MODELLING THE IMPACT OF ENTEPRENEURSHIP IN URBAN EMPLOYMENT GROWTH OF MINING TOWNS IN A DEVELOPING COUNTRY – A SYSTEM DYNAMICS APROACH

GEORGE MALULEKE

University of Pretoria, Graduate School of Technology Management, South Africa
George.maluleket@gmail.com

LEON PRETORIUS

University of Pretoria, Graduate School of Technology Management, South Africa
leon.pretorius@up.ac.za

ABSTRACT

The purpose of the research paper was to establish linkages between declines in mining activities and levels of entrepreneurship in mine towns. The paper studied the impact of entrepreneurship in creating economic and employment growth in areas where mining dominates economic activities. Previous literature on concepts that include: modern entrepreneurship, measures of entrepreneurship, urban employment growth, value capturing and value creations are used to construct a system dynamics model for mining value chain activities and the development of entrepreneurial independence. This paper argues that entrepreneurship by small enterprises in mining may create value where large scale companies capture the value from opportunities created by large capital project expenditures. A system dynamic model was developed using data collected through focus groups in the Northern Cape town of Kathu. The research approach is thus based on a system dynamics simulation of established principles of embededness and structuration theories to further analyse the causal relationship between entrepreneurship and employment growth of an urban area.

An argument is raised in the paper that there is a link between growth in entrepreneurship led employment in mining and subsequent levels of economic activities in secondary and tertiary sector businesses. The paper concludes and concurs with previous authors that economic development is best achieved through activities of opportunity entrepreneurship and not through dominance of large enterprises. We argue that, the points raised in this research may contribute to a dialogue in the South African mining environment where historical mines are nearing the end of their useful life with most of the towns facing potential decay due to lack of alternative industry and negative business migration . The findings of this research can be used by policy makers in determining future direction in mining and entrepreneurial development in South Africa however, cannot be generalised to all geographies as some aspects of the outcome reflect the performance of thriving mining towns with uniquely South African policy dynamics.

Key words: Entrepreneurship; Economic growth; System dynamics; Structuration

INTRODUCTION

The South African mining industry has for many years been very capital intensive compared to other primary and secondary sector industries such as agriculture and manufacturing. The sad reality of this level of capital intensity is that, it creates presence in the areas where mining occurs for as long as the mining activities continue. Those employed in the mining operations develop skills that are specialised and at times rigid but necessary to interact with the machines that are used to mine and manage the support activities such as maintenance and capital projects required to create new capacity or replace the aging assets. Teece (2007:1347) concludes that for both large and small enterprises to achieve successful financial results, they need to embed in their company a level of entrepreneurial managerial capitalism. Teece (2007:1347) describes this phenomenon as the ability of enterprise management to identify problems and trends, redirect resources and reshaping organisational structures to address environmental changes while staying aligned to customer expectations. This in our view describes the business agility required to morph the enterprise and the interaction with the business environment semi continuously and to act as a seed for further business entrepreneurship.

Acs (2006: 97) distinguishes between necessity entrepreneurship and opportunity entrepreneurship and concludes that the latter has more positive developmental impact than the former. Block and Sandner (2009:4) simply argue that necessity entrepreneurship is based on the requirements of the entrepreneur whereas opportunity entrepreneurship is driven by an opportunity and therefore beyond the entrepreneur's immediate needs. Similarly, Fatoki and Chindoga (2011:161) distinguish between latent and actual entrepreneurship and argue that both forms are very low in South Africa when compared to other countries globally. Acs (2006:99) further describes in the reading of the Global Entrepreneurship Monitor (GEM) that, a correlation exists between the ratio of opportunity to necessity entrepreneurship and growth as measured by gross domestic product (GDP) of that country. We believe that small enterprises represent a good example of opportunity entrepreneurship and accordingly study them as part of the research presented in this paper in order to understand the behaviour and impact of opportunity entrepreneurship in the mining industry.

In the work of Maluleke and Pretorius (2016), a causality was drawn between infrastructure capacity development and skills development where they argued that as the mineral resource development value chain transits into more beneficiation and downstream activities, the number of people employed above semi-skilled level increases. Tom (2016:84) similarly concludes that mineral beneficiation contributes greatly towards the growth of a country's GDP and employment. Maluleke and Pretorius (2016) further argued that people employed in beneficiation activities would offer a new set of skills that would either make them more easily employed in secondary industries such as manufacturing or they could create jobs themselves using these skills. Those who use their skills to create own jobs as entrepreneurs would fit the category of necessity entrepreneurs defined by Acs (2006) and later Block and Wagner (2010:2). Fatoki and Chindoga (2011:161) also highlight the correlation between intention to start a business and the behaviour of an entrepreneur even before a venture is created.

The work of Maluleke and Pretorius (2016) on the dynamic relationship between mineral beneficiation and economic infrastructure capacity development in the Manganese industry forms the base upon which this research was conducted. In comparing the behaviour of large scale companies and small enterprises, Santos (2012) argues that there is a stark contrast between value creation and value capture. Mair and Marti (2006:38) contend that entrepreneurs, in pursuit of selfish interest, contribute to establishing new markets, industries and technologies, all of which have impact on new jobs, skills and overall welfare of society. Similarly, Peredo and McLean (2006:58) add that entrepreneurship is concerned with creating greater value through innovation at the face of risk.

We therefore argue that entrepreneurship by small enterprises in mining may create value where large enterprises capture the value from opportunities created by large capital project expenditures. We start the discussion with a view that small entrepreneurship offers employees a unique opportunity to develop skills that are more adaptable to other industries and allow them to become more creative in creating job opportunities as entrepreneurs in their own right.

