The antecedents of breakthrough innovation in small and medium-sized enterprises (SMEs) during the Covid-19 pandemic.

* Corresponding Author: zimutojilson@gmail.com

Abstract

Purpose – This study replicates the ideas of Cheng and Chen (2013) to determine the effects of dynamic innovation capabilities and open innovation activities on breakthrough innovation. Based on the Resource-based view of the firm (RBV) and dynamic capabilities view (DC), the authors seek to argue that dynamic innovation capabilities and open innovation activities significantly affect breakthrough innovation positively in a turbulent environment.

Design/methodology/approach – Based on a cross-sectional design, a questionnaire was distributed to a sample size of Zimbabwean 300 SMEs management. The target respondents were the business owners and managers who had wide knowledge and understanding of leadership. The survey’s data were analysed through regression.

Findings – The findings supported the argument that dynamic innovation capabilities and open innovation activities positively and significantly affect breakthrough innovation.

Practical implications – Business owners and managers must realise the critical rationale of SMEs dynamic innovation capabilities and open innovation activities in fostering breakthrough innovation.

Originality/value/contribution – This study added to the existing literature that the survival and growth of SMEs must promote and support emerging industries even in an uncertain environment (e.g. Covid-19 pandemic environment), with activities that foster breakthrough innovation.

Key words: breakthrough innovation, dynamic innovation capabilities, open innovation activities, SMEs, Covid-19.
Introduction
Drawing on the Resource-based view of the firm, (Barney, 2001; Teece, 2007; Barney & Clark, 2007) there is a need to invest in resources that foster breakthrough innovation. On the other hand, Cheshbrough (2010) contend that managers can employ open innovation activities to come up with new products (Sok, O’Cass and Miles, 2016). Suggestions from innovation literature posit some relationship between dynamic innovation capabilities, open innovation activities and breakthrough innovation (e.g. Cheng & Chen, 2013; Rosenkopf & Nerkar, 2001). In addition, literature argues that the absorptive capacity of a firm increases as dynamic innovation capabilities are developed, leading to breakthrough innovation (Lavie & Rosenkopf, 2006; Chang, Jack & Webster, 2017). Inversely, based on organizational inertia theory, Hannan and Freeman (1984), dynamic innovation capabilities discourage breakthrough innovation (e.g. Benner & Tushman, 2003; Levinthal & March, 1993; Chang & Webster, 2019). The debate is still rife on the relationship between dynamic innovation capabilities, open innovation activities and breakthrough innovation. Hence, this study seeks to test the relationship using the SMEs, during this time when Covid-19 is ravaging the globe.

Theoretical foundations
The resource-based view of the firm
Resource-based view (RBV) of the firm developed (Penrose, 1959; Rumelt 1984:556; Wernerfelt 1984:171; Amit & Schoemaker, 1993:33; Barney, 1986:1231, 1991:99; Peteraf, 1993:179; Henderson & Cockburn, 1994:63) into a full-fledged theory. Makodak (2001:387) is convinced that firms may create rents by exploiting resources effectively with the proper capabilities. The RBV has emerged as critical in strategic management research (Barney, 2011:108). Based on their submissions, this study borrows the RBV of the firm propositions to determine the antecedents of breakthrough innovation.

Dynamic capabilities view
There is still debate over dynamic capabilities (Teece, Pisano & Shuen, 1997:509) in aligning and realigning resources (Eisenhardt & Martin, 2000:1106) in a turbulent environment for competitive advantage. The RBV of the firm has not adequately explained how and why certain firms have a competitive advantage (Eisenhardt & Martin, 2000:1106) and dynamic capabilities by which firm managers integrate, build, and reconfigure resources (Teece et al., 1997: 516) to become the source of sustained competitive advantage. Zimuto and Maritz (2018) extended the argument in the South African franchising industry and found that only sensing dynamic capability significantly impact performance. Other capabilities remain unearthed even in Zimbabwean SMEs. For the purposes of this study, it is argued further that Zimbabwean SMEs require dynamic innovation capabilities to realise breakthrough innovation.

