






INNOVATION IN MICRO AND SMALL BUSINESSES: HOW INBOUND OPEN INNOVATION AND DYNAMIC CAPABILITIES WORK TOGETHER TO EXPLAIN INNOVATION PERFORMANCE

 Yohana J. Sesabo¹
 Mushumbusi P. Kato²
 Emmanuel J. Chao³

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Purpose: This study examined how inbound open innovation and dynamic capabilities (sensing, seizing, and transforming capacity) work together to explain innovation performance.

Methodology: The study used a case research method that involved interviewing ten purposively selected managers of micro and small furniture industries in Arusha, Dar es Salaam and Mbeya cities of Tanzania. Subsequently, the study used illustrative and content analysis methods to compare and align predetermined theoretical relationships on how dynamic capabilities and inbound open innovation explain innovation performance to empirical results.

Originality: The use of illustrative analysis to compare extant theoretical relationships between dynamic capabilities, inbound open innovation, and innovation performance to case studies' processes in this study is novel to the open innovation literature. Also, the resultant conceptual framework and relationships linking inbound open innovation to innovation performance through systematic processes of dynamic capabilities are novel.

Main results: This study showed that inbound open innovation explains innovation performance through systematic complementary processes of dynamic capabilities. Moreover, the study showed that if inbound open innovation generates complex external ideas, micro and small firms adopt coupled open innovation as a predecessor of dynamic capabilities to unlock complexity.

Theoretical contributions: This study has integrated the theories of open innovation and dynamic capabilities by developing a conceptual framework and relationships that show how inbound open innovation explains innovation performance through dynamic capabilities.

¹ Lecturer, Department of Business Management, Mbeya University of Science and Technology (MUST), P.O. Box, 131, Mbeya, Main campus, Iyunga, Mbeya, Tanzania, e-mail: yosesabo17@mustudent.ac.tz, and yohana.sesabo@must.ac.tz

² Senior Lecturer, Department of Marketing and Entrepreneurship, Mzumbe University (MU), P.o. Box 6, Mzumbe, Morogoro, Tanzania, e-mail: mpkato@mzumbe.ac.tz

³ Senior Lecturer, Department of Marketing and Entrepreneurship, Mzumbe University (MU), P.o. Box 6, Mzumbe, Morogoro, Tanzania, e-mail: ejchao@mzumbe.ac.tz

Practical contributions: This study has revealed alternative combinations of dynamic capabilities that business managers need to benefit innovation performance from inbound open innovation.

Keywords: capacity, dynamic capabilities, innovation, open innovation, micro and small business

INNOVACIÓN EN MICRO Y PEQUEÑAS EMPRESAS: CÓMO LA INNOVACIÓN ABIERTA ENTRANTE Y LAS CAPACIDADES DINÁMICAS TRABAJAN JUNTAS PARA EXPLICAR EL DESEMPEÑO DE LA INNOVACIÓN

ABSTRACTO

Propósito: Este estudio examinó cómo la innovación abierta entrante y las capacidades dinámicas (capacidad de detección, captura y transformación) trabajan juntas para explicar el desempeño de la innovación.

Metodología: El estudio utilizado a método de investigación de caso que involucró entrevistar a diez gerentes seleccionados intencionalmente de micro y pequeñas industrias de muebles en las ciudades de Arusha, Dar es Salaam y Mbeya en Tanzania. Posteriormente, el estudio utilizó métodos ilustrativos y de análisis de contenido para comparar y alinear relaciones teóricas predeterminadas sobre cómo las capacidades dinámicas y la innovación abierta entrante explican el rendimiento de la innovación con los resultados empíricos.

Originalidad: El uso del análisis ilustrativo para comparar las relaciones teóricas existentes entre las capacidades dinámicas, la innovación abierta entrante y el desempeño de la innovación con los procesos de los estudios de caso en este estudio es novedoso para la literatura sobre innovación abierta. Además, el marco conceptual resultante y las relaciones que vinculan la innovación abierta entrante con el desempeño de la innovación a través de procesos sistemáticos de capacidades dinámicas son novedosos.