The rest of the paper is then organised as follows: we start with a section on research methodology and methods that introduces and motivates the system dynamics simulation method followed. Thereafter the modelling environment and causal relationships for a mining value chain and entrepreneurship capital are presented together with a conceptual system dynamics model. This is followed by a section describing the system dynamics simulation results. Some conclusions and possible future research on mining value capture and creation as well as opportunity entrepreneurship are then presented in the final section.

RESEARCH METHODOLOGY

The research into this paper followed a simulation approach which is a method recognised as an alternative to empirical analysis of data. Davis, Eisenhardt and Bingham (2007:480) argue that, the strength of using simulation as a theory building method comes with non-linearity and longitudinal process phenomenon that simulation enables in research. Davis, Eisenhardt and Bingham (2007:480) place the value of simulation in novelty theory creation through creative experimentation as well as possible exploration. The conclusions in this exploratory research are arrived at by inference of relationships between principles and concepts established in the literature search and manipulation of data gathered through focus groups. This approach has been used by such scholars as Sterman (1989) in behavioural science to predict causality between policy and feedback. Similarly, Senge (1994) made reference to the causality between the reinforcing, balancing and delay elements of system dynamics.

In conducting the research for this paper, a system dynamics model was used to design the causality based relationships between endogenous variables involved in mining value chain activities and the development of entrepreneurial independence of those involved in small enterprises.

System dynamics design paradigm

The system dynamics platform allows policy makers to code in policy decisions, factor feedback between policy decisions, actions and external feedback in a way that mitigates the human being's limitation in dealing with complex problems as Sterman (1989) correctly points out. Oliva and Sterman (2010: 2) also argue for the suitability of system dynamics to dynamic environments where human behaviour interacts with the physics of operations that bear multiple feedback points. As described in Barlas (1996:185), system dynamics falls in a category of models that are causally-descriptive because they explain how real systems work. Barlas (1996:186) further asserts that these models not only explain behaviour but also explain how the behaviour is generated by describing the internal structure. This view is affirmed by Repenning (2003), where he asserts that system dynamics ties non-linearity of social systems into an empowered social system. The non-linearity in social systems is also created by the circles of causality as Senge (1994) argues and this can introduce a level of complexity that a human mind cannot process in a logical manner. The essence of using the simulation and system dynamics in particular is to achieve the logical consistency that simulation approach brings as Davis, Eisenhardt and Bingham (2007) also point out.

Research Method

This paper is based on the outcome of a system dynamics simulation using data collected through focus group discussion with various entrepreneurs and role players in the Northern Cape Iron Ore mining industry. The focus group was constituted from both entrepreneurs in main stream mining and entrepreneurs in services industry around Kathu. The data collected was used to complete a causality loop that defines the relationship between entrepreneurship activity and economic employment growth in the town. The boundary of the research was limited to the geographic area of Kathu town with specific focus on mining activities in the Iron Ore mines surrounding the town.

Dynamic hypothesis

The dynamic hypothesis tested in the research builds on the finding of the research by Maluleke and Pretorius (2016) which concluded that, there is causality between infrastructure capacity development and skills development, and that as the mineral resource development value chain transit into more beneficiation and downstream activities, the number of people employed above semi-skilled level increases.

i. Glaeser *et al* (2015) found that there is a link between measures of entrepreneurship and urban employment growth. In doing so, Glaeser *et al* (2015) provide insight into the dynamics of economic growth versus the impact of small enterprises in the economic developments of historical mining towns.
ii. Acs (2006:99) further describes in the reading of the Global Entrepreneurship Monitor (GEM) that there is a correlation between the ratio of opportunity to necessity entrepreneurship and growth of gross domestic product (GDP) of a country. We regard opportunity entrepreneurs as those who establish businesses for growth and not for individual economic survival

The hypothesis is tested through a causal loop developed and programmed into Vensim (2017) system dynamics software logic to ensure consistency of evaluation.

Research Approach

The process followed an exploratory approach to the concept of entrepreneurship in a mining environment as this has not been researched within the South African context. With this in mind, we concur with Meyer and Page (2005) when they assert that an exploratory approach is a significant step in research that is aimed at creating new theory. In a similar finding, Davis, Eisenhardt and Bingham (2007:482) argue that simulation can be used to describe and elaborate simple theories by enabling experimentation with the precision that it enforces. In order to deal with complexity of feedback and possibility of exogenous feedback from a different time space that may influence symptoms of current system behaviour (Franklin, 2005), system dynamics is used as a simulation approach We study the work of Acs (2006) on the impact of entrepreneurship on economic and employment growth and test his hypothesis through a focus group discussion and system dynamic simulation.

The profile of the focus group members was determined using the matrix described in Table 1.

Table 1: Profile of focus group participants' summarised

PROFILE ELEMENT	1	2	3	4	5
Domicile of the Company	Wholly domiciled in Kathu	Domiciled in the Northern Cape with offices in Kathu	Domiciled in the Northern Cape with no office in Kathu	Domiciled in South Africa with an office in Kathu	Domiciled in elsewhere with no office in Kathu
Company's Service to the mine	Upstream mining	Beneficiation section of mine	Support services	Goods supply to the mine	Occasional supply to the mine
Persons role in the company	Owner	Director	Executive Member	Senior Manager	Middle Manager
Size of Company	Large Corporation > $50m	Large Company / Corporation >$10 & <$50m	Company >$1 & <10m	Medium Enterprise >250k & <$1m	Small enterprise >$100k & <$250k
Years of company existence	More than 15 years	Between 5 and 15 years.	Between 2 and 5 years	6 months to 2 years	6 months and less.

Critical issues raised and discussed in the focus group include:

i. Company structure to determine the level of multitasking compared to streamlining in larger companies.

ii. Where their key human resources are sourced and the rationale behind their sourcing strategy?

iii. Where the families of their employees reside to indicate where the bulk of the labour earnings are spent?

iv. How the participants see advantage of employing local resources in senior management?

v. How the participants perceive the local stakeholders (i.e. municipalities, NGOs) influence in aiding their businesses?

vi. How the participants perceive the importance of being embedded in the local community outside the mine environment?

vii. Whether there is any advantage to being part of social networks of information and how they think this could help business?

