Intrinsic motivation and innovative work behaviour: The role of organisational support and informational rewards

Aveshan Venketsamy

04883307

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Abstract

An employee's innovative work behaviour plays an instrumental role in organisational performance. At the individual level, previous research has shown that intrinsic motivation may influence this kind of discretionary behaviour. However, the role of organisational factors in this relationship is not well understood. This study investigates empirically how two organisational factors, namely organisational support for innovation and informational extrinsic rewards, affect employee innovative work behaviour and the relationship between intrinsic motivation and innovative work behaviour. Survey data from 150 knowledge workers employed in large firms within South Africa confirmed that intrinsic motivation is positively related to innovative work behaviour. Both organisational support and informational extrinsic rewards was also found to positively affect innovative work behaviour. However, whilst organisational support positively moderated the relationship between intrinsic motivation and innovative work behaviour, informational extrinsic rewards had a negative moderating effect. The theoretical and practical implications of these findings are further discussed in this paper. This study contributes to the growing understanding of the antecedents of employee innovative work behaviour in organisations.

Keywords

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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1 December 2020

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Cover letter

Dear GIBS Project Publish marking committee,

Journal selection motivation: Management and Organization Review

The Management and Organization Review Journal (MOR) is published by Cambridge University Press. It has a ranking of 3 by the Association of Business Schools academic journal guide 2018. According to the Web of Science Group Journal Citation Reports, the journal has a 2 year impact factor of 2.339. The journal is indexed in ABI/INFORM, Academic OneFile, ArticleFirst, Business Source Complete & Corporate, Current Contents: Social & Behavioral Sciences, EconLit, ProQuest Central, PsycINFO, RePEc, SCOPUS, Social Sciences Citation Index, Web of Science. The MOR is dedicated to publish research on behavioural, social and economic sciences which are broadly defined. The journal has a range of social science disciplines that it seeks to publish in, and part of this list includes organisational behaviour, social psychology and innovation theories. The journal also focuses on publishing research done in transforming economies, and the context must be as such.

This research article investigates the interaction effect that intrinsic motivation, organisational support for innovation and informational extrinsic rewards has on employees innovative work behaviour. Thus the study seeks to gain a better understanding of the antecedents of individual innovation which has an impact on organisational performance. The research is empirical in nature and contributes to literature on innovative work behaviour theory. The MOR is nicely positioned as it includes the disciplines of organisational behaviour, social psychology and innovation. Furthermore, it focuses on research from transforming economies, and the research conducted for this article is based in South Africa. Therefore, this journal is best suited for the publication of this research. The research article herein follows the journal's guidelines. In addition, I will be listed as the lead author followed by my supervisor.

Yours Sincerely,
Aveshan Venketsamy

1. Literature review

1.1. Introduction

Innovation is far becoming more important within organisations in order to remain competitive and efficient (Amabile & Pratt, 2016). In organisations, an employee's approach to creating ideas and implementing them becomes crucial to business success (Devloo, Anseel, De Beuckelaer & Salanova, 2015). This approach is defined as an employee's individual innovative work behaviour. The problem facing organisations, is the introduction and stimulation of a work environment that fosters innovative work behaviours. The 2019 Global Competitiveness Index (GCI) report reveals that most countries are still lacking in innovative activities, and recommends that countries need to ensure that their workforce contributes to innovation (Schwab, 2019). Thus, innovative work behaviour has an important role to play if this is to be turned around.

An individual's intrinsic motivation has received recent attention in the study of innovative work behaviour as there is a growing demand for research in this area (Saether, 2019). This type of motivation has been seen to have a positive effect on individual innovation (Yidong & Xinxin, 2013). However, its interaction with organisational factors remains largely unexplored. This study was positioned as such that intrinsic motivation cannot act alone with innovative work behaviour. Thus, to increase the understanding of the antecedents to innovative work behaviour, this study's objective was to investigate empirically the effect of two organisational factors on innovative work behaviour and in the relationship between intrinsic motivation and innovative work behaviour. The two factors are; perceived organisational support for innovation and informational extrinsic rewards.

This study used a step by step empirical testing approach to understand innovative work behaviour (Khalili, 2016) as outlined in the objective above. Firstly, the direct effect of intrinsic motivation on innovative work behaviour was analysed for the sample. Secondly, organisational support was tested directly with innovative work behaviour and then as an interactor variable in the relationship between intrinsic motivation and innovative work behaviour. Thirdly, the direct effect of informational extrinsic rewards on innovative work behaviour was tested before analysing its effect in the relationship between intrinsic motivation and innovative work behaviour.

Intrinsic motivation represents an individual's motivation to perform a task that is driven internally based on personal interest and satisfaction (Gagné & Deci, 2005, p. 331). In this study, the intrinsic motivation variable refers to the individual's intrinsic interest in behaving innovatively. Organisational support for innovation refers to the atmosphere and processes that the organisation creates to foster innovative activities, as perceived by the employees (Yuan & Woodman, 2010, p. 327). Informational extrinsic rewards, are external forms of motivation that would act in synergy to intrinsic motivation (Amabile & Pratt, 2016, p. 176). This study specifically focuses on informational rewards in the form of recognition and encouragement. Innovative work behaviour, the dependent variable, is the behaviour in which new and useful ideas are created and implemented (Saether, 2019, p. 1). The sections to follow in this chapter critically review each construct in relation to the purpose of the study and provide the research questions and hypotheses developed for the study.

1.2.   Innovative work behaviour

Innovative work behaviour is a subsection of innovation literature that is focused on individuals in workplaces (De Jong & Den Hartog, 2010). It is concerned with the creation of ideas and the implementation of those ideas by individuals to improve processes, products or services. Innovative work behaviour is multi-layered as it consists of idea generation, promotion and realisation (Yidong & Xinxin, 2013). The idea generation component can be attributed to creativity (Saether, 2019). Thus, innovative work behaviour is the overarching construct that contains those three behavioural aspects. Therefore, innovative work behaviour starts off with the introduction of ideas by individuals ("idea generation"), this then would need to gain the necessary support and acceptance ("idea promotion") and then finally materialising those ideas by implementing them ("idea realisation").

De Jong and Den Hartog (2010) substantiated that innovative work behaviour is an individual behaviour in which the approach to creating ideas and implementing them is intentional, and was supported by Yidong and Xinxin (2013). The construct must not be confused with creativity as it goes beyond just ideation (Janssen, 2000; Saether, 2019; Yidong & Xinxin, 2013). As mentioned, the first step in innovative work behaviour is the idea generation phase where employees would analyse trends, work on new challenges and generate ideas that would have a positive influence in the organisation (Saether, 2019). The problem is, employees can be creative and generate ideas, but getting the necessary support and transforming those ideas into tangible outcomes for the business

is where innovation is realised. Thus, the second step is the idea promotion phase in which employees would motivate the need for their ideas in order to get support. This support can come from fellow employees and leadership, and requires individuals to persist and motivate the benefits of their ideas to the organisation (Janssen, 2000). Finally, for innovative efforts to be realised, these ideas need to be implemented which represents the third step of innovative work behaviour (Ramamoorthy, Flood, Slattery & Sardessai, 2005).

Janssen (2000) and Ramamoorthy et al. (2005) advocated that innovative work behaviour is seen as a discretionary behaviour within organisational settings which is not directly recognised by formal reward systems. Thus, it is an extra role behaviour. It is on this notion that Ramamoorthy et al. (2005) mentions that innovative work behaviour is more influenced by the intrinsic motivations of employees as it is not explicitly attached to a job requirement. However, enhancing the innovative work behaviour of employees helps organisations thrive in a competitive landscape and increases their performance (Pieterse, Van Knippenberg, Schippers & Stam, 2010). Shanker, Bhanugopan, Van der Heijden and Farrell (2017) found a positive relationship between individual innovative work behaviour and organisational performance. Thus, even though this behaviour may not be attached to a job requirement, Ramamoorthy et al. (2005) advises that rewarding these behaviours may have a positive influence in promoting individual innovation.

Since individual innovative work behaviour has been given support as a positive influencer of organisational performance (Shanker et al., 2017), researchers have placed emphasis on the study of its antecedents in order to better understand the behaviour. This is with the expectation that organisations can have a better view of what may promote or be detrimental to the innovative work behaviour amongst their employees.

The role of leadership has been increasingly studied in recent research on innovative work behaviour. Transformational leadership (Afsar & Umrani, 2019; Khalili, 2016; Pieterse et al., 2010) and ethical leadership (Yidong & Xinxin, 2013) have been given support empirically in having a positive effect on an employee's innovative work behaviour. Scholars have also delved into the notion that a person's organisation fit should have a positive influence over their individual innovation. This has been shown support empirically in a few studies (Afsar & Badir, 2016; Saether, 2019). Other studies on the positive antecedents of innovative work behaviour include psychological empowerment (Afsar & Badir, 2016; Pieterse et al., 2010), job embeddedness

(Susomrith & Amankwaa, 2019), identified motivation (Saether, 2019) and intrinsic motivation (Devloo et al., 2015; Saether, 2019; Yidong & Xinxin, 2013).

The intrinsic motivation variable is central to this study and is explained further in its relationship with innovative work behaviour. Even though there are very few studies, organisational support for innovation, which was one of the organisational factors in this study, has been given support as a positive influencer of individual innovation (Khalili, 2016). However, the interaction between organisational support and intrinsic motivation to predict innovative work behaviour has not been explained in literature. In terms of the second organisational factor that this study explored i.e. informational extrinsic rewards, the direct effect of these rewards on innovative work behaviour has not been understood in theory, as well as its interaction with intrinsic motivation to predict innovative work behaviour.

1.3.   Intrinsic motivation and innovative work behaviour

Intrinsic motivation is a sub-component of self-determination theory because it is concerned with an individual's personal interest and satisfaction that motivates them to perform an action, thus allowing them to become self-determined as their needs are fulfilled (Ryan & Deci, 2000). Self-determination theory is based on the study of human motivation and personality, and thus rests on the choices human's make emanating from their motivation (Gagné & Deci, 2005). One of the assumptions of self-determination theory is that an individual's motivation varies in the degree to which the individual is autonomous versus controlled (Gagné & Deci, 2005). Intrinsic motivation is a form of autonomous motivation (Saether, 2019).

Employees have three basic psychological needs according to self-determination theory, which are the need for competence, autonomy and relatedness (Deci, Olafsen & Ryan, 2017). A person's motivation is only self-determined if they have an internal locus of control as opposed to having an external locus of control (Ryan & Deci, 2000). Moreover, in workplace settings, employees are said to be empowered by intrinsic motivation when it comes to creativity (Auger & Woodman, 2016) and productivity (Dewett, 2007). The intrinsic motivation variable in this study was based on the individuals' intrinsic interest in performing a task and being innovative.

The intrinsic motivational drivers for innovative work behaviour mentioned by Ramamoorthy et al. (2005) has been studied empirically by a few researchers of recent and has seen to have a positive effect (Devloo et al., 2015; Saether, 2019). Devloo et al. (2015) explain how intrinsic motivation has evolved in the theory of innovative work behaviour as an influential motivational construct. What this means is that individuals that are intrinsically motivated would be more creative and innovative (Devloo et al., 2015). Amabile and Pratt (2016) support the view of Devloo et al. (2015) in their study on creativity and innovation, highlighting that some research have asserted the notion that intrinsic motivation is important for creativity and innovation. In a longitudinal study based on a sample of engineering students in European universities, Devloo et al. (2015) showed a relationship between basic need satisfaction and innovative work behaviour by using intrinsic motivation as a mediator. However, only partial mediation was seen in the study. A limitation in their study was the narrow focus of the sample as data was gathered only from individuals within the engineering field, which was similar to the study by Seather (2019) in which a single source data gathering method was used based on research and development (R&D) employees. This reduces generalisability (Yidong & Xinxin, 2013) as innovative work behaviour should include various types of employees (Saether, 2019). In addition, the view of innovation should not be limited to the creation of products, as it includes a variety of other factors including the creation of new work processes and services that has an effect on business performance (Kahn, 2018).

In the study by Saether (2019), based on employees from three Norwegian organisations, two types of individual motivation, namely, intrinsic motivation and identified motivation; and person-organisation fit where analysed in its influence to innovative work behaviour. This study used intrinsic and identified motivation as mediators between person-organisation fit and innovative work behaviour. The results showed a positive relationship between intrinsic and identified motivation on innovative work behaviour, including a positive relationship of the indirect effect of person-organisation fit. This research adds further support to Yidong and Xinxin (2013) on the positive influence of intrinsic motivation on innovative work behaviour.

Thus, intrinsic motivation was used as an independent variable in this study focused in the South African environment which is a different sample to that of previous studies. In addition, this study increased the generalisability of the sample compared to the studies by Devloo et al. (2015) and Saether (2019). It was thus imperative to firstly understand the nature of the relationship between intrinsic motivation and innovative work behaviour for this research sample prior to assessing the two organisational factors. The research

question and hypothesis follow. It was expected that intrinsic motivation positively predicts innovative work behaviour for this research sample as in previous studies.

Research question 1: Does intrinsic motivation positively predict innovative work behaviour?

Hypothesis 1: Intrinsic motivation has a positive relationship with innovative work behaviour.

1.4.   Organisational support for innovation

The first organisational factor that this study explored was organisational support for innovation as perceived by the employees of an organisation. In relation to the study, two questions were initially posed, the first was centred around whether an organisation's support for innovation had a direct effect on innovative work behaviour, and the second was whether it had an interacting effect with intrinsic motivation to predict innovative work behaviour.

Organisational support for innovation relates to how an organisation creates an atmosphere that fosters innovative work behaviours (Khalili, 2016). This support allows for creativity and tolerates differences across organisational members (Yuan & Woodman, 2010). Tolerating differences means that organisations are open to the various views of its employees and supports this by being responsive to positive change within the organisation (Khalili, 2016). By being responsive and open to change, an organisation can assess new opportunities that would've otherwise been hidden if the firm was restricted in their approach to change. The research conducted by Yuan and Woodman (2010) suggested a negative relationship between perceived organisational support and expected image risks. This implied that those employee's with more support from their organisations would be less concerned about image risks and may behave more innovatively, as they feel psychologically safe.

Leadership has been suggested to have an important role in realising organisational support for innovation (De Jong & Den Hartog, 2007). De Jong and Den Hartog (2007) interviewed various leaders in a knowledge intensive firm to assess leadership practices in promoting individual innovation. One of the key themes in their research was the support for innovation given by the organisation to the organisational members in order to enhance individual innovation. When organisations consider mistakes to be a learning

curve (De Jong & Den Hartog, 2007), individuals would not feel discouraged to behave innovatively as their organisation supports their efforts (Khalili, 2016).

Despite the growing literature on innovative work behaviour theory, organisational support for innovation has received little attention (Saether, 2019). A recent empirical study by Shanker et al. (2017) conducted in Malaysia, revealed that an organisation's climate that fosters freedom and autonomy positively relates to innovative work behaviour. However, the study focused on the management level within organisations, thus reducing the generalisability of the sample. Saether (2019) tested the creativity portion of organisational support in relation to innovative work behaviour and found a positive but rather weak effect. However, it had a stronger positive effect on person organisation fit in the study. Thus, employees tend to fit in more with the organisation if given higher organisational support for creativity.

In terms of the construct of organisational support for innovation, which includes creativity and tolerance of differences, a few previous studies found its positive effect on individual innovation (Khalili, 2016; Scott & Bruce, 1994). Khalili (2016) found a slightly stronger relationship than Scott and Bruce (1994) possibly due to the increased generalisability of their research. Thus, even though there are just a few studies, there is still empirical evidence of its positive effect on individual innovation. The first objective of this part of the study was to empirically explain the direct effect of organisational support for innovation on innovative work behaviour in the South African context prior to testing its interaction with intrinsic motivation. Given the empirical evidence from theory, it was suggested that organisational support for innovation has a positive effect on innovative work behaviour.

Research question 2a: Does organisational support for innovation positively predict innovative work behaviour?

Hypothesis 2a: Organisational support for innovation has a positive relationship with innovative work behaviour.