Resultados principales: Este estudio mostró que la innovación abierta entrante explica el desempeño de la innovación a través de procesos complementarios sistemáticos de capacidades dinámicas. Además, el estudio mostró que si la innovación abierta entrante genera ideas externas complejas, las micro y pequeñas empresas adoptan la innovación abierta acoplada como predecesora de las capacidades dinámicas para desbloquear la complejidad.

Contribuciones teóricas: Este estudio ha integrado las teorías de innovación abierta y capacidades dinámicas mediante el desarrollo de un marco conceptual y relaciones que muestran cómo la innovación abierta entrante explica el desempeño de la innovación a través de capacidades dinámicas.

Prácticas: Este estudio ha revelado combinaciones alternativas de capacidades dinámicas que los gerentes de negocios necesitan para beneficiar el desempeño de la innovación a partir de la innovación abierta entrante.

Palabras clave: capacidad, capacidades dinámicas, innovación, innovación abierta, micro y pequeña empresa

INTRODUCTION

Innovation in new or improved business products and processes is vital to the success of businesses, including micro and small ones (Kraus et al., 2019; Saunila, 2020). Innovations

capture market value, receive premium prices, foster reaction to environmental changes, and deter competitor replication, leading to competitive performance (Teece, 2017). These innovation benefits accrue into respective economies' income, employment, and tax revenue. As a result, knowledge of how to improve innovation interests micro and small business managers and their promoters, including policymakers, educators, and consultants.

Studying how modern businesses innovate, Chesbrough introduced the concept of open innovation (OI) in 2003 (Vanhaverbeke, 2017; Bogers et al., 2019). The idea is that businesses opening to external parties gain external ideas and information, which improves innovation performance (Chesbrough, 2003). The opening involves three OI processes (strategies): inbound OI, outbound OI, and coupled OI (Gassman & Enkel, 2004; Mazzola et al., 2016; West & Bogers, 2017). Inbound, outbound, and coupled OI involve monetary and non-monetary knowledge acquisition from, transfer to, and sharing with customers, competitors, Universities and other external parties that direct ideas and information for innovation from outside-in, inside-out, and both outside-in and inside-out the firm, respectively (Gassman et al., 2009; Hinteregger et al., 2018; West & Bogers, 2017). Indeed, some researchers (Hinteregger et al., 2018; Leitao et al., 2020) have indicated significant positive effects of OI strategies on innovation performance.

However, many other researchers (Filiou, 2020; Greco et al., 2016; Exposito et al., 2019) revealed negative, u-shaped and insignificant positive relationships between OI strategies or their activities and innovation performance. These relationships stem from the costs of over-searching and poorly selecting external ideas, leaking internal ideas to external parties, failing to manage external relationships, and imply that firms need capabilities to manage OI (Greco et al., 2016; Laursen & Salter, 2006; Ovuakporie et al., 2021). Accordingly, dynamic capabilities that address the role of external resources in complementing firm resources and the dynamic environment in which they operate provide opportunities to explain innovation performance in OI (Vanhaverbeke & Cloudt, 2014; West & Bogers, 2017). Moreover, the strategic nature of OI knowledge exacerbates the need for strategic processes such as dynamic capabilities (Teece, 2020).

Prior studies have identified the dynamic capabilities for OI which include sensing, seizing, transforming, absorptive, and collaboration capacities (Grimaldi et al., 2013; de Aro & Perez, 2021; Pihlajamaa, 2021). This list of dynamic capabilities for OI differs by author, but the current study focuses on Teece (2007)'s micro-foundation of dynamic capabilities, namely sensing, seizing and transforming capacities. These capacities reflect the generic implication of

strategies to a given firm, the possibilities of each firm to apply them unique from other firms, and surface extant literature the most (Kump et al., 2019; Schilke et al., 2018).