THE MODELLING ENVIRONMENT AND CAUSAL RELATIONSHIPS

The model used a causal loop developed from established principles of embeddedness and structuration theories to further analyse the causal relationship between entrepreneurship and employment growth. Jack and Anderson (2002:467) define embedding as "a mechanism whereby an entrepreneur becomes part of a local structure". We follow this definition in the causal loop diagram to establish the extent to which this is true for small enterprises in the Northern Cape mining environment and if so determine if there is causality between this and their ability to succeed. We also rely on the work of Jack and Anderson (2002:469) who argue that entrepreneurship is a complex process which is a result of a dynamic outcome of individual and context (mostly social context). This dynamic relation implies that, the variations in both social context and individual ability and appetite for risk and innovation will determine an outcome which may vary from individual to individual and from one social context to another.

In order to develop causal loop diagram, the 4Cs system dynamics process described by Roos (2000) was followed in the specific application of the embeddedness and structuration process based on the hypothesis described using the work of Glaeser *et al* (2015) and Acs (2006) .We build the causal link of entrepreneurship from the work of Maluleke and Pretorius (2016) where they described the causal link between mining activity and the ability of the economy to create more downstream economic activities in order to create a transition from reliance on primary economic output to secondary and tertiary economic activities.

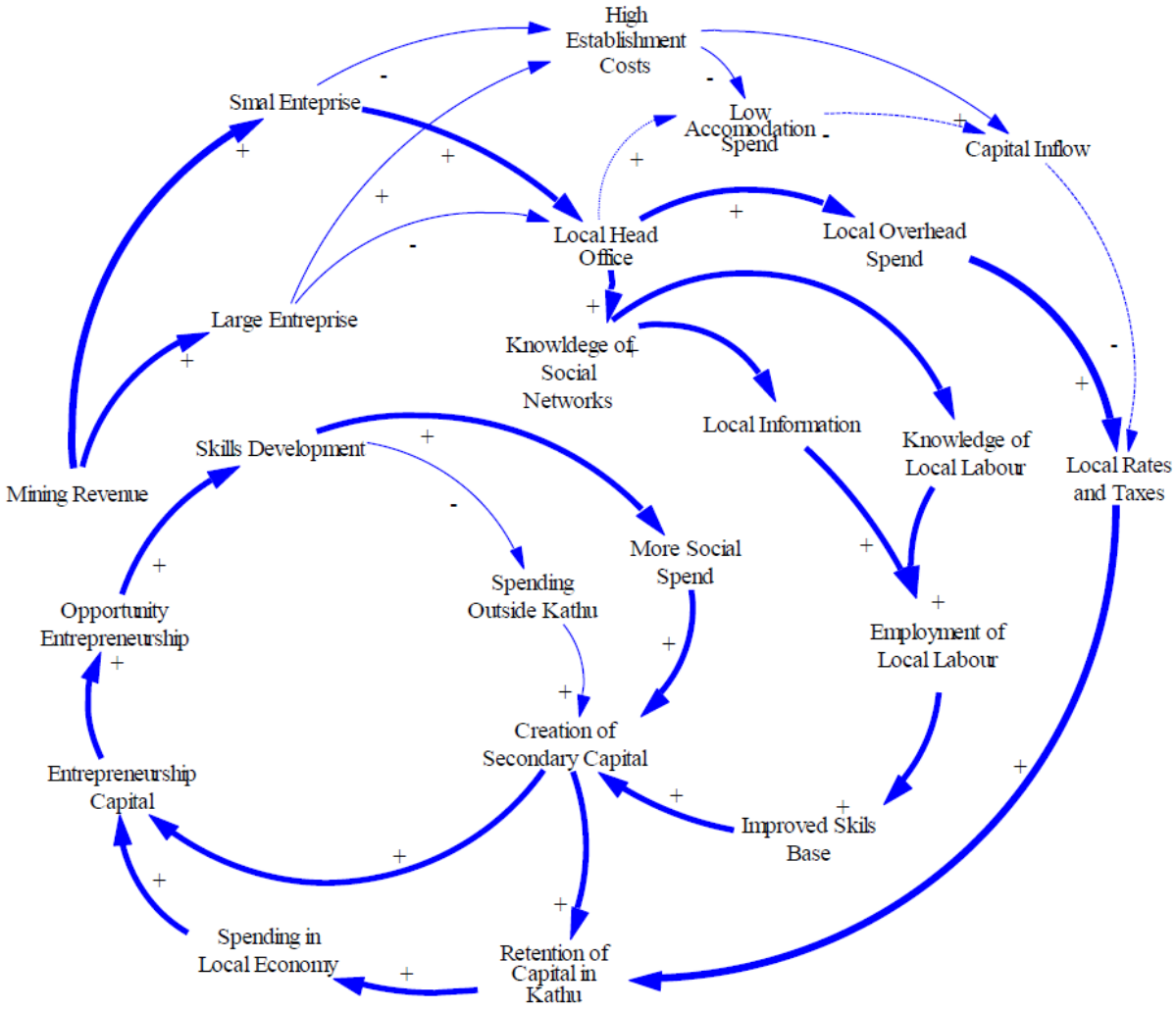

Figure 1: Causal loop diagram describing the impact of small and large enterprises in Kathu.