The second objective of this part of the study was to assess the interaction of organisational support in the relationship between intrinsic motivation and innovative work behaviour. This has not been explained empirically in innovative work behaviour theory. An outcome of the qualitative study by De Jong and Den Hartog (2007) showed that leaders should give ample autonomy to employees conducting a task and also

provide support in order to increase individual innovation. Gagné and Deci (2005) also proposed that by providing a degree of autonomy to individuals, their intrinsic motivation will be enhanced, and thus individual innovation will increase (Saether, 2019). Both Bysted (2013) and De Spiegelaere, Van Gyes, De Witte, Niesen and Van Hootegem (2014) found a positive effect of job autonomy on innovative work behaviour. Khalili (2016) noted that innovative individuals might suppress an idea if the organisation was not supportive of innovation, i.e. if the organisation is known to be restrictive in their approach to allowing innovative efforts. Thus, it is argued that the workplace environment becomes a key factor in either supporting or restricting the innovative efforts of employees. Given these sentiments, it was emphasized that organisational support for innovation may have a complementary effect on an individual's intrinsic motivation to behave innovatively so as to enhance their innovative work behaviour.

It was beneficial to understand the nature of the relationship amongst intrinsic motivation, organisational support and innovative work behaviour in order to gain a deeper explanation into the antecedents of innovative work behaviour. As mentioned earlier, intrinsic motivation has been given support in positively affecting innovative work behaviour and organisational support for innovation has been shown to positively relate to innovative work behaviour in prior studies. It was thus hypothesized that organisational support would vary the magnitude of the effect that intrinsic motivation has on innovative work behaviour positively, i.e. high levels of perceived organisational support will increase the magnitude. The research question emanating from the preceding discussion follows, together with the hypothesis.

Research question 2b: Does organisational support for innovation positively interact with intrinsic motivation to predict innovative work behaviour?

Hypothesis 2b: Organisational support for innovation positively strengthens the relationship between intrinsic motivation and innovative work behaviour.

1.5.   Informational "synergistic" extrinsic rewards

Informational "synergistic" extrinsic rewards was identified as another variable in relation to the organisation that needed to be explained in innovative work behaviour theory. Synergistic extrinsic rewards, mentioned by Amabile and Pratt (2016), are extrinsic forms of motivation that act in synergy to intrinsic motivation to enhance creativity. Ryan and Deci (2000) describe extrinsic motivation to be derived from an individual activity that is

done based on an external outcome that is separated from that particular activity. Thus, it is motivation that is externally regulated. These forms of motivation in an organisational context can either be imposed through financial rewards (performance related pay, bonuses) or non-financial rewards (recognition and encouragement) (Malik, Butt & Choi, 2015).

According to Gagné and Deci (2005), studies have shown that extrinsic motivators that are perceived as controlling undermines intrinsic motivation. This means that the controlling forms of extrinsic motivation erodes the effects of an individuals' intrinsic motivation. In an organisational context, employees would tend to shift from an internal to an external locus of control, especially if the rewards are made contingent to task performance (Malik et al., 2015). However, other studies have shown that some kinds of extrinsic motivators may have additional or complementary effects (Baer, 2012) and may not undermine intrinsic motivation (Amabile & Pratt, 2016).

Cognitive evaluation theory posits that individual feelings of competence (self-efficacy) and autonomy (self-determined) are central to maintain intrinsic motivation if extrinsic motivators are used on individuals (Deci et al., 2017). Thus, extrinsic rewards diminish intrinsic motivation and creativity only when a reduction in self-control occurs (Gagné & Deci, 2005). The negative effect of extrinsic rewards on creativity has been empirically studied (Burroughs, Dahl, Moreau, Chattopadhyay & Gorn, 2011) thus asserting the sentiments by Gagné and Deci (2005). However, as mentioned, creativity must not be confused with innovative work behaviour (Saether, 2019). Innovative work behaviour includes creativity but goes a step further by incorporating idea promotion and implementation.

Amabile and Pratt (2016) describe that extrinsic motivators that seek to provide information, i.e. recognition and encouragement, support intrinsic motivation as it confirms a person's competence, hence the modification to their componential framework of creativity to include synergistic extrinsic motivation together with the original intrinsic motivation. These extrinsic motivators are non-contracted for and usually occur during or after the event (Amabile & Pratt, 2016). For example, recognition is given to an individual after he or she has performed well and encouragement can be given whilst an individual is performing an activity. Given this, it is argued that these types of extrinsic rewards are not only beneficial for those conducting uncreative or mundane tasks (Malik et al., 2015), but also for knowledge workers who are central for innovation (De Jong & Den Hartog, 2007).

Recent research involving extrinsic rewards has been focused on creativity rather than the construct of innovative work behaviour. Informational extrinsic rewards, specifically recognition and encouragement, has not been understood in innovative work behaviour theory. This presented an opportunity for research in its relation to individual innovation as well as with the inclusion of intrinsic motivation, as literature was lacking. Financial extrinsic rewards however, has been given attention recently in literature. Performance related pay specifically, has been given initial support in having no effect on innovative work behaviour (De Spiegelaere, Van Gyes & Van Hootegem, 2018). However, other unexplained variables may have attributed to the lack of any effect in the study by De Spiegelaere et al. (2018). Gupta (2020) however, found a negative effect of financial extrinsic rewards on innovative work behaviour. In keeping with financial rewards that are contracted for, Zhou, Zhang and Montoro-Sánchez (2011) found a positive effect of financial rewards on individual creativity. Their study also looked at the moderating effect of financial extrinsic rewards on the organisational intrinsic elements of human resource management practices and creativity. However, due to limitations of a negative interaction term and absence of a test for significance, the results did not provide adequate evidence that financial rewards complements the intrinsic elements of human resource management practices to enhance individual creativity.

A study by Malik et al. (2015) on linking both financial (contracted for) and non-financial extrinsic rewards (non-contracted for) to employee creative performance revealed that the relationship was only positive when creative self-efficacy and the importance of the reward were used as moderators. The non-financial rewards, which included informational type rewards, was tested alone with creativity and showed that a positive relationship only occurred with the addition of the moderators, namely, creative self-efficacy and the importance of rewards. Their study showed that extrinsic rewards has a positive effect on creative performance only when it is important to the individual, although this could be perceived as controlled behaviour (Ryan & Deci, 2000). Moreover, Loi, Mao and Ngo (2009) asserted that the quality of the leader-member exchange relationship increases with the greater importance or value placed on exchange benefits like rewards.

Given the studies mentioned, there was still the unexplained area of the effect of informational extrinsic rewards on an employee's innovative work behaviour. This study empirically tested this notion. In keeping with the analysis by Amabile and Pratt (2016), and since creativity does form part of innovative work behaviour, it was postulated that these rewards will have a positive effect on innovative work behaviour.

Research question 3a: Does informational "synergistic" extrinsic rewards (recognition and encouragement) positively predict innovative work behaviour?

Hypothesis 3a: Informational "synergistic" extrinsic rewards (recognition and encouragement) has a positive relationship with innovative work behaviour.

As mentioned, informational extrinsic rewards are thought to promote motivational synergy with intrinsic motivation (Amabile & Pratt, 2016). Amabile and Pratt (2016) leveraged insights from various scholars like Baer (2012) to substantiate the notion of motivational synergy. However, Amabile and Pratt (2016) reiterated that these informational rewards need empirical testing to assess motivational synergy to promote creativity. Moreover, this study focused on individual innovative work behaviour, and the interaction effect of informational rewards on the relationship between intrinsic motivation and innovative work behaviour has not been explained. In keeping with the sentiments of motivational synergy by Amabile and Pratt (2016) and to add to the growing theory of innovative work behaviour, this study hypothesized that informational extrinsic rewards enhances the relationship between an individual's intrinsic motivation and their innovative work behaviour.

Research question 3b: Does informational "synergistic" extrinsic rewards (recognition and encouragement) positively interact with intrinsic motivation to predict innovative work behaviour?

Hypothesis 3b: Informational "synergistic" extrinsic rewards (recognition and encouragement) positively strengthens the relationship between intrinsic motivation and innovative work behaviour.

1.6.   Conclusion

Intrinsic motivation is an important motivational component that is associated with innovative work behaviour (Yidong & Xinxin, 2013). However, its interaction with organisational factors was largely unexplored. A critical review of literature showed that two organisational factors, namely organisational support for innovation and informational extrinsic rewards, needed to be understood in the relationship between intrinsic motivation and innovative work behaviour. The objective of this study stems from the growing need to assess the motivational aspects of an individual's innovative work behaviour (Saether, 2019). Thus by incorporating organisational factors in order to

further understand the antecedents of innovative work behaviour, this research adds valuable contribution to academia and business.

This study was also one of the first to assess the interaction effect of organisational support for innovation in the relationship between intrinsic motivation and innovative work behaviour, as well as the direct effect of informational extrinsic rewards on innovative work behaviour and in the relationship between intrinsic motivation and innovative work behaviour. Although this research aimed to fill the gaps and contribute to theory, in a practical sense, organisations can leverage on valuable insights in order to understand which external initiatives can be put in place in order to enhance the innovative work behaviour of their employees, specifically knowledge workers. The research model that incorporates the hypotheses emanating from the literature review is shown in figure 1. The methods and processes used to assess the hypotheses is explained in section 2.

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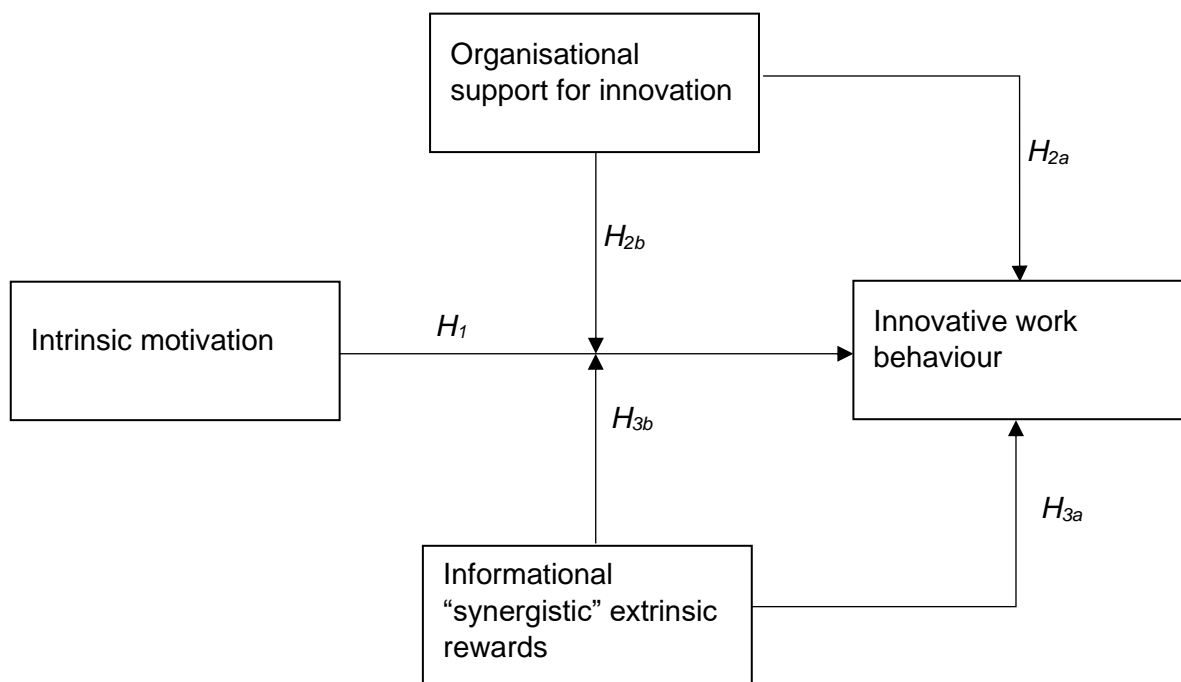
Figure 1: Research model

2. Research methodology

2.1. Choice of methodology

A research philosophy is based on the underlying assumptions that would be used to assess the development and nature of knowledge in research (Saunders & Lewis, 2012). This research utilised a positivist philosophy which involves the study of social realities that can be observed, leading to generalisations (Barnham, 2015; Saunders & Lewis, 2012). In recent studies, researchers have been more interested in testing the realities of innovative work behaviour (Devloo et al., 2015; Saether, 2019; Shanker et al., 2017). The chosen philosophy was thus dependent on the need to establish representativeness (Barnham, 2015) in order to reveal the real nature of how society operates.

Approaches to the development of theory has two distinct methods defined by Saunders and Lewis (2012) as deduction and induction. This research followed the deduction process. The deduction process involves the testing of existing theory and aims at extending knowledge in that theory (Echambadi, Campbell & Agarwal, 2006). As outlined in the literature review, there are studies on intrinsic motivation and innovative work behaviour, hence this research aimed to empirically test those theories with the effect of organisational support for innovation and informational extrinsic rewards. The five hypotheses emanating from the literature review were developed in order to understand the relationships between variables and contribute empirically to theory (Barnham, 2015). The research thus remained quantitative in nature.

There are three methods of gathering research data mentioned by Saunders and Lewis (2012) which are; mono, multi and mixed methods. Most of the previous studies on intrinsic motivation and innovative work behaviour, as well as some on organisational support, have followed a mono method using a single data collection technique. Bettis, Gambardella, Helfat and Mitchell (2014) mention that multi-methods are not necessary as this study was not aimed at causality. Based on the explanations given and the nature of the research, a mono method was used. On the one hand, this research objective was to describe the situation, but on the other hand it also aimed at explaining the relationships between variables with the use of regression models (Bettis et al., 2014). Thus, this study's approach was both descriptive and explanatory leading into a descripto-explanatory purpose. This was the best approach for the research as it aimed to evaluate interaction effects (Dawson, 2014).

The various research strategies defined by Saunders and Lewis (2012) is guided by the objectives of this study. This study used a survey strategy in order to collect data. The survey approach was useful as it allows a large number of data with consistent items to be gathered (Saunders & Lewis, 2012) which in turn provide a valuable platform to analyse the effects between variables (Echambadi et al., 2006). A well-established method of data collection in the self-determination field are self-completed questionnaires (Malik et al., 2015; Ryan & Deci, 2000) as well as in organisational support for innovation (Khalili, 2016). In terms of innovative work behaviour measures, self-completed questionnaires on one's own perceptions of innovativeness has been argued by Janssen (2000) and Saether (2019) as being appropriate as people are aware of their own activities. Thus, for this research, a self-completed questionnaire incorporating all the operationalised constructs was used to gather data.

Finally, a cross-sectional study was conducted as this research aimed to identify patterns and correlations (Barnham, 2015). In addition, this study does not consider change in social behaviour over time, but rather considers a particular period in time.

2.2. Population

The population refers to the complete set of members in a group that this research sampled from to gather data (Saunders & Lewis, 2012). As outlined in the literature review, the research conducted by Saether (2019) focused on R&D employees, while other studies focused on engineering students (Devloo et al., 2015) and managers (Shanker et al., 2017). Saether (2019) also advocates that a single-source data gathering method reduces generalisability and the study may be more prone to bias within the data. Innovative work behaviour, being an extra-role behaviour (Janssen, 2000), should include a variety of individuals (Saether, 2019). Khalili (2016), as well as Yidong and Xinxin (2013), increased generalisability in their study by surveying employees with different backgrounds. Moreover, Drucker (1999) advocates that knowledge workers should be viewed as essential role players when it comes to innovation within organisations, further substantiated by De Jong and Den Hartog (2007) in that work is becoming more knowledge based. According to Drucker (1999) a knowledge worker is defined as those employees who are involved in knowledge related work which are tasks that require developing and using knowledge.

Since a self-reported questionnaire was used for this study, and in order to increase the generalisability of the data and reduce common method bias (Podsakoff, MacKenzie,

Lee & Podsakoff, 2003), this research focused on gathering data from knowledge workers focused in large industries in South Africa with diverse professional backgrounds.

2.3.   Unit of analysis

The unit of analysis in previous studies, for example in Saether (2019), was the set of employees. This was due to the studies focusing on individual innovative work behaviour. This research focused on knowledge workers. Hence the unit of analysis represents the employees involved in knowledge related work, i.e. the knowledge worker.