Also, some prior studies investigated the relationships between OI and dynamic capabilities in fostering innovation performance. For example, Ovuakporie et al. (2021) showed that transforming capacity moderates the effect of OI on innovation performance. Pundziene et al. (2021) found that dynamic capabilities enhance OI, which determines innovation performance. Van Lieshout et al. (2021) framed OI as a determinant of each dynamic capability, whereas each capability reciprocates to foster OI and simultaneously foster innovation performance. Teece (2020)'s case research describes a bi-direction relationship between each dynamic capability and OI. Hutton et al. (2021)'s case research describes linear and reciprocal relationships, whereas OI realisation leads to seizing capacity, OI engagement, seizing capacity, and OI appropriation, in this order. OI engagement and appropriation each reciprocate to foster sensing capacity.

The relationship between OI and dynamic capabilities in prior studies is ambivalent and based on modelling each dynamic capability independently. This modelling is sceptical, for example, on how sensing opportunities independent of their seizing leads to innovation performance in actual firm processes. This study models dynamic capabilities as systematically dependent on one after another to link inbound OI to innovation performance in micro and small furniture industries (MSFIs) in Tanzania. The focus on inbound OI is due to its high adoption in small businesses (Chabbouh & Boujelbene, 2022; Roper et al., 2017). The modelling extends Teece (2007)'s process model to integrate inbound OI separate from dynamic capabilities. Teece's model embedded inbound OI within sensing capacity (Vanhaverbeke & Cloudt, 2014). Integrating OI and dynamic capabilities as separate concepts enriches each concept (Teece, 2020). Consequently, this study contributes to framing relationships that clarify how dynamic capabilities link inbound OI to innovation performance. As stated earlier, past studies have yet to elaborate well on the mechanism tying OI to innovation performance (Teece, 2020).

In addition, the framework of relationships between inbound OI, dynamic capabilities and innovation performance is vital for guiding quantitative empirical research toward theorising the linkage between openness and dynamic capabilities. Conceptual frameworks set the basis for researchers to test proposed relationships quantitatively (Giniuniene & Jurksiene, 2015). Because processes reveal the order of occurrence of concepts (Neuman, 2014), this study's process approach enhances micro and small business managers' knowledge of prioritising inbound OI and dynamic capabilities. Also, the paper provides empirical evidence on the relationship between dynamic capabilities and OI in explaining innovation performance

from a low-tech context in developing countries. In this context, research on OI is inadequate (Hinteregger et al., 2018). Hence, the study contributes to filling the knowledge gap about the applicability of theories of OI and dynamic capabilities in developing nations of Southern Africa.

THEORETICAL REFERENCE FRAMEWORK

Pioneering the OI view, Chesbrough (2003) observed that information and communication development spread knowledge once held in inhouse-R&D to external parties such as customers, universities, and competitors. As a result, firms' opening to knowledge searching from, transferring to, and sharing with the external parties gained external ideas not present internally and commercialised their ideas to the external parties to improve innovation performance (Chesbrough, 2003; Gassman et al., 2009; Chesbrough & Bogers, 2014). From this OI view, inbound OI, due to idea searching and acquiring from external parties, directs new external ideas toward firms (West & Bogers, 2017; Vanhaverbeke, 2017). As such, broadening the number of external parties and deepening their extent of interaction increases the flow of external ideas and information in the firm (Laursen & Salter, 2006; D'Ambrossio et al., 2017).