The causal loop in Figure 1 highlights the impact of opportunity entrepreneurship, represented in the causal loop as small enterprise in comparison to large enterprise using the information collected through focus group discussion. The causations in Figure 1 reflect the hypothesis derived from Glaeser *et al* (2015:26)'s conclusion that measures of entrepreneurship have significant impact on urban employment growth. Jack and Anderson (2002:468) emphasise the social link to entrepreneurial success by suggesting that entrepreneurs embed themselves in the community to realise opportunities. Jack and Anderson (2002:470) argue this point by highlighting that local knowledge plays key role in achieving profitability and imply that there is a link between social structure and entrepreneurial agency. We consider this aspect in the causal loop scenarios by asking the questions where a large enterprise and an opportunity driven small enterprise have access to similar mine opportunities over a ten year period. We ask a question "how do small enterprises in the Northern Cape embed themselves in a way that is different from large enterprises while operating in the mines around Kathu?"

Jack and Anderson (2002:469) referencing Aldrich and Zimmer (1986) argue that the position of a person in a social network can constrain, or prohibit their access to social information that enables business. We test whether, employing more localised suppliers in mining activity can influence the growth of entrepreneurial agency and reinforce the growth trajectory or impact it negatively. The causality diagram shows how mining activities (primary economic activity) can be used to develop human capital (new skills) and create sufficient pool of money to support new industry (entrepreneurship capital) in secondary and tertiary sector just as Maluleke and Pretorius (2016) found.

The systems dynamics model

The model described in Figure 2 compares the performance of small enterprise against a large enterprise, considering a similar set of input data such as value of mining business in the Kathu environment per year. This is done by simulating the impact of the two different labour structures as well as overhead expenses. The model is designed to monitor specific variables, known as “flows” and integrate their impact through accumulation variables called “stocks”. As Sterman (2010:19) explained, stocks increases when the net inflow between flow on the left of the stock variable and the right increase and vice versa.

Based on focus group feedback, the reinforcing elements of a small enterprise include the higher “Local labour cost” compared to a typical large enterprise that would generally bring a core of its skilled resources from other sites outside of the Kathu environment. Similarly , the “overhead spend” of a small enterprise is considered higher in the local area of Kathu due to the fact that its headquarters are in the local area compared to a Large enterprise that has centralised headquarters in big urban centres such as Johannesburg. The system dynamic model in Figure 2 focuses on the creation of new capability that is focused on entrepreneurs through empowerment of small enterprises and employment of local labour. This concurs with Chen *et al* (2010:101)’s view that there is an evident reinforcement of probability of new entrepreneurial success by historical patterns of successful investment in local regions and highlights the impact of reduced hurdle rates from venture capitals based in the region to support their argument..

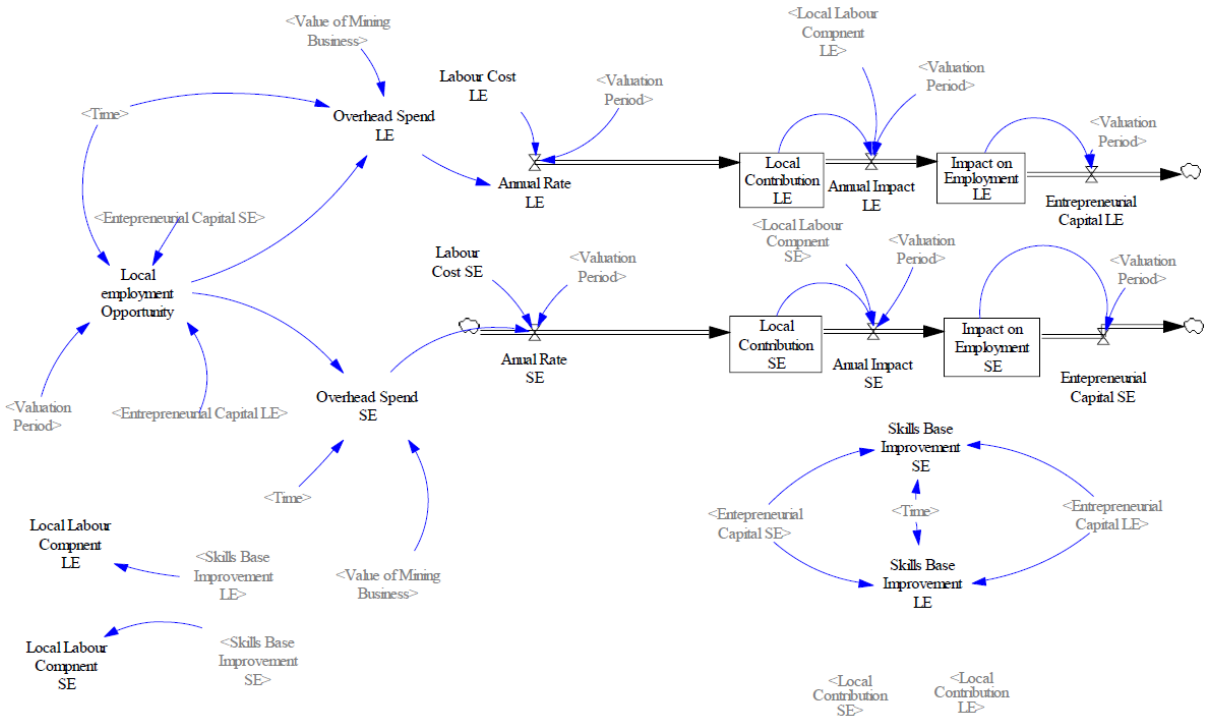

Figure 2: System dynamics model comparing the performance of small and large enterprises

Equally, it was established in the focus group that the small enterprise would not be able to make an impact in the local economy in the first 3 years of operation as it lacks the cash power to spend significantly in the economy. This is considered a balancing feedback for the small enterprise.