2.4.   Sampling method and size

A non-probability sampling technique was used for this research as there wasn't a complete list of the population and hence no sampling frame (Saunders & Lewis, 2012). The technique utilised purposive sampling. The reasons for purposive sampling was to allow the researcher to use judgement as knowledge workers were controlled for and the researchers professional network was used to access and distribute the survey to knowledge workers focused in large industries. As mentioned, a knowledge worker is someone who develops and uses information in their job, and thus differs from those who are not knowledge workers in that their jobs are not manual and repetitive (Drucker, 1999). To ensure reliability in the data, and to control for knowledge workers, only skilled workers and above were accepted into the final sample for analysis (refer to the questionnaire in appendix C). In addition, further questions were asked to ensure the sample was representative of knowledge workers employed in large firms in South Africa (refer to appendix D for the cleaning criteria of the dataset).

Studies on innovative work behaviour mentioned in the literature review had typical reported sample sizes of between 150 and 300 individuals, and according to Dawson (2014) the region of significance depends on the size of the sample. For interaction models, sample sizes need to be larger than for non-interaction models (Hair, Black, Babin & Anderson, 2019) and typical sample sizes required to generate significant effects are between 137 and 154 (Dawson, 2014). In summary, Dawson (2014) advocates that it is advisable to have a sizeable sample related to that of the number of variables being studied. Thus, by combining the theory assessed in previous studies of innovative work behaviour, together with recommendations from Dawson (2014) and

Hair et al. (2019), the minimum sample size for this study was 137. Data was gathered until saturation was reached bearing in mind the minimum sample size required.

2.5. Measurement instrument

All measurement items in the questionnaire was adopted from established scales with adequate validity and reliability. All study variables besides demographic variables were measured on a seven-point Likert-type scale. The independent variable scales (intrinsic motivation, organisational support for innovation and informational extrinsic rewards) range from strongly disagree to strongly agree and the dependent variable scale (innovative work behaviour) ranges from never to always (refer to the questionnaire in appendix C). The following sections describe each measure used in this study.

2.5.1. Innovative work behaviour

Innovative work behaviour, the dependent variable in this study, was measured with a nine-item scale used by Janssen (2000). The scale reflects on the three stages of innovative work behaviour which consists of idea generation, promotion and realisation (Janssen, 2000). This scale is a self-reported measure of the respondents innovative activities. Saether (2019) concurred that self-reported measures for innovative work behaviour may be more beneficial as individuals are aware of their own innovative activities. Sample items included: how often do you – "Create new ideas for difficult issues?" and "Transform innovative ideas into useful applications?".

2.5.2. Intrinsic motivation

Intrinsic motivation, which is essentially the intrinsic interest in behaving innovatively, was measured using a five-item scale adapted from Yuan and Woodman (2010). This scale has two questions more than the scale used by Yidong and Xinxin (2013). Both these scales were originally adapted from the research by Tierney, Farmer and Graen (1999). It must be noted that the scale uses the word 'products' in some questions, but as mentioned, innovation should not be limited to the development of only products (Kahn, 2018). To ensure a generalised approach, the words 'processes' and 'services' were added to these questions. Sample items included "I enjoy finding solutions to complex problems" and "I enjoy coming up with new ideas for processes, products or services".

2.5.3. Organisational support for innovation

The organisational support variable was measured using a 13-item scale adapted from Yuan and Woodman (2010). The objective in this study was to gather the perception of the employees with respect to support given by the organisation, thus this scale was most appropriate. The scale used in the study by Yuan and Woodman (2010) was adapted from research conducted by Scott and Bruce (1994). It is an overall scale that measures an organisation's support for innovation through two sub-dimensions which are "support for creativity" and "tolerance of differences" (Scott & Bruce, 1994). The scale also contained reverse coded questions (refer to appendix D for the coding of the dataset). During the pilot study (see section 2.6), some respondents did not understand some of the questions in which the word 'here' was in, for example one of the questions is denoted as 'creativity is encouraged here'. Thus, to make the questions more clear to respondents, the word 'here' was replaced with 'in my organisation'. Sample items thus included "Creativity is encouraged in my organisation" and "Our ability to function creatively is respected by the leadership".

2.5.4. Informational "synergistic" extrinsic rewards

Extrinsic rewards to perform innovatively is underexplored in innovative work behaviour literature, however, the study conducted by Malik et al. (2015) provided a validated and reliable scale that includes informational type rewards. Six items were adapted from this scale which represents only the assumed non-controlling informational type rewards which are linked to recognition and encouragement. Sample items included "I get recognised by my supervisor when I suggest new ideas for tasks, processes, products or services" and "I receive encouragement by my supervisor when I am working on new ideas".

2.5.5. Control variables

Three control variables were coded and used in this study which were also used in previous innovative work behaviour research (Gupta, 2020; Saether, 2019; Yuan & Woodman, 2010). These were the qualification level (education level) of the respondents, their current job level and the total work experience (refer to appendix D for the coding of the dataset).

2.6. Data gathering process

The survey for this study was designed on google forms. It included five sections of which the first section was based on background questions. In order to ensure that respondents understood the survey and what was required, pilot testing was carried out (Saunders & Lewis, 2012) on a few knowledge workers. Based on the feedback received, the organisational support questions were made clearer as mentioned in section 2.5.3. The pilot study also highlighted that the time taken to complete the survey was approximately 10 minutes. Once these revisions were made, the final survey was electronically distributed to knowledge workers by use of the researchers professional network. To ensure further reliability, only those who worked for an organisation with larger than 250 employees were accepted into the final sample for analysis (refer to the questionnaire in appendix C).

2.7. Quality controls

2.7.1. Common method variance

Since this study used self-reported questionnaires based on the perceptions of the respondents, there could be issues with common method bias (Saether, 2019). Both procedural and statistical remedies of addressing any potential bias were used in this research (Shanker et al., 2017).

In terms of procedural means, this study provided anonymity and confidentiality of the responses in the survey similar to studies by Saether (2019) and Shanker et al. (2017). For maintaining anonymity, no personal information, namely the respondents names and contact details, was requested. To ensure confidentiality, only aggregated data was reported. Further procedural effort was made in which some items in the questionnaire were made clear and concise following the pilot study as mentioned earlier, which was recommended by Podsakoff et al. (2003). In addition, data was gathered from different sources (knowledge workers with diverse professional and educational background) as opposed to single-source data gathering (Saether, 2019).

In terms of statistical means, the widely used Harman's one factor test was done to assess the possibility of common method bias (Podsakoff et al., 2003).

2.7.2. Validity and reliability

The validity and reliability of primary data based on the constructs used are important when carrying out surveys to a wide audience (Echambadi et al., 2006). In research, Echambadi et al. (2006) mentions that the use of multiple measures of a construct becomes mainstream to ensure the correctness of estimates on relationships. Bettis et al. (2014) further advocates that measurement instruments must be verified to ensure a logical relationship between variables is maintained.

Construct validity is a measure of the accuracy of a scale to measure what it intends to measure (Hair et al., 2019). It comprises of convergent and discriminant validity (Li, Guo, Yi & Liu, 2010). Firstly, this study conducted a bivariate correlation test per scale between the items and the item total score to assess convergent validity in order to ascertain whether the scale was measuring its intended construct (Hair et al., 2019). Secondly, a confirmatory factor analysis (CFA) was carried out on the measures (Echambadi et al., 2006) to establish a good model fit to the data by analysing the fit indices (Zhang & Bartol, 2010). For convergent validity by use of the CFA, the standardized factor loadings were assessed against a minimum threshold of 0.4 (Khalili, 2016; Saether, 2019; Shanker et al., 2017). In addition, the average variance extracted (AVE) was calculated to ascertain adequate convergent validity against a minimum value of 0.5 (Li et al., 2010). To assess discriminant validity, the requirement was that the AVE values should be more than the square correlations between the factors (Saether, 2019).

Construct reliability refers to the extent to which a set of measured variables is internally consistent, i.e. it measures the internal consistency of a scale (Hair et al., 2019). The Cronbach's alpha was used to assess internal consistency. In order to indicate good internal consistency, a minimum value of 0.7 was recommended for the Cronbach's alpha (Khalili, 2016).

2.8. Analysis approach

The analysis of the data was done in three parts. The first part was based on performing statistics on the demographic background of the respondents in the sample using Microsoft 365 Excel. The analysis included the respondents gender, age, educational level, job level, industry type and years of work experience. The nature of the demographic variables were guided by previous innovative work behaviour studies (Saether, 2019; Shanker et al., 2017; Yidong & Xinxin, 2013; Yuan & Woodman, 2010).

Secondly, as mentioned in section 2.7.2, the validity and reliability analysis was done. For validity, the bivariate correlation test was done using IBM SPSS Statistics 26 and the CFA was conducted using IBM SPSS Amos 26. The Cronbach's alpha for assessing the reliability of each scale was calculated using IBM SPSS Statistics 26.

Thirdly, inferential statistics was performed using IBM SPSS Statistics 26 to test the hypotheses outlined in the literature review. Since all five hypotheses developed in this study involved the relationship between variables, a linear regression approach was used (Dawson, 2014). This approach was used because the aim was to predict the size of the dependent variable (Hair et al., 2019). Specifically for hypothesis 2b and 3b, which include a two-way interaction model, a hierarchical regression approach was used to test these hypotheses. The reason for this approach was the need to calculate the size of the moderating effects (Dawson, 2014). The interpretation of the interaction effects for hypothesis 2b and 3b was supplemented with simple slopes analysis (Malik et al., 2015) in order to best explain the practical relevance of the interpretation (Dawson, 2014).

2.9.   Limitations

A few limitations in this study was considered. Firstly, this study was cross-sectional in nature and the data analysed was based on self-reported measures, hence causality cannot be determined (Echambadi et al., 2006; Shanker et al., 2017). The use of field experiments and longitudinal studies in an attempt to replicate this study will add more valuable insight in understanding innovative work behaviour. The self-reported measures are also prone to common method bias (Saether, 2019), however, this was reduced based on procedural and statistical means (Podsakoff et al., 2003). Future studies could however include employee self-reports together with their supervisor ratings.

The research sample in this study could also be another limitation. Even though the sample was based on different sources to increase generalisability, it was still limited to knowledge workers focused in large industries. The analysis of the data excluded knowledge workers in small, medium and micro enterprises (SMMEs). Thus, it would be recommended to include SMMEs in future research to assess any unexplained differences in the variables used in this study.

Due to the emphasis of autonomy, self-determination theory has been criticised as being too focused on individualism rather than collectivism (Deci et al., 2017). However, Deci

et al. (2017) advocates that this view is more on autonomy as independence as opposed to autonomy as volitional. Thus, it would be pertinent to replicate this study in a different cultural context, either nationally or community based.

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4. Appendices

4.1. Appendix A: Author guidelines of the journal

A copy of the author guidelines can be accessed here: https://www.cambridge.org/core/journals/management-and-organization-review/information/instructions-contributors

Editorial Statement and Reviewing Policies

Management and Organization Review (MOR) aims to be the premier journal for advancing indigenous management and organization research in China and all other transforming economies.

MOR is a multidisciplinary journal rooted in the behavioral, social, and economic sciences underlying management research, broadly defined. MOR seeks to publish research from diverse social science disciplines, including international business, organizational behavior, organization theory, social psychology, sociology, cultural anthropology, political science, economics, strategic management, economic geography, development studies, innovation theories, public administration, urban planning, cross-cultural studies, and cognitive science.

The editors recognize that new insights emerge at the intersection of established theories and research methods. They also realize that many of the established theories were developed in western, educated, industrialized, rich, and democratic societies. Therefore, MOR aspires to attract manuscripts that complement such established theories with indigenous data and indigenous theories. Such papers must justify and discuss the contextual, cultural, and institutional applicability of testing established theories in the context of China or other transforming economies. MOR welcomes comparative studies in which comparison to non-transforming economies highlights unique indigenous aspects of transforming economies. MOR also seeks papers that observe actual indigenous phenomena and involve abductive reasoning and new insights to arrive at a novel understanding of phenomena that are new to the literature and contextually relevant to China or to other transforming economies.

Papers published in MOR can focus on all types of organizations, such as firms, academic, educational, and cultural institutions, not-for-profits, governmental and nongovernmental organizations, and state-owned enterprises.

MOR is open to diverse and rigorously executed research methodologies, including qualitative research, surveys, archival and historical analyses, content analysis, laboratory and field

experiments, simulations, and computational methods, as well as papers that synthesize or translate theories and empirical research that make research accessible to scholars outside disciplinary subfields.

When considering papers submitted to MOR, the Editors consider the following questions:

1. Is the paper intended for MOR? (e.g., literature review is embedded in discourse related to MOR and shows understanding of up-to-date research published in MOR)

2. Does it fall within the domain of MOR? (e.g., contextually specific to China or other transforming economies)

3. Is it forward looking? Does it offer fresh insights? Does it break new ground? Does it elucidate indigenous management theories outside disciplinary subfields?

4. Does the empirical analysis and methods satisfy rigorous requirements for scientific research, for example falsifiability, data transparency and replication criteria? One of the strengths of MOR is the methodological diversity of the journal, but different methods have different quality mechanisms. For example, for historical methods replication is not relevant - traceability of evidence is.

Perspective Papers

To enrich scholarly discourse and promote theoretical innovation, MOR will occasionally publish perspective papers that direct attention to new important phenomena or that redirect or shut down a line of research. The Editor-in-Chief oversees the review of perspective papers. Accepted perspective papers may be followed by one or more invited commentaries.

Dialogue, Debate, and Discussion (D^3) Submissions

The goal of the D^3 editorial area is to attract discourse that breaks ground at the crossroad of disciplinary exchanges on related topics, revisit past debates, and highlight important current issues in management and globalization. It features essays and interviews designed to stimulate and engage vibrant Dialogue, Debate, and Discussion **between management scholars and practitioners.**

Management and Organization Review Reviewing Policies

The MOR editorial team is committed to seeking the jewel in each submitted manuscript. They will engage the author(s) in a developmental process to feature the paper's ideas and findings. MOR invites authors to nominate the Senior Editor that best matches the domain of the paper

submitted for consideration by MOR [https://www.cambridge.org/core/journals/management-and-organization-review/information/editorial-subject-areas]. In addition, MOR encourages authors to nominate up to four ad-hoc reviewers who are knowledgeable in the domain of their paper and do not have a conflict interest with the author(s) (e.g., family member, on same faculty, co-author, faculty supervisor, etc.)

The purpose of the reviewing policies is to ensure that research published in MOR satisfies falsifiability, data transparency, and replication criteria. For a comprehensive discussion of these goals, see Lewin et al. (2016) [doi: 10.1017/mor.2016.43]. MOR is a signatory to the Transparency and Openness Promotion (TOP) guidelines, which were adopted by over 850 scientific journals (Nosek et al. 2015).

The guidelines that follow delineate the underlying principles of the MOR peer-review process:

1. Hypothesis testing is not a prerequisite. MOR welcomes papers that avoid framing research in the guise of hypothesis testing. MOR encourages, and will consider, exploratory research meant to identify and describe the phenomena of interest. However, hypothesis testing is appropriate when research involves confirmatory research or replications meant to test hypotheses generated from theory or reported in prior research.

2. The context of every paper published in MOR must be that of transforming economies (e.g., China, India, Latin America, Africa, and Eastern Europe, Russia and former Soviet Republics). Whenever appropriate, contextual studies in transforming economies should consider comparative implication for Chinese Management research.

3. Empirical studies must motivate every research question by framing it within the extant literature. The objective is to convey the puzzle in the literature, a puzzle that the manuscript aims to solve (or at least elucidate). The literature review underlying the theory development should serve as a mini review and must demonstrate that the author is interpreting implications of cited papers. The discussion of empirical papers must convey summary conclusions about the empirical findings – including discussion of effect size in prior findings. If the cited paper does not report effect size, the literature

review should draw appropriate implications. The empirical plan for investigating the focal research question and the discussion of the data for the study follows the theory development section.

4. MOR requires that statistical analyses present and discuss <u>all</u> findings including null findings. Report coefficient estimates alongside exact p-values. Arbitrary cutoff points (asterisks *) of significance should not be reported or referred to.

5. Authors are required to provide readers with a reasonable sense of how strongly an independent variable affects the dependent variable by including an explicit discussion of the effect size (extent of explained variance) and discuss alternative theoretical explanations. Comprehensive discussion of findings including competing or alternative theoretical explanations is foundational for advancing understanding and knowledge creation.