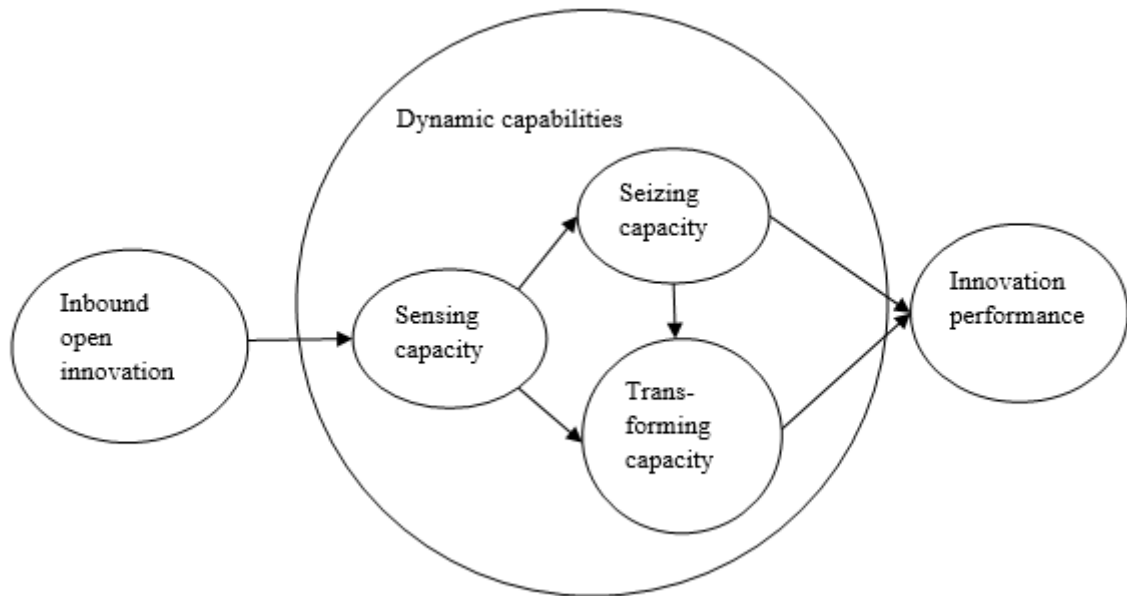
While the broadened and deepened search for knowledge from external parties increases the flow of external ideas for innovation in firms, research (Laursen & Salter, 2006; Greco et al., 2016; Aliasghar et al., 2020) has shown that unless the firms have abilities to absorb and use the external ideas for innovation, their search costs and poor choice and execution impend innovation. Subsequently, firms need sensing capacity, seizing capacity, and transforming capacity to see and execute external innovation opportunities into innovation performance (Grimaldi et al., 2013; Pihlajamaa, 2021). However, applying sensing capacity, seizing capacity and transforming capacity independent of each other in prior studies (Hutton et al., 2021; Ovuakporie et al., 2021; Van Lieshout et al., 2021; Teece, 2020) has not reflected actual firm innovation processes. Teece (2007)'s process model suggests that sensing capacity initiates innovation by enabling firms to discern external opportunities. Seizing capacity and transforming capacity, in this order, follow to foster firms' investment and transformation of existing resources to execute opportunities into innovation outcomes and sustain the outcomes.

Extending Teece's model, this study separates inbound OI from sensing capacity. As pointed out earlier, Teece (2020) has argued for integrating dynamic capabilities and OI to enrich each concept. Due to directing external ideas inside the firm (Chesbrough & Bogers, 2014; West & Bogers, 2017), inbound OI contributes to sensing capacity, as shown in figure 1.

The external ideas and information come in pictures, conversations, and angst expressions, which firms must analyse to discern innovation opportunities (Teece, 2007). Because sensing capacity embodies cognitive and analytical tools (Hodgkinson & Healey, 2011), the flow of external ideas and information from inbound OI contributes to their analysis, which increases the likelihood of firms’ identification of opportunities for innovation (sensing capacity). Accordingly, Hutton et al. (2021) found that engagement in knowledge search (inbound OI) contributes to sensing capacity.

Figure 1

Conceptual framework of inbound open innovation, dynamic capabilities, and innovation performance



Source: Authors’ construction

Unless executed, merely identifying innovation opportunities does not lead to innovation performance. One has to seize the identified opportunities by investing resources to execute them and attain innovation performance. Seizing capacity consists of investment decisions that facilitate selection and on-time commitment of appropriate and adequate resources to execute the opportunities (Teece, 2017). Connecting seizing capacity to opportunities, Kindstrom et al. (2013) argued that sensing innovation opportunities is a preliminary stage that requires their seizing to help firms produce competitive advantage (innovation), at least in the short run. Moreover, Min and Kim (2021) found that seizing sensed opportunities contributes to innovation performance. This paragraph, connected to the

preceding discussion on inbound OI as a source of external ideas that lead to sensing opportunities, underscores the following proposition:

Proposition 1 (P1): Inbound OI positively affects innovation performance through sensing capacity and seizing capacity.