Absorptive capacity perspective
Drawing on the absorptive capacity perspective, the firm can "recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). The absorptive capacity is mainly a function of a firm’s prior knowledge and is especially related to how well it can use new knowledge to achieve desired innovation (Volberda et al.,2010; Lewin et al., 2011). This means that every firm, for example, an SME, owns innovation capabilities. Therefore, it follows that dynamic innovation capabilities are capabilities that organizations already have or have newly developed to manage the process of innovation (Hertog et al., 2010; Davenport et al., 2006), implying that SMEs own such capabilities. When dynamic innovation capabilities become embedded in organizational routines over time, they become more valuable, inimitable, and non-substitutable, therefore representing an important source of absorptive capacity (Davenport et al., 2006; Cheng & Chen, 2013:445). This can be hypothesised that SMEs have absorptive capacity for competitive advantage.

Organic inertia theory
On the other hand, organizational inertia is another perspective that supports innovation. Hannan and Freeman (1984) argue that organizational inertia explains the stability in innovation development that underlies insufficient adaptation to changes in the environment. Organizations in the throes of organizational inertia often establish routines to maximize efficiency (Cheng & Chen, 2013). When these routines become embedded within an organization over time, they decrease the firm’s innovation capabilities in response to demands in the environment and as a result create strong internal resistance against radical change (Benner and Tushman, 2003; Nelson and Winter, 1982). Thus, firms’ dynamic innovation capabilities develop over time and accumulate as a result of their past experience (Cheng & Chen, 2013). They reflect the firms’ abilities to use existing resources (Christensen et al., 2005; Afuah, 2002). This implies that even SMEs are able to develop organizational inertia for innovation to take place.

Hypotheses development
The hypotheses of this study were developed based on the RBV of the firm (Penrose, 1959; Wenerfelt, 1984; Barney, 1991, etc.) dynamic capabilities view (Teece et al., 1997), absorptive capacity perspective (Cohen & Levinthal, 1990) and
organizational inertia (Hannan & Freeman, 1984). Based on the absorptive capacity view and the organizational inertia theory, Cheng and Chen (2013) tested the impact of dynamic innovation capabilities on breakthrough innovation using open innovation activities as the moderator. They found some relationship between dynamic innovation capabilities and breakthrough innovation. In addition, they discovered that open innovation activities enhance the positive relationship between dynamic innovation capabilities and breakthrough innovation. However, this study considers open innovation activities as an independent variable. Hence it is assumed that open innovation activities directly impact breakthrough innovation significantly.

The findings of Cheng and Chen (2013) share the same notion with other researchers (e.g. Morgan et al., 2009; Verona and Ravasi, 2003; Danneels, 2004) that dynamic capabilities are critical in an ever-changing environment on breakthrough innovation. Eisenhardt and Martin (2000), further posit that researchers need to identify dynamic capabilities that firms can use to adapt, integrate, and reconfigure their resources and competencies in response to changing environments. In the same vein, Lavie (2006) laments over the lack of empirical evidence for dynamic capabilities studies. And Chesbrough (2010) suggests that open innovation activities promote the open coordination of resources to support various developments in innovation.

Drawing on extant literature, this study argues that both dynamic innovation capabilities and open innovation activities significantly affect breakthrough innovation in SMEs. Hence, the hypotheses were as follows:

H1: The dynamic innovation capabilities positively affect breakthrough innovation in SMEs.

H2: Open innovation activities significantly affect breakthrough innovation in SMEs.

The diagram below postulates explored relationships in the theoretical framework.

Methodology
Design/approach
The study used a descriptive design – where a single cross-sectional design was used to collect from the respondents only once. This design was deemed the most appropriate because it permitted the researchers to examine the relationships among the constructs.

Sampling and data collection
The study employed a convenience sampling method whereby respondents were selected based on their accessibility to the researchers. This method was deemed the most appropriate because of the limited number of managers and owner-operators who were found operating their businesses especially during the lockdown period that resulted from the Covid-19 pandemic. The offline survey consisted of two sections. The first section is comprised of questions that solicited demographic data from respondents and the second section has questions that related to the research constructs (breakthrough innovation, open innovation activities and dynamic innovation capabilities) of the study. The collection of data was done between March and May 2020 in the cities of Harare, Bulawayo, Gweru and Masvingo. The survey was conducted on the premises of the respondents who were found doing their business. Because of the risks and challenges associated with Covid-19 only those managers and business owners who volunteered to participate in the survey would complete the questionnaires. A total of 300 questionnaires were distributed and only 210 were fully completed, thus the response rate was 70%. The 210 questionnaires were then used for data analysis.