It is understood however that once the small enterprise survives the first three years of operation, its ability to recruit more skilled employees from outside the town of Kathu where the case study data has been collected and its contribution to the overhead spend in the local economy also increases with increased establishment cost and incentives paid to its skilled employees. The large enterprises are credited with superior overhead spend in the first two years of the monitoring period due to site establishment cost for their stuff that are generally sourced from areas outside the local town and required accommodation and other services. Large enterprises are also likely to contribute more into the local corporate social responsibility as a way of complying with regulations and mine requirements in the first two years of operations however the balancing view is that the large enterprises tend to reduce this spend towards the end of their contracts and do so even in terms of labour hire (i.e. towards the end of their contract they tend to reduce local staff in favour of their regular staff)

The annual impact on the employment growth of the town is determined in the model by evaluating the extent to which each of the local contribution is biased towards local labour component. This evaluation is done on the premise that, a portion of the labour that is from local the town will tend to spend all its earnings in the local area by supporting family and other dependent's requirements in areas such as education and health. This is contrasted with external labour which is likely to send earnings to places away from the town of employment to support families at the places of their origins.

As indicated in the work of Maluleke and Pretorius (2016) which is depicted in Figure 3, the increase in local employment and the related expenditure would have an impact on the level of spending in properties such as housing and in turn influence infrastructure development. This would in turn increase the activities of secondary business such as manufacturing and impact on further employment beyond mining into the secondary industry. The circulation of cash in the town would create what Audretsch and Keilbach (2002:1) refer to as entrepreneurship capital. Audretsch and Keilbach define entrepreneurship capital in the economy as the ability of the economic agents to create new firms. For this to happen, we model the impact of understanding the social context and the resources available to turn potential revenue into business opportunity.

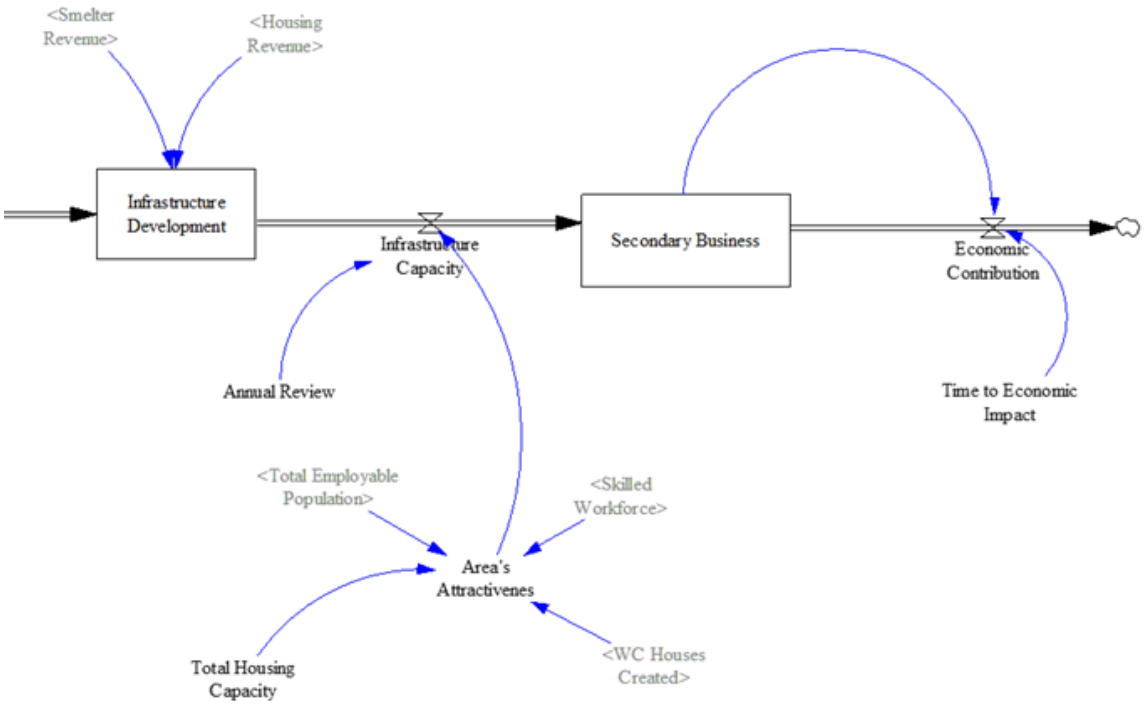

Figure 3: Stock flow logic for Infrastructure Development adopted from Maluleke and Pretorius (2016)

Jack and Anderson (2002:481) emphasise the importance of embeddedness in the social networks for the purpose of understanding the rules of doing business in the area and also understanding that being known individually by locals would lead to crucial business links being created. As also depicted in Figure 3, only when the local component of the labour increases that such links are easily created and the impact on local employment growth is realised.

RESULTS PRESENTATION AND ANALYSIS

The results of the system dynamic simulation employing the model presented in Figure 2 taking into account also the structure shown in Figure 3 revealed some interesting relationship between opportunity entrepreneurship, represented in the model by small enterprises and employment growth in the area. Maluleke and Pretorius (2016) found that there was a fluid relationship between infrastructure development, attractiveness of an area and economic contribution. Maluleke and Pretorius (2016) found that the fluidity of the relationship was due to saturation of land and unavailability of skilled workforce to take advantage of the potential economic growth. In our model we emphasise the impact of spending and employing local as a measure of skills and entrepreneurial capital development in the area.

Overhead spend

The results in Figure 4 reflect the views expressed by participants in the focus groups that large enterprises invest more in establishment spend in the town of Kathu as they come in however, they normalise during execution as they bring in more of their regular staff from other sites outside Kathu and have to support the upkeep of their centralised headquarters.