6. We encourage post-hoc analysis but expect authors to clearly distinguish between such analysis and hypothesis testing. Hypothesizing after results are known (HARKing) is a questionable practice that undermines the scientific effort. When justified appropriately, post-hoc analysis can be important in exploring and testing hypotheses and new research questions that were not originally considered but that emerge from new insights during the analysis (e.g., because of unexpected null results, negative findings, or analysis of outlier data points).

7. Data, Research Materials, and Analytic Code
   i. During the review process authors may be asked to provide the Senior Editor and reviewers with access to data and research materials (e.g., survey instruments, field notes), or analytic code (e.g., variable definitions, transformations, statistical procedures). These will be kept confidential, just like a submitted manuscript. Authors who foresee difficulty in complying with this policy must disclose it at the time of submission.[1]

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[1] Authors can easily meet this requirement by sharing a private project page with editors and reviewers, using a view-only link. The Open Science Framework (OSF) offers free and secure tools to manage scientific projects. To start, see http://help.osf.io/m/projects

ii. Once a manuscript is accepted, authors are encouraged to make the data and/or the instruments publicly available and receive the corresponding badges (see below). Authors are not required to share, but every published article must state whether data, materials, or code are available, and, if so, where to access them. This information will be requested at the initial submission, and authors may update it up to the time of publication.

iii. Citation of data and materials: MOR recognizes data, research materials, or analytic code, as original intellectual contributions, which deserve recognition. All data, materials, or analytic code must be appropriately cited. Specifically, references for data sets and program code should include a persistent identifier, such as a Digital Object Identifier (DOI). Persistent identifiers, which ensure future access to published digital objects, are assigned to data sets by digital archives. For instance, authors who deposit their data or research materials with the Open Science Framework receive a DOI.

An example of citing a dataset: Campbell, A., & Kahn, R. L. 1999. American National Election Study, 1948. ICPSR07218v3. Ann Arbor, MI: Interuniversity Consortium for Political and Social Research [distributor]. http://doi.org/10.3886/ICPSR07218.v3

8. Qualitative studies. MOR encourages the submission of qualitative studies. Such studies must be clear about the research question of interest, methods, such as examination of archival documents, interviews, informants, triangulation, and alternative or competing explanations for observed phenomena. Senior Editors knowledgeable with the requirements and nuances of qualitative studies will guide the review process of such papers.

9. Replication. Publishing replication studies or null findings is foundational for building cumulative knowledge about any phenomenon. MOR encourages the submission of replication studies using the same data or new data. Replication studies must be identified at the time of submission prior to the assignment of a Senior Editor who will guide the review of the paper. A replication paper must provide enough detail of the purpose of the replication and the importance and relevance of the findings, compared with those of the original study. Replication studies will undergo double-blind review, just like non-replication studies.

10. Authors are encouraged to review the standards available for many research applications from http://www.equator-network.org/ and use those that are relevant for the reported research applications.

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Preapproval and preregistration can help authors clarify their goals and plans before embarking on the time-consuming (and sometimes irreversible) effort of data collection. In preregistration, authors register the proposal in a public, open-access repository (but they may keep the registration non-public during the review process). Then, authors submit for peer review a proposal, akin in content to a dissertation or grant proposal. The proposal should describe the research questions that the study proposes to address and the key hypotheses and data collection and analysis plan. Essentially, authors submit what typically constitutes half a ready manuscript, up to and including the data and description of the empirical approach. However, the proposal should not include data analyses, results, or conclusions. Instead, authors should provide an estimate of the time needed to complete the study.

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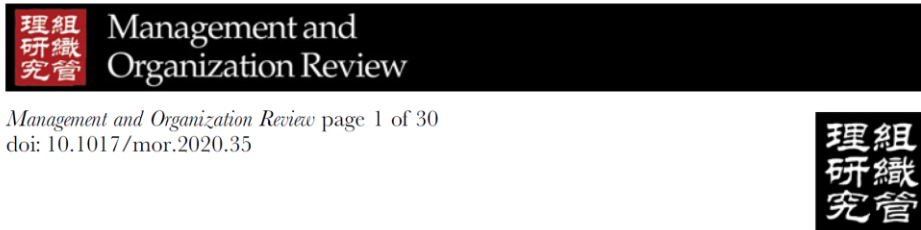
Firm Growth Performance and Relative Innovation Orientation of Exploration vs Exploitation: Moderating Effects of Cluster Relationships

Zhendong Li,[1] Marina Yue Zhang,[2] and Huiying Zhang[3]

[1]*Hangzhou Dianzi University, China,* [2]*Swinburne University of Technology, Australia, and* [3]*Tianjin University, China*

ABSTRACT This article studies the latent mechanisms underlying the non-linear correlation between a firm's relative innovation orientation of exploration vs exploitation and performance. We also investigate the moderating effects of cluster relationships on this relationship. Using a sample of 638 SMEs in four industry clusters in Tianjin, China, we confirm an inverted U-shaped correlation between a firm's relative innovation orientation and performance, and explicate the latent mechanisms underlying such an inverted U shape. We find that the number and strength of a firm's cluster relationships can moderate this inverted U-shaped curve: the former moves the turning point of the inverted U shape toward exploratory orientation, and the latter moves the turning point toward exploitative orientation. For improved performance, we discuss appropriate innovation balancing strategies for cluster firms with different cluster relationships, and optimal cluster strategies under different innovation-balancing conditions. This study adds to the increasing scholarly effort on latent mechanisms behind U-shaped relationships and moderating effects on such relationships in management research.

KEYWORDS cluster relationships, exploitative innovation, exploratory innovation, firm performance, inverted U-shaped curve, relative innovation orientation

ACCEPTED BY Senior Editor Can Huang

INTRODUCTION

The two innovation orientations of exploration and exploitation each contribute to firm performance in different ways (He & Wong, 2004; Jansen, van Den Bosch, & Volberda, 2006; O'Reilly & Tushman, 2008; Stettner & Lavie, 2014). Exploitative innovation, incremental in nature, contributes to firms' current growth, by refining, improving, and extending their existing technological assets and innovation capabilities, whereas exploratory innovation, largely uncertain and risky, contributes to firms' future growth by experimenting with novel

Corresponding author: Marina Yue Zhang (myzhang@swin.edu.au)

technology, knowledge, and competence for radical breakthroughs (Benner & Tushman, 2002, 2003; Rowley, Behrens, & Krackhardt, 2000). To sustain viable growth, firms need to balance both orientations in their innovation strategy. In recent decades, innovation research has recognized complementary effect (+) and competing effect (–) between the two types of innovation orientations on firm performance when they interplay (Bauer & Leker, 2013; Gupta, Smith, & Shalley, 2006). However, how the complementary and competing effects change and impact firm performance when the two innovation orientations interplay is less understood.

Exploration and exploitation are two types of innovation activities which follow fundamentally different logics (e.g., He & Wong, 2004; March, 1991), and they require vastly different knowledge, structures, routines, processes, strategies, capabilities, and even cultures in organizations (He & Wong, 2004; March, 1991; O'Reilly & Tushman, 2008; Stettner & Lavie, 2014). To balance the two types of innovation orientations, organizational scholars propose to use different organizational structures (e.g., domain separation through ambidextrous organization model or temporal separation through punctuated equilibrium model) (e.g., Cao, Gedajlovic, & Zhang, 2009; He & Wong, 2004; O'Reilly & Tushman, 2008; Qi, Wang, Zhang, & Zhu, 2014; Stettner & Lavie, 2014). However, when a firm has limited resources for innovation, it has to face an exclusivity in organizational resources between exploratory and exploitative orientations – an increasing in one orientation means a decrease in the other (Gupta et al., 2006). Such resource exclusivity suggests that balancing these two types of innovation activities will inevitably impose organizational challenge and even internal competition, especially for SMEs that often face resource scarcity. In fact, no matter what organizational structure a firm adopts in its innovation balancing strategy, it will incur extra costs to coordinate these two different types of activities (Uotila, Maula, Keil, & Zahra, 2009). Some scholars (e.g., Gupta et al., 2006) propose that the relationship between firms' innovation orientations and performance is a non-linear correlation that is contingent upon the interplays between exploratory and exploitative innovations. However, there is a lack of clarity about the latent mechanisms that underlie how such interplays influence firm performance (Haans, Pieters, & He, 2016). Given the importance of balancing the two types of innovation orientations and the influences of their interplays on a firm's innovation balancing strategies, it is crucial to understand the mechanisms underlying the impact of the interplays between exploration and exploitation on firm's innovation balancing strategy and performance (Haans et al., 2016).

Nowadays, with increasing complexity in technology, firms hardly operate in isolation (Li & Tang, 2010; Niesten & Stefan, 2019). In recent decades, though firms have benefitted from a growing global circulation of information, knowledge, skills, and capital for innovation activities, the significance of industry clusters on firm performance has not diminished (Autio, Nambisan, Thomas, & Wright, 2018). In fact, firms in technology-intensive industries have relied even more on

collaborations with their cluster partners to deal with increasing technological complexity, rapid changes in product design, and demand conditions. Cluster networks are still one of the critical sources from which firms acquire ideas, information, and knowledge to improve innovation performance. Existing literature has studied the effects of cluster networks on firm's innovation performance from the perspectives of a firm's network structure and its position in the networks (Bell, 2005; Fang, Lee, & Schilling, 2010; McCann & Mudambi, 2005; Ozer & Zhang, 2015; Schilling & Phelps, 2007). However, how exactly cluster firms benefit from their cluster relationships to improve innovation capability and performance is less understood. Specifically, it is not clear how a firm's different cluster relational attributes at the inter-firm level influence the firm's exploratory and exploitative innovations separately, as well as their interplays, both of which have an impact on the firm's innovation balancing strategy and performance.

To address the above-outlined deficiencies in the literature, this article aims to answer the following research questions: First, when a firm balances exploratory and exploitative innovations, what is the correlation between the firm's relative innovation orientation and performance? And what is the latent mechanism underlying this relationship? Second, when a firm is embedded in clusters, how do the firm's cluster relationships affect the correlation between its relative innovation orientation and performance? We use a firm's relative innovation orientation (RIO) to measure the firm's relative amount of innovation activity between exploration and exploitation. The results of our empirical evidence confirm an inverted U-shaped correlation between a firm's RIO and performance. We also verify that this correlation is moderated by the firm's cluster relationships: the broader a firm's cluster relationships, the more likely the turning point of the inverted U-shaped curve moves toward exploratory innovation orientation for greater growth performance; on the other hand, the stronger a firm's cluster relationships, the more likely the turning point of the inverted U-shaped curve moves toward exploitative innovation orientation for greater growth performance.

This study advances our understanding of the relationship between innovation strategy (i.e., balancing exploratory and exploitative innovations) and firm performance in the context of cluster networks. First, we add a new latent mechanism that underlies an inverted U-shaped relationship between firms' innovation orientation and performance to Haans et al.'s (2016) model by additively combining the complementary effects (+) and competing effects (−) when exploratory and exploitative innovations interplay. Second, we theorize and test the moderating roles of inter-firm cluster relational attributes on this relationship. Our research highlights the importance of cluster relationships in firm's knowledge acquisition and innovation capability building, and, thus, on firm performance. Our findings carry practical significance for SMEs in managing their innovation strategy and cluster relationships, both of which may lead to improved performance.

In the following sections, we will review the relevant literature and develop the hypotheses, outline the methods used to test the hypotheses, present the

results, and discuss the implications of our findings. Figure 1 summarizes the conceptual relationships between the theoretical constructs used in this study.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Innovation Orientation Toward Exploration vs Exploitation and Firm Performance

Since the concepts of exploration vs exploitation were introduced in organizational learning (March, 1991), many scholars have examined their applications in other management fields, such as knowledge sourcing, strategic alliances, capability building, organizational adaptation, new market development, and technological innovation (e.g., Atuahene-Gima, 2005; He & Wong, 2004; Katila & Ahuja, 2002; Lavie & Rosenkopf, 2006; Tushman & O'Reilly, 1996). According to March (1991:71), exploration includes activities captured by terms such as 'search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation', and exploitation encompasses activities defined as 'refinement, choice, production, efficiency, selection, implementation, and execution'. From these differences, we can see that exploration and exploitation represent two orientations in innovation activities: the former is used in experimenting with novel technologies and knowledge for developing new things, in order to create opportunities for future growth, and the latter is often used in refining, improving, and extending existing assets, in order to sustain existing performance (He & Wong, 2004; Jansen et al., 2006).

One consensus in the literature is that firms can benefit from balancing the two types of innovation (e.g., Benner & Tushman, 2002, 2003; He & Wong, 2004; Uotila et al., 2009). This stream of research has stressed the importance of synergistic or complementary effects when adopting the two types of innovation orientations concurrently (Cao et al., 2009; He & Wong, 2004). However, given that these two types of innovation orientations require vastly different knowledge and other assets, balancing the two imposes considerable tension or internal competition as firms need to divide limited organizational resources between the two (Cao et al., 2009; He & Wong, 2004). Therefore, it is reasonable to argue that there exists resource exclusivity between these two types of innovation activities, meaning that if a firm increases its investment in one type of innovation, it has to decrease its investment in the other (Gupta et al., 2006). In other words, there exists competing effects between the two innovation orientations.

Organizational scholars, however, are divided on how to manage the balance between the two innovation orientations (e.g., Boumgarden, Nickerson, & Zenger, 2012). One stream of research proposes that domain or behavioral separation – an ambidextrous organization – may enable firms to manage these two types of innovation simultaneously to benefit from their complementary effects (Gibson & Birkinshaw, 2004; Jansen, Volberda, & van Den Bosch, 2005; Lavie & Rosenkopf,
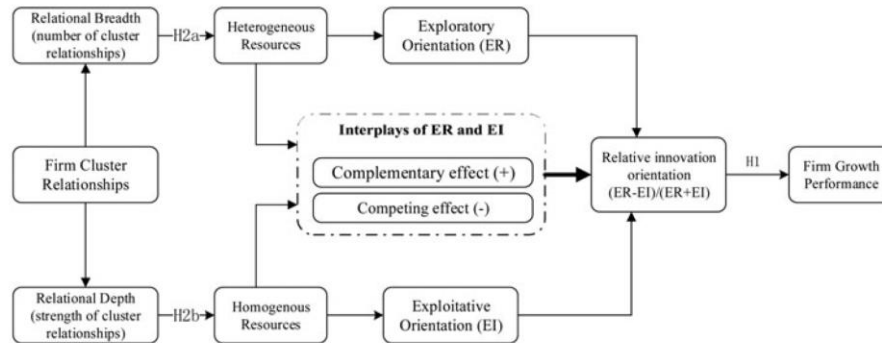
Figure 1. Theoretical constructs

2006). Another stream of research posits a temporal or systemic separation (a punctuated equilibrium model) to manage the tension between the two, which helps firms, particularly those operating under conditions of severe resource scarcity but with certain organizational flexibility, manage the balance sequentially by employing one innovation orientation at a time to mitigate competing effects (Burgelman, 2002; Gupta et al., 2006; Mudambi & Swift, 2011). Both views have their limitations. The ambidextrous organizational model overlooks the coordination costs incurred when a firm pursues both exploratory and exploitative innovation activities simultaneously. The punctuated equilibrium model does not pay sufficient attention to the transitional costs from one type of innovation to the other sequentially and the potential complementary effects when the two types of innovation are employed simultaneously (He & Wong, 2004).

For SMEs, a strategically important decision is how to allocate limited resources between exploratory and exploitative innovation activities in order to optimize firm performance. To do so, SMEs need to consider the dynamics of both complementary and competing effects between the two innovation orientations on firm performance when formulating their innovation balancing strategies. This suggests that organizational structures for balancing the two types of innovation orientations should not be a simple choice between an ambidexterity or a punctuated equilibrium; rather it should be a deliberation of balancing both the positive and negative effects of the interplays between the two innovation activities, under different conditions.

Existing research has suggested that the relationship between firms' innovation orientations and their growth performance is non-linear (e.g., Gupta et al., 2006; Uotila et al., 2009). However, what is this relationship? And more importantly, what are the latent mechanisms underlying such a relationship? To answer these questions, we need to examine not just the direct effects of both innovation orientations, but also the dynamics of the two (i.e., complementary and the competing effects) when they interplay, on firm performance.