While the preceding discussion suggests that seizing capacity leads to the execution of opportunities to achieve innovation performance, firms sometimes face limitations in seizing capacity or sense opportunities that do not require seizing immediately. Instead, firms change existing resources (transforming capacity) to execute the opportunities. For example, following government and media reports on the dire implications of Covid 19 spread and respective lockdown measures (inbound OI), firms realised the opportunity to work without physically meeting by using existing information and communication tools such as computers (sensing capacity). In response to the opportunity, firms changed their routines to working from home and meeting on online platforms such as Zoom (transforming capacity). Moreover, businesses liquidate resources like machinery that no longer help to seize opportunities well and resort to outsourcing the services once performed by the liquidated machine until the owner solicits enough funds to buy a new machine. This change-making ability entails transforming capacity (Kump et al., 2019), whereas the resulting changes in resources and routines entail management innovation (Damanpour et al., 2018). Accordingly, Ovuakporie et al. (2021) indicate a positive effect of transforming capacity in fostering the effect of inbound OI on innovation performance. The discussion in this paragraph, connected to the previous discussions on inbound OI as a source of external ideas for sensing opportunities, leads this study to propose the following:

Proposition 2 (P2): Inbound OI positively influences innovation performance through sensing capacity, and transforming capacity.

Teece (2007), on his side, supposed that seizing capacity leads to innovation performance once complemented by transforming capacity. The logic behind the complementarity is that seizing opportunities executes them to generate innovative outcomes. Their accumulation and unique changes trigger changes in existing resources (transforming capacity) to sustain innovation outcomes. Similarly, Chiu, Chi, Chang and Chen (2016), in their study of Chinese manufacturers, verified that the complementary process of sensing capacity,

seizing capacity, and transforming capacity, in this order, contributes to radical innovation. This systematic relationship of sensing capacity to seizing capacity and transforming capacity, in extension to inbound OI as the source of external ideas for innovation, underlies the following proposition:

Proposition 3 (P3): Inbound OI positively affects innovation performance through sensing capacity, seizing capacity, and transforming capacity.

METHOD

Research design

This study applied a qualitative case research design. The study adopted the design due to its suitability in detailing processes and relationships underlying their concepts in real contexts (Maxwell, 2004; Yin, 2018). To understand how inbound OI and dynamic capabilities explain innovation performance from the process view by using immature theories of OI and dynamic capabilities to guide the study, the researchers had to choose a design that can compare proposed theoretical relationships to actual firm processes. Neuman (2014) agrees that case research allows comparing empirical relationships to prior theories and confirming or developing them.

Sample and data collection

This study sampled ten micro and small furniture industries (MSFIs), four, three, and three MSFIs from large Tanzanian cities of Dar es Salaam, Arusha, and Mbeya, respectively. This sample size decision followed Francis et al. (2009)'s advice for qualitative researchers to initially sample 10 respondents, beyond which the researchers can keep increasing three respondents at a time until when new data stops unfolding (data saturation). Nevertheless, this study's sample reached saturation point at the seventh (07) case, whereas the three additional cases did not reveal new data, making the ten cases adequate. Appendix 2, for qualitative data coding, illustrates the sale of services and cooperation with training institutions as the latest new themes in the 7th case.