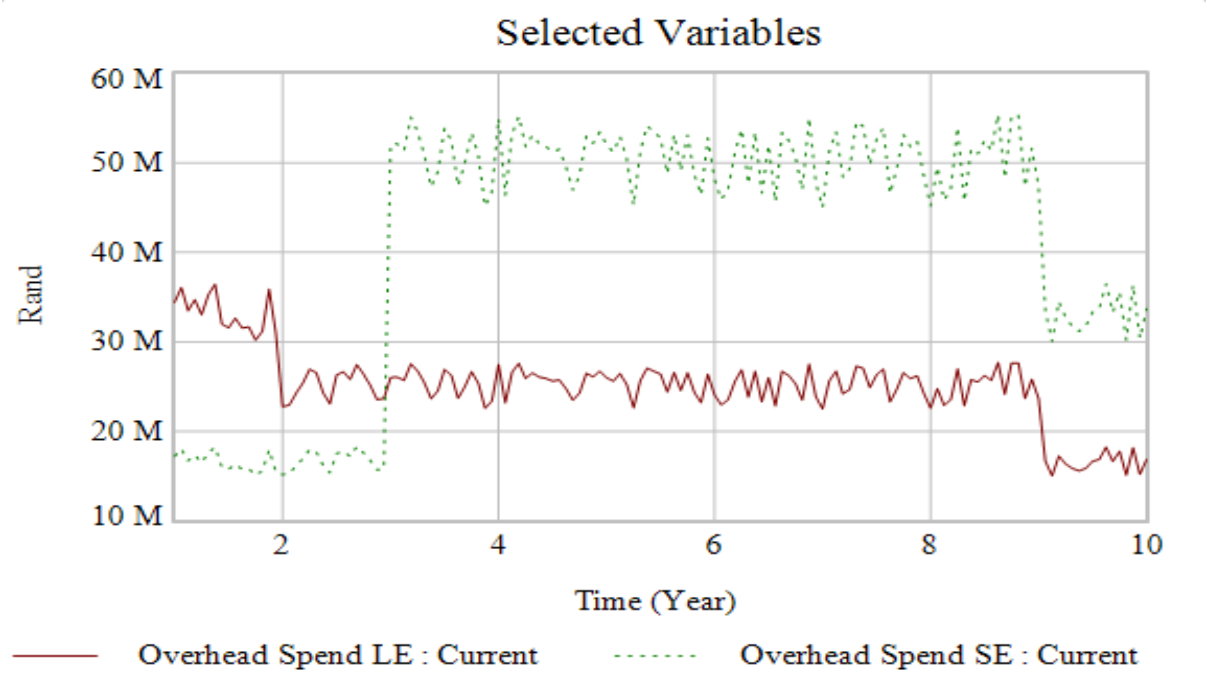

Figure 4: Comparing the ratio of overhead spend of large enterprises and small enterprises in the local town of Kathu

The graph in Figure 4 shows that small enterprises (SE) seem to lag large enterprises (LE) during the early years of entering the mining activities but they pick up after three years and perform above large enterprises. The lag correlates or corresponds with the domicile nature of the small enterprises and how they recruit their staff. The small enterprises recruited more locally and do not spend a lot of money on establishment in the first three years of entering the mining activities in the town. The graph also shows that both large and small enterprises will reduce their overhead spend towards the end of contract as a way of mitigating against impact of reduced revenue.

Labour cost

When analysing the labour component of the expenditure by large and small enterprises during the contract period, the model revealed interesting results. The simulation results in Figure 5 indicate that with the same input in mining business, large companies and small enterprises would spend almost equal amount of money on local labour. The noticeable difference is that, large enterprises tend to do so in the early phases of the work whereas small enterprises do so towards the end. This indicates a steady growth in contribution by small enterprises (SE) whereas large enterprises (LE) tend to lean towards directing spend away from the local town as they prepare to exit the mining towns.

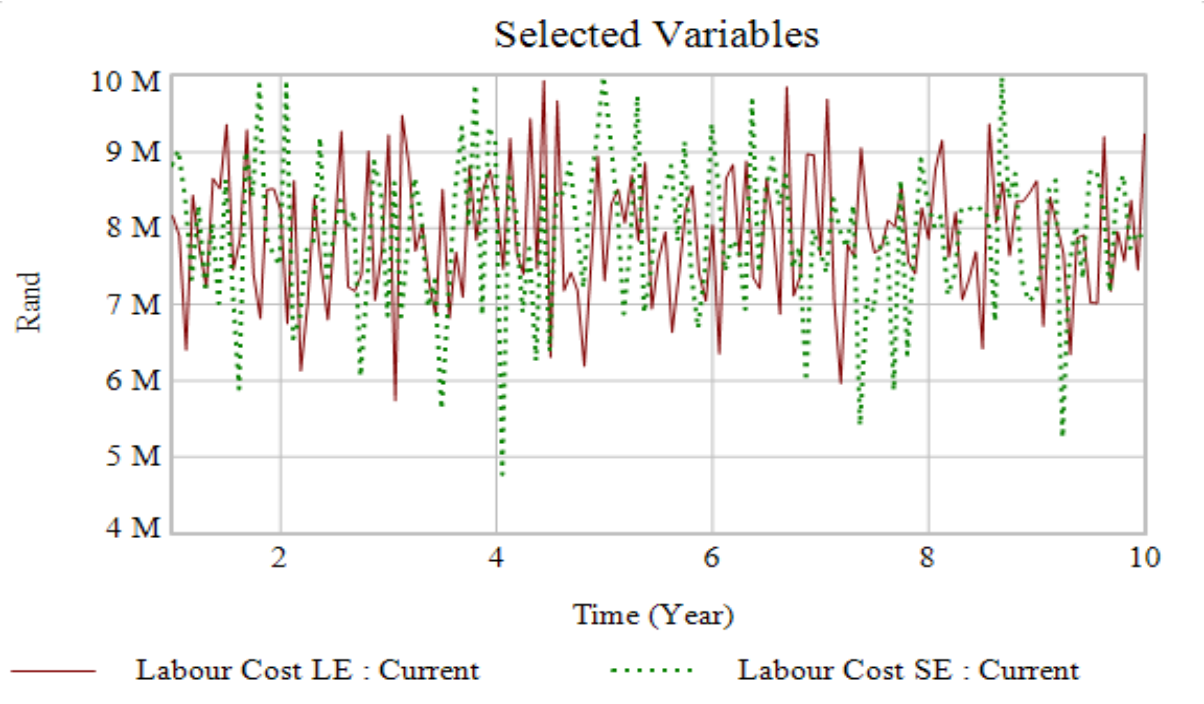

Figure 5: Comparing the ratio of local employment cost for large enterprises and small enterprises.