First of all, the concurrency of the two innovation orientations can generate synergistic/complementary effects (+), which contribute positively to firm

performance. The logic behind the complementary effect is that firms need exploration to increase the chances of technological breakthroughs, which provides directions for exploitative innovation; on the other hand, improvement of efficiency and productivity through exploitation helps firms accumulate knowledge and capability for exploratory innovation. In other words, balancing the two types of innovation orientations can enhance firm performance as they complement each other (Benner & Tushman, 2003; He & Wong, 2004). The complementary effect is likely to be highest when the firm splits its organizational resources more or less evenly between the two types of innovation activities, whereas a shift toward either direction can reduce the complementary effect. This is to say that the complementary effects are a concave function of innovation orientations. In Figure 2a, we illustrate the benefit effects (+) of complementarity of the two innovation orientations on firm performance.

Secondly, given the competing effects, balancing the two types of innovation activities incurs co-ordinational, transitional and other costs which have a negative impact on firm performance. The cost effects are likely to be highest when a firm splits its organizational resources more or less evenly between the two types of innovation activities, whereas a shift toward either direction can reduce the competing effects (Haans, et al., 2016). In Figure 2b, we illustrate the cost effects (–) of balancing the two types of innovation orientations on firm performance.

Finally, following Haans et al.'s (2016) logic of latent mechanisms underlying U-shaped or inverted U-shaped relationships, when subtracting the cost effects (–) from the benefit effects (+), we can get an inverted U-shaped curve between the interplays of exploratory vs exploitative innovations and firm performance, as shown in Figure 2c. This inverted U-shaped relationship suggests that there exists an optimal point along the spectrum of a firm's innovation orientations between exploration and exploitation (which we define as 'relative innovation orientation' in this article) where the firm's performance may be maximized. We, thus, posit the following hypothesis:

Hypothesis 1: An inverted U-shaped correlation exists between a firm's relative innovation orientation of exploration vs exploitation (RIO) and its performance.

Moderating Effects of Cluster Relationships

In recent decades, the rapid change in product technology and demand conditions has forced firms, especially those in technology industries, to acquire knowledge and technology from their alliances and partnerships. Academic studies have shown that for firms in innovation intensive industries, to stay competitive in general and in technological development in particular, they need to actively seek information, knowledge, and other resources from external networks (Collins & Smith, 2006; Phelps, 2010; Srivastava & Gnyawali, 2011). As a firm's knowledge base can determine its innovation capability, its knowledge acquisition
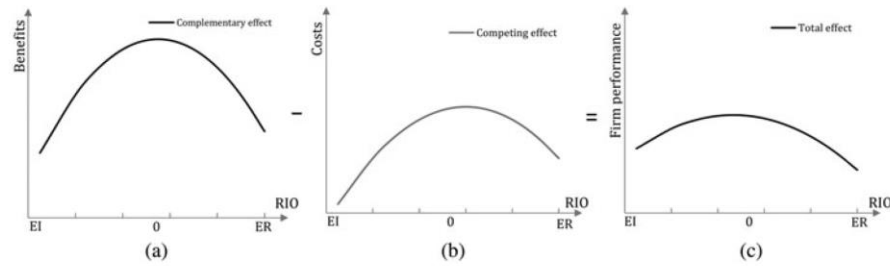
Figure 2. The latent mechanism of the inverted U-shaped relationship between relative innovation orientation (RIO) and firm performance.

from external networks can also influence the firm's innovation capability (e.g., Dai, Goodale, Byun, & Ding, 2018; Kogut & Zander, 1992; Zhou & Li, 2012). Therefore, firms may increase their innovation capability by building relationships with other firms in their networks. In fact, as suggested in previous research (e.g., Bell, 2005; Tripsas, 1997), the networks from which a firm sources and acquires its external knowledge can have important influences on the firm's innovation strategy and performance. Such external networks include direct links of tightly-coupled partnerships or alliances for new product development, or indirect links of loosely-coupled connections such as joining industry associations or consortia (Dai et al., 2018). Among all types of external networks, industrial cluster networks remain a major network type from which firms acquire external knowledge, information and other resources for innovation capability (Autio et al., 2018).

Due to geographic proximity and industry relatedness of clusters (Arikan, 2009; Bell & Zaheer, 2007; Porter, 1990), network relationships in industry clusters can be more beneficial for cluster firms, as such firms are more likely to build direct or indirect links with others within the clusters, and acquire relevant information, knowledge and other resources for innovation capability (Pouder & Caron, 1996). Thus, a firm's cluster relationships can have direct impacts on its exploratory and exploitative innovation activities separately and on their interplays (complementary and competing effects) indirectly. Cluster relationships, therefore, can influence firms' performance by influencing their innovation orientations (McCann & Folta, 2011).

In recent decades, aspects of cluster relationships, such as inter-firm learning, knowledge sharing, and technological collaborations, have been identified as factors influencing cluster firms' innovation performance (e.g., Inkpen & Wang, 2006; Sammarra & Biggiero, 2008; Zhou & Li, 2012). However, how such network relationships contribute to a firm's innovation capability building and, thus, innovation strategy and performance, remains controversial. For example, Schilling and Phelps (2007) argue that firms embedded in alliance networks with high clustering (scope) and high reach (quality) have greater potential to increase their exploratory innovation than those without such alliances. In contrast, Ozer and Zhang (2015) suggest that cluster memberships enhance firms' exploitative product innovation capability but may hinder their exploratory innovation.

The discrepancy in the results on the impact of cluster relationships on firm innovation performance is perhaps caused by insufficient attention to the different processes by which different cluster relational attributes affect firm's innovation orientations. For example, a firm's cluster relational attributes (scope and depth) can have different influences on the knowledge the firm acquires from its external networks (Wasserman & Faust, 1994). This is because a firm's network/cluster breadth may expand the firm's scope of new knowledge acquisition, and network/cluster depth may increase the efficiency of the firm's uses or reuses of its existing knowledge (Katila & Ahuja, 2002). In this study, we examine the impact of two relational attributes (scope and depth in cluster relationships) on the relationship between a firm's innovation orientation and performance.

Relational breadth and innovation orientation. Relational breadth is measured by the number of network ties a firm has with other cluster firms. Existing research has suggested that a firm's location in a cluster network can influence its number of ties in the network. For instance, the centrality of a cluster firm's location may enable the firm to acquire more knowledge, and enhance its innovation performance (Bell, 2005; Tripsas, 1997). Similarly, McCann and Folta (2011) explain that when a firm is located in a structural hole of a network, which enables the firm to develop more alliance partners (increasing the number of network ties), it may have a higher chance to improve its performance on exploratory innovation. On the other hand, Lin et al. (2016) confirms that inter-organizational partnerships (numbers) increase the scope but not the depth that a firm might acquire knowledge from its network. Hence, the more network ties a firm has, the broader the scope of the firm's access to new information, knowledge, and technology, which, as a consequence, may encourage the firm to develop more exploratory innovation capability and pursue more exploratory activities.

Studies suggest that the number of a cluster firm's dyadic network ties with other cluster firms has a direct impact on the scope of the firm's heterogenous knowledge resources (e.g., Arikan, 2009; Stuart, 2000). However, the number of a cluster firm's network ties is not necessarily useful in the firm's use of existing ideas, knowledge, and information. Zang's (2018) work indicates that the scope of a firm's relational breadth in a network contributes more to its exploratory innovation capability than exploitative innovation capability. This is perhaps because too many network ties can constrain the firm from developing deep relationships with others, which enables circulation of homogeneous knowledge between cluster firms and is beneficial to the firm's exploitative innovation capability building (Lin et al., 2016; Zang, 2018). Following this line of reasoning, we can argue that a firm's relational breadth (number of network ties) in a cluster positively influences its propensity to acquire heterogeneous knowledge, but not homogenous knowledge. In other words, the more network relationships a firm has, the more likely it acquires heterogeneous knowledge, which may be conducive to its exploratory innovation capability and, thus, improve performance. However, a firm's

relational breadth is not useful in deepening its existing knowledge base and enhancing its exploitative innovation capability.

Hence, it is reasonable to hypothesize that increasing the number of cluster relationships enables cluster firms to develop more exploratory innovation capability, supported by extra heterogeneous knowledge acquired from their wider scope of network ties. The enhanced exploration capability in innovation, in turn, can increase the firm's exploratory innovation activity, and contribute to firm performance. Meanwhile, external resources will also strengthen the complementary effects between the two innovation orientations. Under this condition, if a firm's innovation orientation leans toward exploration, it will contribute to improved performance, as shown in Figure 3a. Similarly, the broader a firm's network, the more likely the firm will have more exploratory innovation activity through extra heterogeneous resources acquired through the expanded network ties, which, in turn, will mitigate the competing effects between the two, as shown in Figure 3b. Following Haans et al.'s (2016) model, subtracting the cost effects (as shown in Figure 3b) from the benefit effects (as shown in Figure 3a) will lead to the turning point of the inverted U-shaped curve between firms' relative innovation orientation and performance leaning toward exploratory innovation, as shown in Figure 3c.

Hence, we posit the following hypothesis.

Hypothesis 2a: In a cluster, the larger the number of network ties a firm has with other cluster members, the more likely the turning point of the inverted U-shaped curve between its relative innovation orientation and performance moves toward exploration orientation for better performance.

Relational depth and innovation orientation. The depth of a firm's network ties with other members in the network measures its relational strength, and the stronger a relationship, the more likely the firm will develop deep-level closeness, reciprocity, and indebtedness with its relationship partners (Granovetter, 1973), which may lead to information sharing, especially the exchange of tacit knowledge (Leonard & Sensiper, 1998). As suggested by Rowley et al. (2000), the depth of network ties can impact a firm's innovation capability and performance. Deep cluster relationships enable cluster firms to acquire more informal information and tacit knowledge, and the closeness in such relationships may lead to a higher level of homogeneity in their knowledge structures and encourage more exploitative innovation activity (Bell & Zaheer, 2007). This is because, in an industrial cluster, most firms are in related product families or on related value chains, and their knowledge bases are related and, to a large extent, similar (Autio et al., 2018), and strengthened network relationships can, therefore, contribute to a firm's endogenous creativity which contributes to its exploitation of existing technology (Madhavan, Gnyawali, & He, 2004).

Thus, firms with deep cluster relationships are more likely than those without such relationships to actively seek common ground for cooperation through strong network ties, which may lead to further convergence of their product designs and
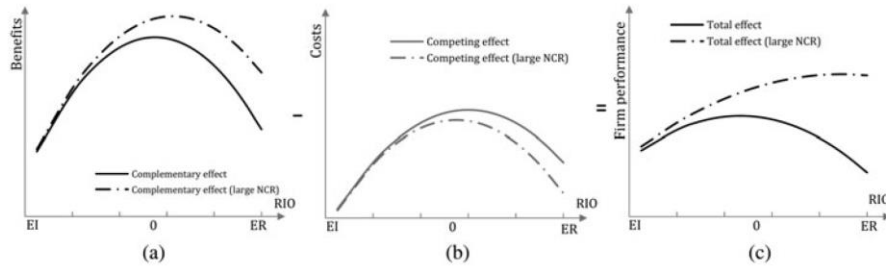
Figure 3. The latent mechanism underlying the moderating effect of number of cluster relationships (NCR) on the inverted U-shaped relationship between a firm's relative innovation orientation (RIO) and firm performance.

other innovations (Jansen et al., 2006). When a firm's cluster relationships with other cluster members are strengthened, it is likely that the firm enhances its exploitative innovation capability enabled by increased homogeneous knowledge (Sen & Egelhoff, 2000). This situation is especially true when a small number of firms in cluster relationships create narrow but robust circulations of existing knowledge among themselves, which may fence off external (heterogeneous) influences (Ozer & Zhang, 2015; Sen & Egelhoff, 2000). Indeed, deep and concentrated network relationships among cluster firms may lead such firms to be isolated from the influence of industry norms, the status quo of industry knowledge, and dominant technology (even just temporarily) (Ahuja, 2000; Burt, 2004; Burt, 2009; Schilling & Phelps, 2007).

On the other hand, excessively close relationships among cluster firms may also reduce the incentives for such firms to experiment with unknowns and explore new things, as some members may expect to get 'free rides' from others' risk-taking, exploratory innovation activity (Dai et al., 2018). Thus, accumulation of homogeneous knowledge and other resources will lead to enhanced exploitative innovation capability but will not help improve exploratory innovation capability. This is to say that the stronger a firm's cluster relationships, the more likely it will acquire more homogenous knowledge in the cluster, and, thus, skew its innovation balance toward exploitation.

In summary, it is reasonable to posit that stronger cluster relationships help cluster firms accumulate more homogeneous knowledge and other resources for innovation, which may lead such firms to direct more attention to exploitative innovation, and, thus, enhance firm performance. Meanwhile, external resources can reinforce the complementary effect between the two types of innovation activities. Thus, a firm will benefit more if its innovation orientation leans toward exploitation, as shown in Figure 4a. On the other hand, stronger cluster relationships will help the firm develop more exploitative innovation capability enabled by extra homogeneous resources acquired from its deeper network ties, which, in turn, will mitigate the competing effect between the two types of innovation orientations, as shown in Figure 4b. Thus, subtracting the cost effects (Figure 4b) from
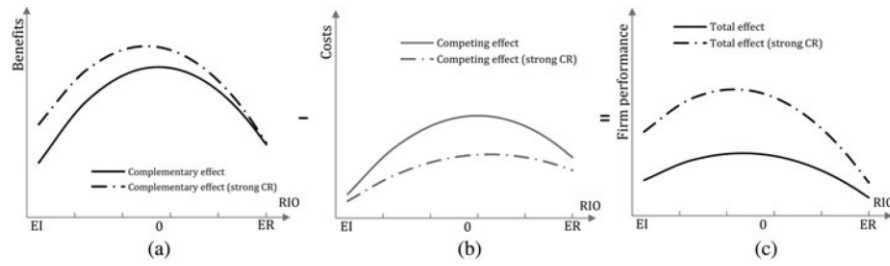
Figure 4. The latent mechanism underlying the moderating effect of strength of cluster relationships (SCR) on inverted U-shaped relationship between relative innovation orientation (RIO) and firm performance.

the benefit effects (Figure 4a) we can have the turning point of the inverted U-shaped curve lean toward exploitative innovation, as shown in Figure 4c. Thus, we posit the following hypothesis.

Hypothesis 2b: In a cluster, the deeper a firm's cluster relationships, the more likely the turning point of the inverted U-shaped curve between its relative innovation orientation and performance moves toward exploitation for better performance.

METHODS

Sample and Data Collection

To test the hypotheses (H1, H2a, and H2b), we conducted a survey with innovation-intensive small and medium-sized enterprises (SMEs)[1] in four clusters in Tianjin. As a transportation junction connecting inland Northern China with the global market via air and sea, Tianjin is one of four autonomous municipalities in China. In recent years, the city has become one of the country's innovation centers. At the end of 2015, with an increasing number of technology-oriented SMEs, Tianjin was home to nine high-tech industry clusters, including electronic information, biopharmaceutics, marine technologies, new materials, sustainable energy and environmental protection, medical apparatus, aerospace, new concept vehicles, and equipment manufacturing, which, collectively, contributed to about 71% of the city's gross industrial output. For these two reasons, Tianjin provided an ideal context in which to examine SMEs' innovation orientation and their performance in clusters.

Endorsed by the Tianjin Municipal Government, we sent questionnaires to 1,256 innovation-intensive SMEs in Tianjin.[2] We chose our sample following the definitions of enterprise size, registration location, and industry classifications set by the National Bureau of Statistics of China on SMEs. Our sample firms are from four innovation-intensive industries: electronic information industry (46.6%), biopharmaceutical industry (33.7%), new materials industry (12.5%), and sustainable energy and environmental protection industry (7.2%). Innovation-intensive industries are characterized by four attributes: rapid

technological upgrades, technology-driven products, fierce market competition, and responsiveness to industry innovation trends.

We received 638 valid and complete questionnaires (an effective return rate of 50.8%[3]). The results of a t-test show that there is no significant difference in industry distribution between firms that responded and those that did not (p = 0.097).