Variables and measures
The main aim of the study was to examine the relationships among breakthrough innovation, open innovation activities and dynamic innovation capabilities. In order to measure the study constructs, a five-point Likert scale was employed to measure all the research variables. The scale ranged from 1= strongly disagree to 5 strongly agree. Dynamic innovation capabilities were measured using 5 items that were adapted from previous studies (Cheng & Chen, 2013; Hertog et al., 2010; Davenport et al., 2006 and Song et al., 2005). Open innovation activities were measured by the use of 5 items adapted from various sources (Vrande et al., 2009; Chesbrough, 2003, 2010; Laursen & Salter, 2006, etc.). Lastly, breakthrough innovation was operationalised by 5 items adapted from Zhou et al., (2005) and Gatignon and Xuereb, (1997). Thus, all constructs were measured using previous scales that were adapted from previous studies.

Analysis and results
Table 1 shows that the majority of the respondents (58.3%) were males. The dominant age group consisted of respondents aged between 31 and 40 years implying that middle-aged people are dominating the small to medium enterprises in Zimbabwe. The majority of the respondents were graduates from university which also reflects that most graduates from Zimbabwean universities find their way into the informal sector after completing their studies.
Descriptive statistics, validity and reliability tests

In order to test the validity and reliability of the constructs the researchers employed, Cronbach's alpha, composite reliability, inter-item reliability and convergent validity. According to the results depicted in Table 2, Cronbach's alpha values were above the minimum recommended value of .7. The average variance extracted was used to test the convergent validity and the values for all the constructs were above .5 as suggested by Fornell and Larcker (1981), supporting the convergent validity. To test the discriminant validity of the constructs the researchers applied an approach suggested by Fornell and Larcker (1981). The discriminant validity of the constructs was tested by comparing the squared inter-construct correlation estimates with the average variance extracted. The average variance extracted values were greater than the squared inter-construct correlation values, supporting the discriminant validity of constructs.

Table 2: Descriptive statistics, reliability and validity tests

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>SD</th>
<th>α</th>
<th>AVE</th>
<th>CR</th>
<th>BI</th>
<th>OIA</th>
<th>DIC</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakthrough innovation (BI)</td>
<td>4.28</td>
<td>970</td>
<td>.67</td>
<td>.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>≥.7</td>
</tr>
<tr>
<td>Open innovation activities (OIA)</td>
<td>3.94</td>
<td>952</td>
<td>.59</td>
<td>.77</td>
<td>.44</td>
<td>.77</td>
<td></td>
<td></td>
<td>≥.5</td>
</tr>
<tr>
<td>Dynamic innovation capabilities (DIC)</td>
<td>4.31</td>
<td>846</td>
<td>.58</td>
<td>.76</td>
<td>.41</td>
<td>.407</td>
<td>.76</td>
<td></td>
<td>≥.7</td>
</tr>
</tbody>
</table>

Standard deviation (SD); Cronbach’s (α); composite reliability (CR); average variance extracted (AVE); diagonal items (√AVE)

In order to test the proposed relationships, the researchers applied a two-step approach that was prescribed by Anderson and Gerbing (1988), where one is required to run the confirmatory factor analysis after which one would then run a structural equation modelling. An SPSS and Amos Version 24.0 software packages were used to examine the relationships. As per Anderson and Garbing’s (1988) prescription, the proposed model was initially tested using confirmatory factor analysis and thereafter, the hypothesised relationships were tested using structural equation modelling. For the purposes of examining the goodness-of-fit of the measurement model, the researchers used the Chi-square test (X²), comparative fit index (CFI), incremental fit index (IFI), normed fit index (NFI), Tucker-Lewis index (TLI) and root mean square error of approximation (RMSEA).

Confirmatory factor analysis

Based on confirmatory factor analysis, the overall model had the following values: χ² = 222, 541; df = 101; p = .000; CFI = .913; IFI = .915, NFI = .855, TLI = .883 and the RMSEA = .082. This CFA laid the foundation for the researchers to...
test the hypotheses that the relationships among observed variables and their latent constructs exist. Generally, the model fit is acceptable.