Contribution to the town's economy

The system dynamics simulation results in Figure 6 indicate that the local contribution of large enterprises (LE) are greater in the first few years of entering the mining activities in the town.

However, the comparison with small enterprise (SE) shows that small enterprises contribute more to the local entrepreneurship capital over time and make a more significant contribution overall. The graph in Figure 6 depicts a scenario for a social entrepreneur, who according to Peredo and McLean (2006:57), focuses on creating corporations or venture to achieve social goals. Peredo and McClean (2006:60) argue that social entrepreneurship is about finding new ways of creating sustainable social value. We argue from these results that by contributing more skills and income to the local economy small enterprises fulfil the requirements according to Peredo and McClean to social entrepreneurship.

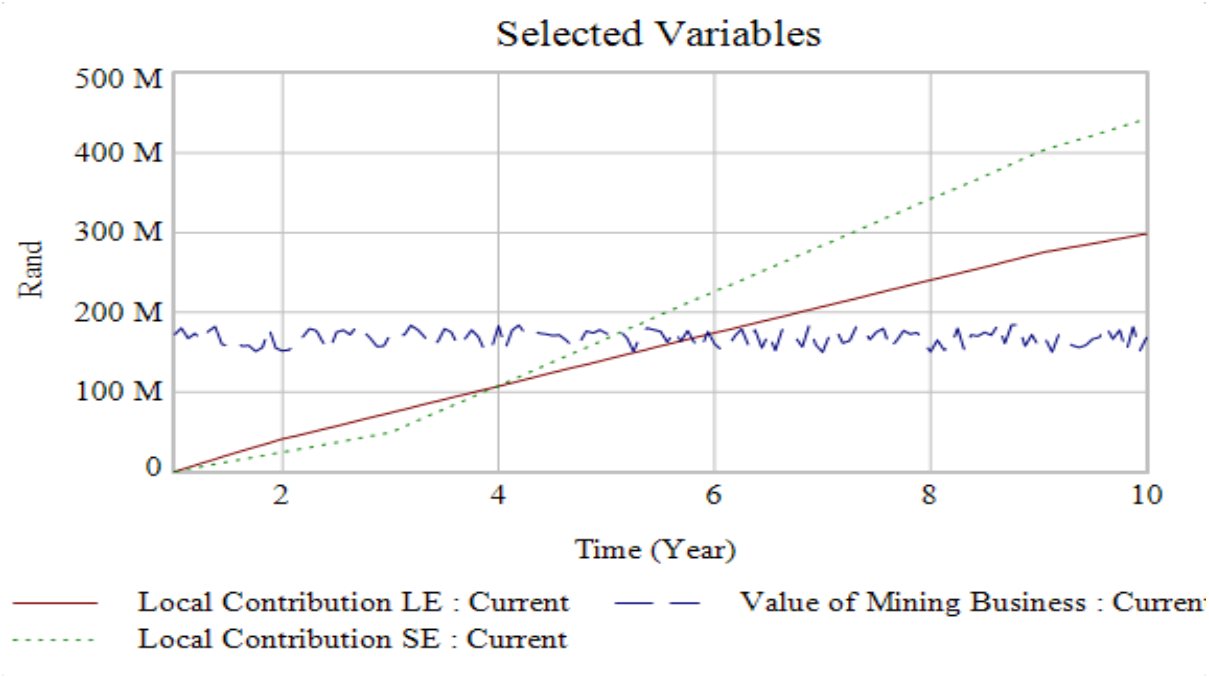

Figure 6: comparing the local contribution to the economy of Kathu by large and small enterprise

The value of local contribution for each of the enterprises as depicted in Figure 6, is an important indicator of impact by such enterprise. As Mair and Marti (2006:38) point out, the value contributed by enterprises to the local town create an economic opportunity at a local level that is a critical element of entrepreneurship. In their research of impact of mining into indigenous communities in Australia, Buultjens *et al* (2010:599) highlight that mining companies have created independence from mining by facilitating the creation of small businesses, often linking it to post mining closure activities. Buultjens *et al* (2010:599) placed more emphasis on creating small enterprise capability that enables continuation of business beyond mining activities which is relevant to the South African mining scenario and the Northern Cape mines in particular.

Entrepreneurial capital created

Simulation results in Figure 7 highlight the difference in the entrepreneurial capital created over 10 years between small and large enterprises given the same amount of mining business over the same period. The graph in Figure 7 shows that this is only evident after year 5, which means that unless this performance is monitored over a reasonable period (over 5 years) there is a risk that one can arrive

at a different conclusion about the impact of small enterprises in the economic growth of an urban town.

