objectives, such as maximising profits, gaining market share, creating niche markets or adding value for stakeholders – particularly for labour and the community in the mining sector.

7. CONCLUSION

The study provides guidance to managers and company leaders interested in employing CE strategies and provides direction to managers and employees seeking to enhance EO. In light of these broad suggestions some specific recommendations are:

- Increase the number of innovation sponsors (champions) by encouraging managers to help employees getting their work done by removing obstacles and roadblocks.
- Establish a culture more tolerant toward risks, mistakes and failure by allowing employees to take calculated risks and practical experimentation. Accept mistakes and failure as a learning process and learning necessitates mistakes.
- Ensure corporate venturing is related to EO and develop a set of metrics to track the efficacy of venturing by measuring inputs (such as the number of hours devoted to innovative projects), throughputs (such as the number of new ideas entering the company's innovation pipeline), and outputs (such as the cost advantages gained from innovative breakthroughs).
- Employees must perceive innovativeness, proactiveness and risk taking as a strategic requisite to avoid organisational complacency and inertia.

- Engage strategically by exploiting under-utilized resources, extract further value from existing resources, introduce competitive pressure onto internal suppliers, spread the risk and cost of product development, and divest non-core activities (Kuratko *et al.* 2013).

Finally, in the broader context the study contributes to existing research where evidence of employees developing new business activities at the firm level, suggest that even at the macro-level a positive correlation between corporate entrepreneurship and a countries GDP per capita is possible. Thus, it appears that entrepreneurial activities by employees are, as predicted by theory, very important to move a country towards more advanced phases of economic development (Bosma, Stam & Wennekers 2010).

Although the study has several limitations it presents future research avenues. The cross-sectional nature of the study prevents any causal relationship between EO and CE strategies to be drawn. A longitudinal study is required to provide further insights and causal inferences into the relationships as proposed in this study. Moreover, the study relies on perceptual data where responses may have been influenced by perceptual biases and cognitive limitations. Considering the relatively small size of the study sample, the results must be interpreted with caution in terms of representativeness and generalizability. An avenue for future research could be to focus on the relevance of specific CE strategies and link these to different financial and non-financial performance measures.

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