**Structural equation modelling**
In order to examine the relationships between the constructs in the structural model, SEM was employed. Explored relationships were among dynamic innovation capabilities; open innovation activities and breakthrough innovation were estimated. As a result, the structural model was a good fit as indicated by the following model fit indices shown in Table 3.

<table>
<thead>
<tr>
<th>TABLE 3: Model fit indices</th>
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<tbody>
<tr>
<td>X²</td>
</tr>
<tr>
<td>----</td>
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<tr>
<td>163,951</td>
</tr>
</tbody>
</table>

**Hypotheses testing**
Drawing on SEM using Amos Version 24, hypotheses were tested. The relationship between dynamic innovation capabilities and breakthrough innovation (H₁) and the relationship between open innovation activities and breakthrough innovation was investigated using the structural model. Hence, Figure 1 depicts the results.

![Figure 1: Hypotheses Testing](image)

It can be observed from Figure 1, that dynamic innovation capabilities had a significant positive effect on breakthrough innovation ($\beta = .374; p < .05$), supporting H₁. Open innovation activities had a significant positive effect on breakthrough innovation ($\beta = .424; p = .05$), supporting H₂.

**Discussion**
Based on RBV, organizational inertia theory and absorptive capacity view, researchers tested the effect of dynamic innovation capabilities and open innovation activities on breakthrough innovation. We find that dynamic innovation capabilities have a significant positive effect on breakthrough innovation. Again open innovation activities have a significant positive effect on breakthrough innovation. The study has the contribution to the existing literature as follows: First, more emphasis is placed on what dynamic innovation capabilities do to breakthrough innovation. Second, open innovation activities (use of open ways in producing new products and the linking of participants in transactions) bring a fresh discovery to SMEs during the lockdown of Covid-19. Instead of using open innovation activities as a moderator, they directly impact breakthrough innovation which is different from previous studies (Cheng & Chen, 2013). This implies that the more the SME has dynamic innovation capabilities and open innovation activities, the more innovation becomes critical in a turbulent environment. Hence the debate on the lack of empirical evidence for dynamic capabilities (Lavie, 2006) is silenced. But Chesbrough’s (2010) suggestion that open innovation activities promote the open coordination of resources to support various developments in innovation is supported.

**Practical implications**
The findings of this study have practical implications for SMEs owner-operators and managers in periods like Covid-19 pandemic. Small businesses must realise the importance of dynamic innovation capabilities and open innovation activities at their disposal for the purposes of breakthrough innovation. Since Zimbabwe is also hit hard by the pandemic, SMEs, therefore, need to coordinate their resources to stimulate more breakthrough innovation. Entrepreneurs can make use of new product development by identifying new product opportunities, to replace inferior alternatives.

**Limitations and further research directions**
The study has several limitations. First, control variables that were not accounted for in this study could have explained to what extent they affect the outcome. Second, researchers employed the cross-sectional study to explore the relationships among dynamic innovation capabilities, open innovation activities and breakthrough innovation. Instead, a longitudinal
study can track the development of dynamic innovation capabilities and open innovation activities over time. Third, the sample only came from the major cities of Zimbabwe, ignoring other small towns where more entrepreneurs are also. In addition, the sample was constrained since other managers could not be reached because of Covid-19 pandemic. Fourth, the findings are peculiar to Zimbabwe and may not be generalized to other economies or contexts. Future studies must consider small towns and industries to increase representativeness.

Conclusion
We found that dynamic innovation capabilities and open innovation activities have a positive significant effect on breakthrough innovation during Covid-19 pandemic. The findings support the RBV proposition that firm resources cannot be used in isolation. Hence, there is a need for dynamic capabilities to integrate and reconfigure their resources and competencies. Moreover, it can be concluded that the absorptive capacity perspective shows how well an SME can use new knowledge to achieve desired innovation. On another note, organic inertia theory implies that even SMEs are able to develop organizational inertia for innovation. However, scholars are encouraged for further research.

Acknowledgement
We acknowledge the study of Cheng and Chen (2013). It became our main reference point.

References


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