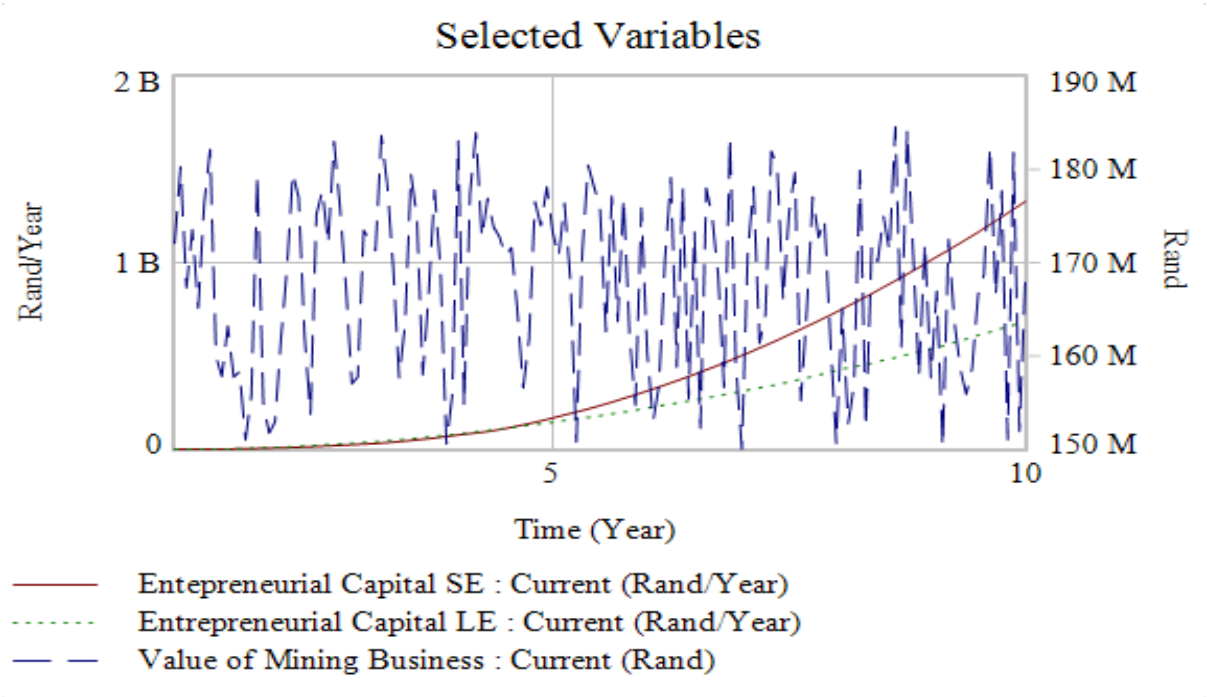

Figure 7: Comparing the contributions of large enterprises (LE) and small enterprises (SE) toward the entrepreneurship capital of the mining town Kathu

The results presented in Figure 7 indicate that more entrepreneurial capital is created by small enterprises and not large enterprises. Contrasting these results with the work of Teece (2007:1347), the results in Figure 7 can be interpreted to imply that small enterprise should inherently possess the dynamic capabilities that allow them to create more value despite changes in business environment. This outcome seems to agree with Chen *et al* (2010:100)'s argument that early success in venture capital is reinforced when new entrepreneurs seek funding from previously successful investments in the same region.

CONCLUSION

The dynamic hypothesis for this research was informed by the findings of Glaeser *et al* (2015) and Acs (2006) which, read together imply that growth in entrepreneurship and in particular, opportunity entrepreneurs is likely to impact employment growth of an urban area better than large enterprises. Underlying the hypothesis is the assumption that in the dynamic mining environment, success of an enterprise over a long term also depends on the dynamic capability of such enterprise, large or small as described by Teece (2007:1347) to sense changes, seize the opportunity and reconfigure itself to adapt to changing environment and opportunities. The system dynamics model simulation highlighted based on a 10 year scenario that, provided with the same amount of mining business (in revenue terms), small enterprises may contribute more revenue and job opportunities to the local town when compared to large enterprises and contribute to entrepreneurship capital in the town.

We however note, similar to Mair and Marti (2006:41) that, being embedded in the social structure can be both enabling and constraining in that as small enterprise can leverage access to local resources to drive down cost and increase impact on profits, they may also be limited by the structural constraints in society. Mair and Marti (2006:42) further point out that, less embedded actors such as large enterprises have the capacity to do unconventional things in the community that may give them advantage over small enterprises We also concur with Acs (2006) that, opportunity entrepreneurship in the form of small enterprises and not necessity entrepreneurship leads to economic development and urban employment growth. Contrasted with Esfahani and Ramírez (2003:470)'s conclusion that economic infrastructure has substantial impact on GDP, we argue that for such infrastructure to be sustainable, small enterprises owned by local entrepreneurs and not multinational large companies should be at the fore front of ownership and maintenance.

Barlas (1996:200) emphasises the need to demonstrate the structural validity of a system dynamics model through a direct-structure test and structure oriented behaviour test. To validate the behaviour of the model and further support our conclusion discussed earlier, we refer to Acs (2006:100)'s finding that global trend have shifted to a scenario where the more developed economies are more dominated and driven by small entrepreneurial activities than larger firms as it used to be in the 70s. As was the case in the findings by Buultjens *et al* (2010:604), mining companies have a moral obligation to facilitate a more direct approach on economic development in order to achieve sustainable post mining development and employment growth of the mining towns. The two references to Acs (2006:100) and Buultjens *et al* (2010:604) are made to specifically highlight the alignment of structure and behaviour outcome of the system dynamics model to the findings of the two referenced studies.

The results described in this paper confirm to some extent that small enterprises contribute more to diverse skill base and entrepreneurial capital, both of which are needed to prevent the total decline of mining towns' post active mining. Entrepreneurship driven through small enterprises can close this gap by creating the type of skills through mining activities that are adaptable to secondary and tertiary sectors of economic activity thereby impacting positively on the urban economic development and

employment growth. Similarly, Glaeser *et al* (2015:26) carefully conclude that there is a link between entrepreneurship and urban employment growth and warns against subsidizing usage of large companies where such is likely to stifle local entrepreneurship. Our study results, albeit not generalizable at a national scale, largely concurs with the conclusion made by Glaeser *et al* (2015:26).

Further research may include extending the system dynamics model to include more than one region as well as possible simulations for other mining towns to create a more in depth understanding of sustainability issues in the mining town developments using and elaborating in more depth into the concepts of opportunity entrepreneurship.

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