The questionnaire we used for this study comprises two parts. The first part consists of questions related to control, moderating and independent variables and was answered by general managers or equivalent in the surveyed firms. The second part relates to dependent variables and was answered by financial managers or equivalent in the firms. This method of requiring that the two parts of the questionnaire be completed by personnel in different functions is to mitigate self-reporting and self-evaluation effects that can result in common method variance (CMV) (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Siemsen, Roth, & Oliveira, 2010). To control for the impact of CMV, we also conducted Harman's one-factor test. According to Podsakoff et al. (2003), if a single factor emerges that accounts for a large percentage of the total variance, the data may have a CMV issue. In our test, the highest factor accounts for 30.9% of the total variance explained, which indicates that CMV is unlikely to significantly affect the results.

Definitions and Measurements of the Variables

The independent variable in this study is the relative innovation orientation between exploration and exploitation (RIO), a state indicating the inclination of a firm's innovation orientation toward either exploration or exploitation, resulting from the difference in the firm's investment in the two type of innovation activities. In this study, we define RIO as the relative amount of exploratory vs exploitative innovation activities over a three-year period. There are two common methods to measure exploratory and exploitative innovations: first, by counting the frequency with which the two types of innovation orientations are mentioned in subject firms' publicly available materials (e.g., annual reports and letters to shareholders) (Uotila et al., 2009); second, by surveying a sample of subject firms using questionnaires (He & Wong, 2004; Jansen et al., 2005; Jansen et al., 2006). The first method is suitable for studying large, public firms, for which public information is easily and reliably available. Most of our sample firms are unlisted and do not use open channels to communicate their firm-related information to the public. Neither is the limited public information entirely reliable. For these two reasons, we chose to use the survey method. The questionnaire used to measure exploratory and exploitative innovations was adopted from Benner and Tushman (2002; 2003), He and Wong (2006), and Jansen et al. (2006). We relied on a seven-point Likert scale survey items, with 1 denoting 'strongly disagree' and 7 denoting 'strongly agree'.

Two commonly used measures of relative innovation orientation are 1) the ratio of the two (Jansen et al., 2005; Uotila et al., 2009) and 2) the *absolute* difference

of the two (Cao et al., 2009; He & Wong, 2004). For example, Uotila et al. (2009) used 'relative exploration orientation' to meaure a firm's orientation toward exploratory innovation by calculating the number of mentionings of exploratory orientation against the total number of both exploratory and exploitative orientations in its publicly available information per year. Adapting Uotila et al.'s method, we designed (ER–EI)/(ER+EI) (ER represents exploratory innovation and EI exploitative innovation) to measure a firm's RIO. The reason we chose such a method is it measures the relative importance of a firm's innovation orientation between exploration and exploitation against the *total* investment in both orientations over three years (to mitigate the lagging effect of innovation strategies, especially exploratory innovation, on firm performance). In other words, it provides a directional indication of a firm's innovation orientation: when (ER–EI)/(ER+EI) is larger than zero, the firm's RIO skews toward exploration; and when (ER–EI)/(ER+EI) is smaller than zero, its RIO skews toward exploitation.

The dependent variable used in this study is firm growth performance (FGP). A firm's growth can be measured by improvements in its financial results and market competitiveness, compared to three years before (Cao et al., 2009; He & Wong, 2004). Hence, we measure FGP by 1) growth of sales revenue, 2) increase in market share, 3) growth in after-tax profit, and 4) improvement in market competitiveness, over three years. Specially, we assign a value to each of these four items using a seven-point scale: if the growth rate of any item over three years is smaller than -30%, the item scores 1 point; if the growth rate is between -30% and 0, the item scores 2 points; if the growth rate is between 0 and 20%, the item scores 3 points; if the growth rate is between 20% and 40%, the item scores 4 points; if the growth rate is between 40% and 60%, the item scores 5 points; if the growth rate is between 60% and 80%, the item scores 6 points; and if it is larger than 80%, the item scores 7 points. We then average the firm's total score on all four items to measure its growth performance over a three-year period.

There are two moderating variables in this study: the breadth and the depth of a firm's network ties in its cluster. We use the *number* of network ties, including partnerships (e.g., joint venture partners), formal alliances (e.g., R&D alliances), and informal alliances (e.g., participating in various industry associations or consortia), that a firm has in the cluster to measure the breadth of its cluster relationships (NCR), and the *strength* of these network ties to measure the depth of its cluster relationships (SCR) (Bell, 2005; Gilsing, Nooteboom, Vanhaverbeke, Duysters, & van den Oord, 2008; Giuliani, 2007; Liu, 2011). We measured each item on a seven-point Likert scale, with 1 denoting 'strongly disagree' and 7 denoting 'strongly agree' with questions such as 'the firm has a large number of ties with … in a cluster', and 'the firm has deep connections with…in a cluster'.

We used five control variables in this study: firm size, firm age, firm ownership, market competition, and industry cluster. First, firm size influences the

resources available for a firm to carry out innovation activities, and, thus, its innovation capability. We measured firm size by a firm's total assets, sales revenues, and total number of employees (Baum, Locke, & Smith, 2001; Cao et al., 2009; Lavie, Kang, & Rosenkopf, 2011). Second, firm age contributes to a firm's knowledge accumulation and experience related to innovation activities. We measured firm age by the number of years since the firm's registration (1 = less than 4 years; 2 = 4–6 years; 3 = 7–10 years, 4 =11–15 years; 5 =16–20 years; 6 = 21–30 years; and 7 = more than 30 years). Third, firm ownership has an impact on a firm's propensity for risk-taking in innovation. In China, firm ownership (i.e., state-owned or privately-owned) has a strong impact on its innovation strategy and growth performance. We set a dummy variable for firm ownership (0 = non state-owned enterprises; and 1= state-owned enterprises). Fourth, the degree of market competition has an impact on a firm's strategic choice of innovation orientation. We measured the market competition a firm faces by the frequency of 'price wars' involving subject firms, the number of entries of new firms, and whether competitors followed any successful product launch with similar offerings in the market place (Auh & Menguc, 2005; Baker & Sinkula, 2007; Jansen et al., 2005; Jansen et al., 2006). Finally, the industry cluster in which a firm operates may influence its innovation strategy as different industry clusters often have different network structures (e.g., density and centrality) and different developmental paces in innovation. To reduce noise generated by industry differences, we set dummy variable for each industry cluster: 1 = in this industry, 0 = not in this industry. Table 1 summarizes the dependent and independent variables in this study with their definitions and measurements.

We used SPSS 19.0 to test the reliability of the data collected for this study. The alpha coefficient (as shown in Table 1) was larger than 0.7 for each variable on the internal consistency test, indicating that the data meet the requirement of high internal consistency.

RESULTS

Table 2 depicts the statistics (means, standard deviations, and correlations) of the variables of this study. From the means, we can see that sample firms are SMEs, and, on average, the market competition the firms face is mild, 34.2% of the firms are state-owned enterprises, and the average age of the firms is 8.6 years. The test of multicollinearity indicates that the values of variance inflation factor (VIF) for all the independent and control variables are below the threshold of 10, and their tolerance values are above the threshold of 0.1, verifying that the likelihood of problems caused by multicollinearity is small (Fox, 1991).

We used a hierarchical regression method to test the hypotheses. Four models of the five control variables with the independent or moderating variables, and interactive items of them were tested. In Table 3, we show the results of the correlations between firms' relative innovation orientation (RIO), number of cluster

Table 1. Definitions and measurements of the independent and dependent variables

Construct	Definition and Measure		References
Exploratory Innovation (ER)	ER is about pursuing new things and it can lead to radical discoveries. It contributes to firm's future growth, though uncertain and risky. ER require new knowledge or knowledge that deviates from existing framework. Four items are used to measure a firm's investment in ER: developing new technologies or applying technology in new areas, searching for and developing new customers, attempting to explore new markets, and exploring new sales channels.	0.855	Levinthal & March, 1993; March, 1991; Rowley et al., 2000; Benner & Thushman, 2002; McGrath, 2001
Exploitative Innovation (EI)	EI is about efficient utilization of existing technological assets. It is incremental in nature and designed to meet the needs of existing customers/markets. EI contributes to firm's current growth, by benefiting from existing knowledge and skills. Four items are used to measure a firm's investment in exploitative innovation: upgrading the quality of existing products/services, striving to improve the versatility of existing products/services, attempting to enhance productivity, and making great efforts to improve the efficiency of existing distribution channels.	0.817	O'Reilly & Tushman, 2008; Raisch & Birkinshaw, 2008; Raisch et al., 2009; Levinthal & March, 1993; Benner & Thushman, 2002; 2003;
Relative Innovation Orientation (RIO)	We use (ER–EI)/(ER+EI) to denote the *relative* gap between a firm's innovation strategy between exploration and exploitation. When (ER–EI)/(ER+EI) is larger than zero, the firm's innovation orientation is leaning towards exploration; and when (ER–EI)/(ER+EI) is smaller than zero, its innovation orientation is leaning towards exploitation. This value has an impact on firm performance.	-	Cao et al., 2009; He & Wong, 2004; Uotila et al., 2009; Boumgarden et al., 2012

Table 1. Continued

Construct	Definition and Measure		References
Relational Breadth (measured by the number of network ties) (NCR)	NCR measures the breadth of relationships a cluster firm has with other cluster members. We measure NCR by three items: a firm's number of formal partners (NCR1), its number of formal alliances (e.g. R&D alliances) (NCR2) and the number of informal alliances (e.g. various industry associations a firm participates) (NCR3). The higher a firm's NCR, the more important its position is in a cluster.	0.745	Knoke & Kuklinski, 1982; Burt, 2004; 2009; Gilsing et al., 2008
Relational Depth (measured the strength of network ties) (SCR)	SCR measures the depth of a firm's cluster ties with other cluster members. We measure SCR by three items: closeness (frequency of all kinds of contacts; the degree of knowledge and information exchange; and the degree of reciprocal services) with partners (SCR1), with other members in formal alliances (SCR 2) and informal alliances (SCR 3).	0.818	Granovetter, 1973; Rindfleisch & Moorman, 2001; Marsden & Campbell 1984; Mathews et al., 1998
Firm Growth Performance (FGP)	Firm's growth performance is a relative value, measured by a firm's financial results and market competitiveness, compared to three years before. FGP is measured by four items: growth of sales revenue, increase in market share, growth in after-tax profit and improvement in market competitiveness.	0.832	Hart, 1992; Cao et al., 2009; He & Wong, 2004

Table 2. Statistics (means, standard deviations, and correlations) of the variables

	Mean	S.D.	1	2	3	4	5	6	7	8
1. Firm size (FS)	3.647	0.590								
2. Market competition (MC)	3.544	0.569	−0.095							
3. Firm age (age)	4.632	0.715	0.136**	−0.003						
4. Firm ownership (ownership)	0.342	0.577	0.205**	0.012	−0.031					
5. Exploitative innovation (EI)	3.884	1.552	0.052	−0.044	0.080*	−0.023				
6. Exploratory innovation (ER)	3.652	1.100	0.164**	−0.058	0.052	0.017	0.064			
7. Number of cluster ties (NCR)	3.205	0.768	0.191**	−0.043	0.225**	−0.042	0.164**	0.194**		
8. Strength of cluster ties (SCR)	3.865	1.007	−0.010	−0.142**	−0.095*	−0.063	−0.029	0.138**	0.031	
9. Firm growth performance (FGP)	3.296	1.106	0.105*	−0.348**	0.034	0.043	0.125**	0.206**	0.108*	0.294**

Notes: * $p < 0.05$, ** $p < 0.001$.

Table 3. The correlations between firms' relative innovation orientation and performance, moderated by SCR and NCR

	M1	S.E	M2	S.E	M3	S.E	M4	S.E
Age	0.019 (0.498)	0.053	0.101** (0.007)	0.055	0.032 (0.409)	0.056	0.124*** (0.000)	0.049
Ownership	0.043 (0.241)	0.085	0.047 (0.186)	0.082	0.059 (0.071)	0.076	0.047 (0.140)	0.074
FS	0.045 (0.135)	0.036	0.097** (0.008)	0.035	0.116** (0.001)	0.033	0.108** (0.001)	0.031
MC	−0.336*** (0.000)	0.034	−0.334*** (0.000)	0.033	−0.304*** (0.000)	0.031	−0.230*** (0.000)	0.031
IN1	−0.124 (0.110)	0.107	−0.099* (0.035)	0.104	−0.103* (0.019)	0.097	−0.057 (0.178)	0.094
IN2	−0.091 (0.147)	0.107	−0.069 (0.118)	0.104	−0.125** (0.003)	0.097	−0.107* (0.018)	0.094
IN3	−0.034 (0.443)	0.187	−0.038 (0.365)	0.177	−0.094* (0.016)	0.167	0.012 (0.748)	0.161
IN4	−0.055 (0.251)	0.159	−0.083 (0.064)	0.149	−0.082 (0.050)	0.139	−0.044 (0.282)	0.135
EI	0.094* (0.014)	0.043						
ER	0.171*** (0.000)	0.057						
RIO			0.196*** (0.000)	0.023	0.155*** (0.000)	0.021	0.088* (0.010)	0.022
RIO^2			−0.246*** (0.000)	0.085	−0.249*** (0.000)	0.086	−0.230*** (0.000)	0.077
NCR					0.103* (0.015)	0.082		
RIO = NCR					0.251*** (0.000)	0.031		

Table 3. Continued

	M1	S.E	M2	S.E	M3	S.E	M4	S.E
RIO^2 = NCR					0.136***	0.037		
					(0.000)			
SCR							0.207***	0.024
							(0.000)	
RIO = SCR							−0.287***	0.039
							(0.000)	
RIO^2 = SCR							−0.126**	0.036
							(0.001)	
R^2	0.180		0.223		0.334		0.376	
Adj. R^2	0.166***		0.211***		0.320***		0.363***	
F-Value	13.721		18.042		34.691		50.905	
Tolerance	≥0.562		≥0.560		≥0.558		≥0.601	
VIF	≤1.729		≤1.786		≤1.791		≤1.663	

Dependent Variable: Firm growth performance (FGP)
Notes: Significance levels: * p-value < 0.05; ** p-value <0.01; ***p-value <0.001.

relationships (NCR), strength of cluster relationships (SCR) and firm growth performance (FGP).

M1 is the baseline model, which includes five control variables, as well as EI and ER. M2 is built by adding the relative innovation orientation (RIO) and its quadratic term (RIO^2) on M1. The results of M1 and M2 indicate that the interactive items of RIO and RIO^2 have more effect than the individual ER or EI on independent variable FGP (*Adj. $R^2 = 0.211$, $p < 0.001$*). Following the suggestions by Haans et al. (2016) on empirical tests of non-linear relationships, we undertook a three-step method, proposed by Lind and Mehlum (2010), to test the inverted U-shaped relationship in this study. The curve can be expressed as Equation 1.

$$FGP = \beta_0 + \beta_1^* RIO + \beta_2^* RIO^2 \qquad (1)$$

First, we tested the sign and significance of coefficient β_2 of Equation 1. The correlation between the quadratic term of RIO and FGP is negative and significant ($\beta_2 = -0.246$, $p < 0.001$). Second, we tested the slopes at both ends of the data range. We did an overall test of presence of the inverted U-shape. The results are shown in Table 4. The slope at the low end of the X-range (X_L) is positive and significant (the slope at $X_L = 4.59$, $p < 0.001$), and the slope at the high end (X_H) is negative and significant (the slope at $X_H = -1.94$, $p < 0.001$). Third, we tested whether the turning point of the curve is within the data range. The turning point of curvilinear at $-\beta_1/2\beta_2 = 0.398$.[4] The 95% confidence interval of the turning point is within the data range ($[0.17, 0.60] \in [-0.75, 0.75]$). To ensure the correct interpretation of the results, we further examined the joint significance of the inverted U-shaped correlation. Based on the research of Sasabuchi (1980), Lind and Mehlum (2010), and Haans et al. (2016), we tested the joint significance of direct and squared terms of RIO, the joint significance of the control variables. These results (as shown in Table 4) suggest that the inverted U-shaped relationship is significant.

Thus, the above results support H1, that is there exists an inverted U-shaped correlation between a firm's relative innovation orientation and its growth performance, as (ER-EI)/(ER+EI) ∩ FGP.

We further build M3 by adding to M2 the number of a firm's cluster relationships (NCR), the interaction of NCR and the RIO, the interaction of NCR and the quadratic term of RIO. Following the procedures in Aiken *et al.*'s (1991) study, we established Equation 2 for the moderating effect of NCR on the correlation between RIO and FGP as:

$$FGP = (\beta_3 + \beta_4^* NCR)^* RIO^2 + (\beta_5 + \beta_6^* NCR)^* RIO + \beta_7^* NCR \qquad (2)$$

The results of M3 suggest that the interaction of a firm's NCR and the linear term of RIO is positive and significant ($\beta_6 = 0.251$, $p < 0.001$), and the interaction of NCR and the quadratic term of RIO is also positive and significant ($\beta_4 = 0.136$,

Table 4. Test of the inverted U-shaped relationship between RIO and FGP

Dependent variable: FGP

Data range (X)	[−0.75, 0.75]
Slope at X_L	4.59***
Slope at X_H	−1.94**
Extremum point	0.30
95% confidence interval	[0.17, 0.61]
Test of joint significance of independent variables [RIO and RIO-squared] (F-value)	27.73***
Test of joint significance of control variables (F-value)	12.96***
Sasabuchi-test of inverse U-shape (t-value)	2.50**

Notes: Significance levels: ** p-value <0.01; ***p-value <0.001.

$p < 0.001$). In addition, $\beta_3 = -0.249$, $p < 0.001$, $\beta_5 = 0.155$, $p < 0.001$, $\beta_7 = 0.103$, $p < 0.05$. Haans et al. (2016) suggest that a shift of the direction of the turning point in a U-shaped curve depends on the coefficients β_3, β_4, β_5 and β_6. If $(\beta_4 \beta_5 - \beta_3 \beta_6)$ is positive, the turning point will move to the right direction as the moderator increases. If $(\beta_4 \beta_5 - \beta_3 \beta_6)$ is negative, the turning point will move to the left direction as the moderator increases (p. 1187). As $(\beta_4 \beta_5 - \beta_3 \beta_6) = 0.084 > 0$, we can conclude that the turning point of the inverted U-shaped curve will move to the right as NCR increases (meaning a firm's relative innovation orientation skews toward exploratory innovation when its number of cluster relationships increases).

The two curvilinear relationships for large and small NCR are plotted by substituting centered high (+1 standard deviation) and low (−1 standard deviation) values in Equation 2. As shown in Figure 5, when NCR increases, the turning point of the inverted U-shaped curve moves rightward. Thus, H2a is supported (*Adj. R^2* = 0.320, $p < 0.001$).

We build M4 by adding to M2 the strength of a firm's cluster relationships (SCR), the interaction of SCR and the RIO, the interaction of SCR and the quadratic term of RIO. This model was used to test the moderating effect of SCR on the correlation between a firm's RIO and FGP. Similar to testing the moderating effect of NCR, we established Equation 3 for the moderating effect of SCR on the correlation between RIO and FGP as:

$$FGP = (\beta_8 + \beta_9^* SCR)^* RIO^2 + (\beta_{10} + \beta_{11}^* SCR)^* RIO + \beta_{12}^* SCR \qquad (3)$$

As shown in M4, the interaction of SCR and RIO is negative ($\beta_{11} = -0.287$, $p < 0.001$), and the interaction of SCR and the quadratic term of RIO is also negative ($\beta_9 = -0.126$, $p < 0.001$). The direct effect of SCR on FGP is positive ($\beta_{12} = 0.207$, $p < 0.001$). In addition, $\beta_8 = -0.230$, $p < 0.001$, $\beta_{10} = 0.088$, $p < 0.05$. Based on these results, we found that the turning point of the inverted U-shaped curve
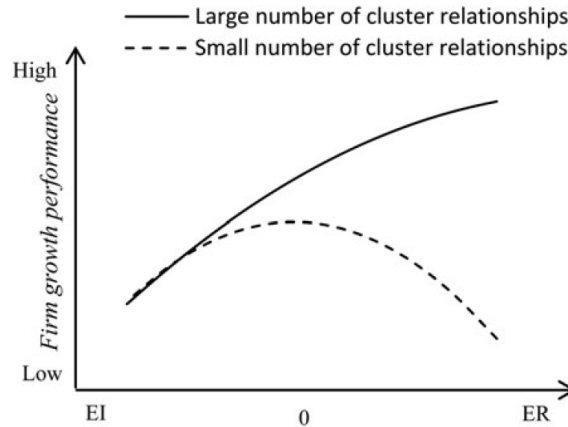
Figure 5. Moderating effect of NCR

between RIO and FGP will move to the left direction (meaning a firm's innovation orientation skews toward exploitative innovation) as SCR increases.

The two curvilinear relationships for strong and weak SCR are plotted by substituting centered high (+1 standard deviation) and low (−1 standard deviation) values in Equation 3. As shown in Figure 6, when SCR increases, the turning point of the inverted U-shaped curve moves leftward. Thus, H2b is supported (*Adj. R^2* = 0.363, p < 0.001).

DISCUSSION

A strategically important decision for SMEs is, under different conditions, how to allocate limited resources between exploratory and exploitative innovation activities in order to optimize firm performance. Our empirical research on 638 SMEs in four clusters in Tianjin, China confirms that an inverted U-shaped correlation exists between a firm's relative innovation orientation and its growth performance (H1 is supported). We also verify that this correlation is moderated by the firm's cluster relationships: the broader a firm's cluster relationships, the more likely the turning point of the inverted U-shaped curve will move toward exploratory innovation orientation for greater growth performance (H2a is supported); on the other hand, the stronger a firm's cluster relationships, the more likely the turning point of the inverted U-shaped curve will move toward exploitative innovation orientation for greater growth performance (H2b is supported). These results carry important implications for theory and practice.

Theoretical Implications

First, we theorize and test that a latent mechanism underlying the inverted U-shaped curve between a firm's relative innovation orientation and performance
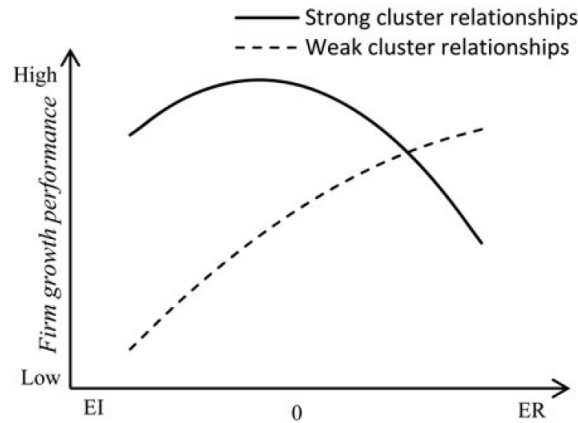
Figure 6. Moderating effect of SCR

is the result of an additive combination of two inverted U-shaped curves: complementary effects of the two innovation orientations is an inverted U-shaped curve which have a positive impact on firm performance (benefit effects), and competing effects of the two is also an inverted U-shaped curve which have a negative impact on firm performance (cost effects). Additively combine these two effects generate an inverted U-shaped curve between a firm's relative innovation orientation and performance. This process contributes to Haans et al.'s (2016) model of latent mechanisms underlying U- or inverted U-shaped curves. The results of our study also enrich the ongoing discourse on firms' innovation balancing strategy between exploration and exploitation and performance.

Second, we theorize and test the moderating effects of cluster relationships on the inverted U-shaped relationship between a firms' innovation orientation and growth performance. In contrast to previous studies that use a firm's cluster network's characteristics (e.g., the firm's locations in the network) or compare cluster firms with non-cluster ones in examining the effects of cluster relationships on firms' innovation strategy, we tested the moderating effects of relational attributes (i.e., breadth and depth) on cluster firms' relative innovation orientation and performance. Theoretically, we extend the level of analysis in this field to inter-organizational levels. From a cluster relationship perspective, this finding enriches our understanding of the relationship between firms' cluster relational attributes and their knowledge acquisition and innovation capability building, and thus, their impact on firm performance.

On the breadth of cluster relationships, we find that an increased number of network ties is beneficial to a firm's exploratory innovation capability and may lead the firm to have more exploratory innovation activity. This finding is similar to the results of Fiol (1995) and Zang (2018), which suggest that the number of a firm's network ties may nurture creative breakthroughs. The reason behind this is because broad cluster networks help a firm acquire more *heterogeneous* resources

from different partners (McCann & Folta, 2011; Wang & von Tunzelmann, 2000), which, in turn, can increase the likelihood of the firm pursuing new unknowns. As shown in Figure 5, the number of a firm's relational ties has little impact on its performance if it skews toward exploitative innovation. This finding supports Rowley et al.'s (2018) argument that broad cluster relationships may benefit a firm's exploratory innovation capability, but not its exploitative innovation capability. However, this result is different from Ozer and Zhang (2015) work, which suggests that a focal cluster firm's network ties are positively related to its exploitative innovation in product development. We believe this discrepancy is caused by different measures of exploration and exploitation. We focus on general innovation activities, but Ozer and Zhang focus on product development.

On the depth of relational ties, we find that the strength of a firm's relational ties may benefit the firm in exploitative innovation by increasing the efficiency of using existing knowledge and other technological assets. The reason behind this is perhaps because a firm with deep cluster relationships facilitated by trusted and reciprocal links with relational firms can enhance deep-level interactions and increase the chance of acquiring more *homogenous* resources through the network ties (Jansen et al., 2006). Deep interactions of cluster firms enable them to exchange informal information and share tacit knowledge, which may be conducive to incremental innovations (Fleming, 2001; Kogut & Zander, 1992). We also find that when a cluster firm possesses stronger network ties with other firms in a cluster, its performance can be negatively influenced if it adopts an exploratory innovation orientation, as illustrated in Figure 6 (on the right of the intersection of the two curves). This suggests that firms with strong network ties that adopt an exploratory innovation orientation may suffer lower performance than those who concentrate on exploitative innovation, at least in the short term. This conclusion is in alignment with Dai et al. (2018) who claim that close R&D alliances among technology-intensive firms can be detrimental to their strategic flexibility and innovation performance. This is because firms embedded in deep network relationships may need to give up their own innovation projects in order to have their strategic focuses aligned with the interests and agendas of the partner firms in the relationship. Such 'compromising' behavior may lead to a phenomenon of some partner firms expecting 'free rides' – benefitting from innovation outcomes shared by closely-knitted networks without investing themselves. If every partner held such an expectation this could lead to the downfall of the long-term viability of the cluster, especially in high-risk, high-return industries where exploratory innovation is key. On this, Arora, Athreye, and Huang (2016) suggest that an effective strategy for innovation forerunners in cluster collaborations is to patent their innovations, as they may lose competitive advantages due to unintended spillover effects when the cluster relationships deepen, which, as a consequence, may reduce innovation activities in the cluster. For example, most cluster firms in our sample are in close geographic proximity, and they are collaborators and competitors at the same time. When the relationship between such firms deepens

(the network ties are strengthened), they tend to develop *interdependence* with one another and benefit potentially from free rides on the partners' innovation outputs, at least in the short term. However, in the long run, such a tendency may be detrimental to the viability of the relationship and firm performance.

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Practical Implications

Our research carries significant practical implications, especially for how SMEs optimize their performance by managing innovation balancing strategies and cluster relationships, under different conditions. Our findings provide strategic guidance for SMEs that face constrained resources on how to adjust their innovation strategies according to their cluster relationships, as well as on how to manage their cluster relationships when employing different innovation strategies.

From the perspective of innovation orientation, a cluster firm should consider its innovation strategy in the context of its cluster relationships. Ultimately, an optimal innovation balancing strategy between exploration and exploitation is not a fixed target; it is contingent upon a firm's internal and external conditions, such as the firm's cluster relational ties. A firm's increased number of relational ties will help it acquire heterogenous resources from its cluster networks, which can enhance the firm's exploratory innovation capability. The implication for managers in this situation is that the focal firm should adopt an innovation balancing strategy skewing toward exploration to benefit from the scope of its network ties. On the other hand, a firm's cluster relational strength helps the firm acquire homogenous resources, which enhances the firm's exploitative innovation capability. The implication is that firms in this situation should adopt an innovation balancing strategy leaning toward exploitation to capitalize on the strength of their network ties.

The results of this study also offer practical guidance for firms aiming to enhance their innovation capabilities by managing their cluster relationships. If a firm needs to enhance its exploratory innovation capability, it should consider increasing the scope of its relational ties with other cluster firms, such as building more collaborative partnerships with other firms, or participating in more formal or informal collaborative alliances or industry associations. On the other hand, if a firm needs to enhance its exploitative innovation capability, it should focus on strengthening relationships with its strategic partners, such as intensifying information exchange and knowledge sharing.

Limitations and Future Research Implications

There are several limitations in this research. First, we had a relatively large pro-portion of state-owned enterprises in the sample (34.2%). Given that state-owned enterprises often have less control over their innovation strategy (e.g., they may pursue an innovation project, focusing on one type of innovation but ignoring the other, simply to fulfill a national innovation mission or to get subsidies from the government), their innovation strategy and growth performance may not reflect the effects of their own innovation capabilities and the influence of their cluster relationships, even after we controlled for firm ownership. Second, our sample is limited to one city – Tianjin (with a small number of firms registered in Tianjin but located in nearby Beijing). Given significant geographic differences in the economy, labor force, industry policy, market, and so on, across China, our findings cannot be generalized across the entire country.

For future research, we intend to expand our investigation to other geo-graphic locations in China. Further effort should also be put into identifying the relational conditions under which cluster firms can manage the optimal balance point of this inverted U-shaped correlation between innovation orientations and performance. Future research might also examine other possible moderators that could affect this inverted U-shaped correlation.

CONCLUSION

This study advances our understanding of the relationship between innovation strategy (i.e., balancing exploratory and exploitative innovation) and firm perform-ance in the context of cluster networks. Our research highlights the importance of cluster relationships in knowledge acquisition and innovation capability building, and, thus, firm performance, for cluster firms.

NOTES

[1] SMEs are defined using the *Criteria for the Classification of Small and Medium-Sized Enterprises* promul-gated by the National Bureau of Statistics of China. Any firm that has more than 20 but fewer than 300 employees and an annual revenue of more than 3 million RMB but less than 20 million RMB is classified as a 'small enterprise', and any firm that has more than 300 but fewer than 1000 and an annual revenue of more than 20 million RMB but less than 400 million RMB is considered a 'medium-sized' enterprise.

[2] The questionnaire was sent out at the beginning of February 2016 and the window for the survey was open until the end of April 2016.

[3] We chose our sample firms from the catalogue of enterprises provided by Tianjin Science and Technology Committee (2014). There were 11,763 SMEs in nine industry clusters listed in this catalogue. The distribution of the firms in the four selected industry clusters is: 14.61% firms in the electronic information industry (IN1), 9.68% in the biopharmaceutical industry (IN 2), 3.47% in the new materials industry (IN 3), and 2.40% in the sustainable energy and environmental protection industry (IN4). To minimize the possibility of sampling bias, we

randomly selected 1,256 firms, distributed in four industry clusters: 608 firms in IN1 (48.4%), 403 in IN2 (32.1%), 144 in IN3 (11.46%) and 101 in IN4 (8.04%). In response, we received 906 questionnaires. After excluding invalid questionnaires, and responses from firms that fell out of the sample definition for 'innovation-intensive' industries due to changes in their core business (for example, some firms engaged in real estate, Internet finance, and other non-innovation related businesses) from the sample, we collected a total of 638 valid and complete questionnaires. The effective response rate was, therefore, 50.8%.

[4] The values of the turning point vary with the regression model and the regression coefficients (standard or non-standard).

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Zhendong Li (lizhendong@hdu.edu.cn) is currently a lecturer at the Department of Business Administration, Hangzhou Dianzi University, where he is also the assistant to the Head of the Department. Dr Li received his PhD from Tianjin University in 2019. He also studied in the Alliance Business School of the University of Manchester as an exchange doctoral student from September 2016 to September 2017. Dr Li's research interests include innovation strategy, digital innovation, and innovation ecosystem.

Marina Yue Zhang (myzhang@swin.edu.au) is an associate professor at Swinburne University of Technology. Before Swinburne, Marina held positions in the University of New South Wales and Tsinghua University, as well as senior management positions in IBM and Ericsson. She holds a bachelor's degree in biological sciences from Peking University, and an MBA and a PhD from the Australian National University. Her research fields cover disruptive innovation, catch-up of latecomers in emerging markets and innovation ecosystem.

Huiying Zhang (hyzhang@tju.edu.cn) is a professor of management at Tianjin University. She obtained her bachelor's and master's degrees from Nakai Univesity and her PhD from Tianjin University. She currently also holds the position of the vice director of the Technical Innovation and Management Professional Committee in Chinese Management Modernization Research Association. Her research involves studies of technical innovation and new product development. She has published more than 100 papers in journals at home and abroad.

4.3. Appendix C: Questionnaire

Research Survey: Innovative Work Behaviour

I am currently a student at the University of Pretoria's Gordon Institute of Business Science and completing my research in partial fulfillment of an MBA.

I am conducting research on what drives innovative work behaviour in organisations. Your participation in this research will be highly valuable. To that end, you are asked to look at the following questionnaire and answer the questions based on your perspective and experience. This will help us to better understand innovative work behaviour characteristics, and should take no more than 10 minutes of your time. Your participation is voluntary, and you can withdraw at any time without penalty. Your participation is anonymous and only aggregated data will be reported. By completing the survey, you indicate that you voluntarily participate in this research. If you have any concerns, please contact my supervisor or me. Our details are provided below.

Researcher name: Mr. Aveshan Venketsamy
Email: 04883307@mygibs.co.za
Phone: 011 771 4000

Research supervisor: Dr. Charlene Lew
Email: lewc@gibs.co.za
Phone: 011 771 4000

There are 5 short sections to follow, each with a few questions and a small description on how to answer them. Thank you for taking the time to complete this questionnaire. Your input is highly appreciated.
*Required

Background

In this first section, there are a few background questions relating to yourself and your career.

1.   1. What is your gender? *

Mark only one oval.

( ) Male

( ) Female

2.   2. What age bracket are you in? *

Mark only one oval.

- ( ) 18 - 21
- ( ) 22 - 25
- ( ) 26 - 30
- ( ) 31 - 35
- ( ) 36 - 45
- ( ) 46 - 55
- ( ) 56+

3.   3. Do you reside in South Africa? *

Mark only one oval.

- ( ) Yes
- ( ) No

4.   4. What is your highest level of qualification? *

Mark only one oval.

- ( ) Matric
- ( ) Higher Certificate
- ( ) National Diploma
- ( ) Bachelor's Degree
- ( ) Honours Degree
- ( ) Master's Degree
- ( ) Doctor's Degree

75

5.   5. Are you currently employed? *

Mark only one oval.

      ( ) Yes

      ( ) No

6.   6. Do you work for an organisation or are you self-employed? *

Mark only one oval.

      ( ) I work for an organisation

      ( ) Self-employed

7.   7. What is the size of the Organisation you work in? *

Mark only one oval.

      ( ) Micro (<10 employees)

      ( ) Small (11 - 50 employees)

      ( ) Medium (51 - 250 employees)

      ( ) Large (> 250 employees)

8.   8. What industry sector best suits the Organisation you work in? *

Mark only one oval.

   ( ) Agriculture, Forestry and Fishing

   ( ) Mining and Quarrying

   ( ) Manufacturing

   ( ) Electricity, Gas and Water

   ( ) Construction

   ( ) Wholesale and Retail

   ( ) Motor trade and repair services

   ( ) Transport and Storage

   ( ) Accommodation and Food service

   ( ) Information and Communication

   ( ) Professional, scientific and technical activities

   ( ) Financial and Insurance

   ( ) Education

   ( ) Government

   ( ) Community and Social work activities

   ( ) Other: _____

9.   9. How would you describe your current job level? *

Mark only one oval.

   ( ) Unskilled worker

   ( ) Semi-skilled worker

   ( ) Skilled worker, i.e. Technical & academically qualified/Junior management/Supervisors

   ( ) Professionally qualified & experienced specialists/Mid-management

   ( ) Senior management

   ( ) Top management/Executive

10.   10. How many years of work experience do you have in your current role? *

Mark only one oval.

( ) < 1 year

( ) 1-3 years

( ) 3-5 years

( ) > 5 years

11.   11. How many years of work experience do you have in total? *

Mark only one oval.

( ) < 1 year

( ) 1-3 years

( ) 3-5 years

( ) 5-10 years

( ) 10-15 years

( ) >15 years

Personal
behavioural
attributes

The following 5 questions are based on your personal characteristics in
relation to your career.

Please answer each question by selecting one of the options ranging from
"Strongly disagree" to "Strongly agree"

12.   I enjoy finding solutions to complex problems *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

78

13. I enjoy coming up with new ideas for processes, products or services *

    Mark only one oval.

    ( ) Strongly disagree

    ( ) Disagree

    ( ) Somewhat disagree

    ( ) Neither disagree nor agree

    ( ) Somewhat agree

    ( ) Agree

    ( ) Strongly agree

14. I enjoy engaging in analytical thinking *

    Mark only one oval.

    ( ) Strongly disagree

    ( ) Disagree

    ( ) Somewhat disagree

    ( ) Neither disagree nor agree

    ( ) Somewhat agree

    ( ) Agree

    ( ) Strongly Agree

15. I enjoy creating new procedures for work tasks *

    Mark only one oval.

    ( ) Strongly disagree

    ( ) Disagree

    ( ) Somewhat disagree

    ( ) Neither disagree nor agree

    ( ) Somewhat agree

    ( ) Agree

    ( ) Strongly Agree

16. I enjoy improving existing processes, products or services *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly Agree

Organisational support

In this section, there are 13 short questions that relate to the Organisation you currently work in. When answering these questions, please draw from your personal experiences at work.

Please answer each question by selecting one of the options ranging from "Strongly disagree" to "Strongly agree"

17. Creativity is encouraged in my organisation *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

80

18. Our ability to function creatively is respected by the leadership *

Mark only one oval.

- ( ) Strongly disagree
- ( ) Disagree
- ( ) Somewhat disagree
- ( ) Neither disagree nor agree
- ( ) Somewhat agree
- ( ) Agree
- ( ) Strongly agree

19. In my organisation, people are allowed to try to solve the same problems in different ways *

Mark only one oval.

- ( ) Strongly disagree
- ( ) Disagree
- ( ) Somewhat disagree
- ( ) Neither disagree nor agree
- ( ) Somewhat agree
- ( ) Agree
- ( ) Strongly agree

20. The main function of members in this organisation is to follow orders which
     come down through channels *

Mark only one oval.

⬭ Strongly disagree

⬭ Disagree

⬭ Somewhat disagree

⬭ Neither disagree nor agree

⬭ Somewhat agree

⬭ Agree

⬭ Strongly agree

21. In my organisation, a person can get in a lot of trouble for being different *

Mark only one oval.

⬭ Strongly disagree

⬭ Disagree

⬭ Somewhat disagree

⬭ Neither disagree nor agree

⬭ Somewhat agree

⬭ Agree

⬭ Strongly agree

22. This organisation can be described as flexible and continually adapting to change *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

23. A person can't do things that are too different in this organisation without provoking anger *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

83

24. The best way to get along in this organisation is to think the way the rest of the group does *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

25. People in my organisation are expected to deal with problems in the same way *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

84

26.   This organisation is open and responsive to change *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

27.   The people in charge in this organisation usually get credit for others' ideas *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

28.   In this organisation, we tend to stick to tried and true ways *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

29.   This place seems to be more concerned with the status quo than with changes *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

Organisational rewards & recognition

In this section, there are 6 questions that relate to rewards and recognition given by your organisation or team in order to recognize you for a display of innovative behaviour on your part.

Please answer each question by selecting one of the options ranging from "Strongly disagree" to "Strongly agree"

30.   I get recognized by my supervisor when I suggest new ideas for tasks, processes, products or services *

Mark only one oval.

( ) Strongly disagree

( ) Disagree

( ) Somewhat disagree

( ) Neither disagree nor agree

( ) Somewhat agree

( ) Agree

( ) Strongly agree

31. My co-workers recognize me when I perform innovative at work *

Mark only one oval.

◯ Strongly disagree

◯ Disagree

◯ Somewhat disagree

◯ Neither disagree nor agree

◯ Somewhat agree

◯ Agree

◯ Strongly agree

32. When an employee exhibits innovative performance, my company or department offers some treats such as a celebration dinner *

Mark only one oval.

◯ Strongly disagree

◯ Disagree

◯ Somewhat disagree

◯ Neither disagree nor agree

◯ Somewhat agree

◯ Agree

◯ Strongly agree

33. When I perform innovative at work and my idea is implemented successfully, my company offers corresponding benefits in return such as a gift voucher, a day off, or a weekend away *

    Mark only one oval.

    - ( ) Strongly disagree
    - ( ) Disagree
    - ( ) Somewhat disagree
    - ( ) Neither disagree nor agree
    - ( ) Somewhat agree
    - ( ) Agree
    - ( ) Strongly agree

34. When I perform creatively at work, my manager or the top management compliments me publicly *

    Mark only one oval.

    - ( ) Strongly disagree
    - ( ) Disagree
    - ( ) Somewhat disagree
    - ( ) Neither disagree nor agree
    - ( ) Somewhat agree
    - ( ) Agree
    - ( ) Strongly agree

35.   I receive encouragement by my supervisor when I am working on new ideas *

Mark only one oval.

◯ Strongly disagree

◯ Disagree

◯ Somewhat disagree

◯ Neither disagree nor agree

◯ Somewhat agree

◯ Agree

◯ Strongly agree

Innovative work behaviour

This is the final section! thank you for your responses thus far, just a few more questions to go. In this section, there are 9 short questions that relate to your innovative activities at work.

Please answer each question by selecting one of the options ranging from "Never" to "Always"

36.   How often do you create new ideas for difficult issues? *

Mark only one oval.

◯ Never

◯ Rarely

◯ Occasionally

◯ Sometimes

◯ Usually

◯ Often

◯ Always

89

37.   How often do you find new working methods, techniques or instruments? *

Mark only one oval.

⬭ Never

⬭ Rarely

⬭ Occasionally

⬭ Sometimes

⬭ Usually

⬭ Often

⬭ Always

38.   How often do you generate original solutions for problems? *

Mark only one oval.

⬭ Never

⬭ Rarely

⬭ Occasionally

⬭ Sometimes

⬭ Usually

⬭ Often

⬭ Always

39.   How often do you mobilize support for innovative ideas? *

Mark only one oval.

⬭ Never

⬭ Rarely

⬭ Occasionally

⬭ Sometimes

⬭ Usually

⬭ Often

⬭ Always

90

40. How often do you acquire approval for innovative ideas? *

Mark only one oval.

- ( ) Never
- ( ) Rarely
- ( ) Occasionally
- ( ) Sometimes
- ( ) Usually
- ( ) Often
- ( ) Always

41. How often do you make important organisational members enthusiastic for new ideas? *

Mark only one oval.

- ( ) Never
- ( ) Rarely
- ( ) Occasionally
- ( ) Sometimes
- ( ) Usually
- ( ) Often
- ( ) Always

42.   How often do you transform innovative ideas into useful applications? *

Mark only one oval.

◯ Never

◯ Rarely

◯ Occasionally

◯ Sometimes

◯ Usually

◯ Often

◯ Always

43.   How often do you introduce innovative ideas into the workplace in a systematic way? *

Mark only one oval.

◯ Never

◯ Rarely

◯ Occasionally

◯ Sometimes

◯ Usually

◯ Often

◯ Always

92

44.   How often do you evaluate the effectiveness of innovative ideas? *

Mark only one oval.

◯ Never

◯ Rarely

◯ Occasionally

◯ Sometimes

◯ Usually

◯ Often

◯ Always

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4.4. Appendix D: Cleaning and coding criteria

D1: Cleaning criteria

Question	Criteria
3. Do you reside in South Africa?	Remove all respondents that answered 'no'
5. Are you currently employed?	Remove all respondents that answered 'no'
6. Do you work for an organisation or are you self-employed?	Remove all respondents that answered 'self-employed'
7. What is the size of the Organisation you work in?	Remove all respondents that answered 'micro', 'small' & 'medium'
9. How would you describe your current job level?	Remove all respondents that answered 'unskilled worker' & 'semi-skilled worker'

D2: Coding criteria

Qualification		Job Level		Total experience	
Matric	1	Skilled worker	1	1-3 years	1
Higher certificate	2	Professionally qualified & experienced specialists/mid management	2	3-5 years	2
National diploma	3	Senior management	3	5-10 years	3
Bachelor's degree	4	Top management	4	10-15 years	4
Honours degree	5			>15 years	5
Master's degree	6				
Doctors degree	7				

Likert scale				
Strongly disagree	1	Never	1	
Disagree	2	Rarely	2	
Somewhat disagree	3	Occasionally	3	
Neither disagree nor agree	4	Sometimes	4	
Somewhat agree	5	Usually	5	
Agree	6	Often	6	
Strongly agree	7	Always	7	

Reverse coded items (Organisational support scale)
OS4, OS5, OS7, OS8, OS9, OS11, OS12, OS13
Reverse coding applied to the Likert scale above for these questions

4.5.   Appendix E: Plagiarism declaration

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____

Aveshan Venketsamy

1 December 2020

4.6. Appendix F: Copyright declaration

Gordon Institute of Business Science
University of Pretoria

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19.1 COPYRIGHT DECLARATION FORM

Student details				
Surname:	Venketsamy		Initials:	A
Student number:	04883307			
Email:				
Phone:				

Qualification details				
Degree:	MBA		Year completed:	
Title of research:	GIBS			
Supervisor:	Dr. Charlene Lew			
Supervisor email:				

Access

A.	My research is not confidential and may be made available in the GIBS Information Centre and on UPSpace.

I give permission to display my email address on the UPSpace website

Yes	✓	No	

B.

	My research is confidential and may NOT be made available in the GIBS Information Centre nor on UPSpace.

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I hereby declare that I have not used unethical research practices nor gained material dishonesty in this electronic version of my research submitted. Where appropriate, written permission statement(s) were obtained from the owner(s) of third-party copyrighted matter included in my research, allowing distribution as specified below.

I hereby assign, transfer and make over to the University of Pretoria my rights of copyright in the submitted work to the extent that it has not already been affected in terms of the contract I entered into at registration. I understand that all rights with regard to the intellectual property of my research, vest in the University who has the right to reproduce, distribute and/or publish the work in any manner it may deem fit.
.

Signature:		Date:	
Supervisor signature:		Date:	

65

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4.7. Appendix G: Certification of additional support

17. APPENDIX 6   CERTIFICATION OF ADDITIONAL SUPPORT

(Additional support retained or not - to be **completed by all students**)

Please note that failure to comply and report on this honestly will result in disciplinary action

I hereby certify that (please indicate which statement applies):

- ***I DID NOT RECEIVE*** *any additional/outside assistance (i.e. statistical, transcriptional, and/or editorial services) on my research report:* ✓
  …………………………………………………………………………….

- ***I RECEIVED*** *additional/outside assistance (i.e. statistical, transcriptional, and/or editorial services) on my research report*
  …………………………………………………………………………….

If any additional services were retained– ***please indicate below which:***

☐   ***Statistician***

☐   ***Transcriber***

☐   ***Editor***

☐   ***Other (please specify:………………………)***

Please provide the name(s) and contact details of all retained:

NAME: ………………………………………………………………………..

EMAIL ADDRESS: …………………………………………………………..

CONTACT NUMBER: …………………………………………………………

TYPE OF SERVICE: …………………………………………………………..

NAME: …………………………………………………………………………..

EMAIL ADDRESS: ……………………………………………………………..

CONTACT NUMBER: …………………………………………………………

TYPE OF SERVICE: ………………………………………………………….

NAME: …………………………………………………………………………..

EMAIL ADDRESS: ……………………………………………………………..

CONTACT NUMBER: …………………………………………………………

TYPE OF SERVICE: ………………………………………………………….

I hereby declare that all *statistical write-ups and thematic interpretations of the results for* **my study were completed by myself without outside assistance**

NAME OF STUDENT: Aveshan Venketsamy
………………………………………………………………………………………

SIGNATURE:
……………………………………………………………………………………….

STUDENT NUMBER: 04883307
………………………………………………………………………………. ………

STUDENT EMAIL ADDRESS: 04883307@mygibs.co.za
……………………………………………………………………………

4.8. Appendix H: Ethical clearance