The study used purposive sampling procedures to select ten (10) cases of MSFIs from three wards, which statistics from each city's trade office indicated have highest number of licensed MSFIs. This selection of wards followed the logic that competition enhances innovation (Moen et al., 2018). In each of the wards, the researchers asked the ward executive officers to identify one micro (having 1-4 employees) or small (5-49 employees) that uses the

most modern production facilities and produces the innovative furniture. The criterion of number of employees ensured the study selects MSFIs in line with the Tanzania's Small and Medium Enterprises Policy 2003 definition of micro and small enterprises (URT, 2003). The criterion of innovation ensured the study selects the MSFIs having the desired property of innovation performance. The officers know the MSFIs because they collect local government levies, and monitor their licensing status and participation in local development projects. Purposive sampling enhances the selection of a few cases with interesting research properties (Yin, 2018). Moreover, due to merit selection criteria, purposive sampling saves time, cost and energy to identify a few respondents with the requisite information (Creswell, 2009). Table 1 describes the sample, showing that most MSFIs that the study sampled are below ten operation year (young) and generic furniture producers.

Table 1

Description of cases

No.	No. of workers	Type of firm	Furniture activities	Experience	Location
1	3	Micro	All except sofa	9yrs	Mbeya
2	6	Small	All except sofa	5yrs	Mbeya
3	4	Micro	All	4yrs	Mbeya
4	6	Small	All except sofa	9yrs	Arusha
5	3	Micro	Sofa only	5yrs	Arusha
6	4	Micro	All except sofa	7yrs	Arusha
7	4	Micro	All except sofa	4yrs	Dar-es-salaam
8	12	Small	All except sofa	10yrs	Dar-es-salaam
9	49	Small	All	5yrs	Dar-es salaam
10	15	Small	All except sofa	26yrs	Dar-es-salaam

Source: Created by the researchers (2022)

This study solicited data from the owner or manager of each MSFI. In particular, the study applied a semi-structured interview to focus the interview on the themes of interest. The questions of the interview guide focused on themes relating to where and how the MSFIs obtain external ideas and information for innovation; and how they process the ideas and information step after step to attain innovation performance. Appendix 1 shows the interview guide that the study used. The study used the guide flexibly to allow follow-up questions such as why, what follows next, and how. Flexibility in allowing follow-up questions in the interview guide adds missing details and clarity of connection between concepts or themes (Saunders et al., 2009).

Table 2 describes the interview, revealing that most interviewees were owner-managers and production or sales managers in a few cases. These managers know their firms' activities and have been used to solicit data in prior studies (Flor et al., 2017). Furthermore, most interviewees are primary and secondary education leavers, reflecting that small business is an option for school dropouts in Tanzania. Also, all the interviewees were men due to the masculinity of the furniture industry. The interview sessions ranged from 30 to 50 minutes.

Table 2

Description of interview

No.	ID	Position	Gender	Education	Interview time
1	OMM1	Owner manager	Male	Diploma	37
2	OMM2	Owner manager	Male	Masters	39
3	OMM3	Owner manager	Male	Certificate	50
4	OMA4	Owner manager	Male	Primary	40
5	OMA5	Owner manager	Male	Secondary	30
6	OMA6	Owner manager	Male	Secondary	35
7	OMD7	Owner manager	Male	Primary	47
8	OMD8	Owner manager	Male	Secondary	31
9	OMD9	Sales manager	Male	Degree	43
10	OMD10	Operation manager	Male	Diploma	40

Source: Created by the researchers (2022)

RESULTS

This study adopted comparative (illustrative) and thematic analysis techniques to derive the results. These two analysis methods helped researchers triangulate the results from multiple methodological perspectives to enhance their reliability and validity (Denscombe, 2007). Further validation of the results involved sending the results back to two knowledgeable interviewees (bachelor's and master's degree holders) to check for any researchers' misinterpretation (Maxwell, 2004; Creswell, 2009). The illustrative analysis was used for its appropriateness when using a prior theory that is not proven or mature in explaining the underlying relationships (Neuman, 2014). As stated in the introduction of this study, the integration of theories of dynamic capabilities and open innovation that the present study applied is still in development. Neuman (2014, p. 489) asserts that *the illustrative data analysis*

method takes theoretical concepts as empty boxes for filling specific empirical examples and descriptions.

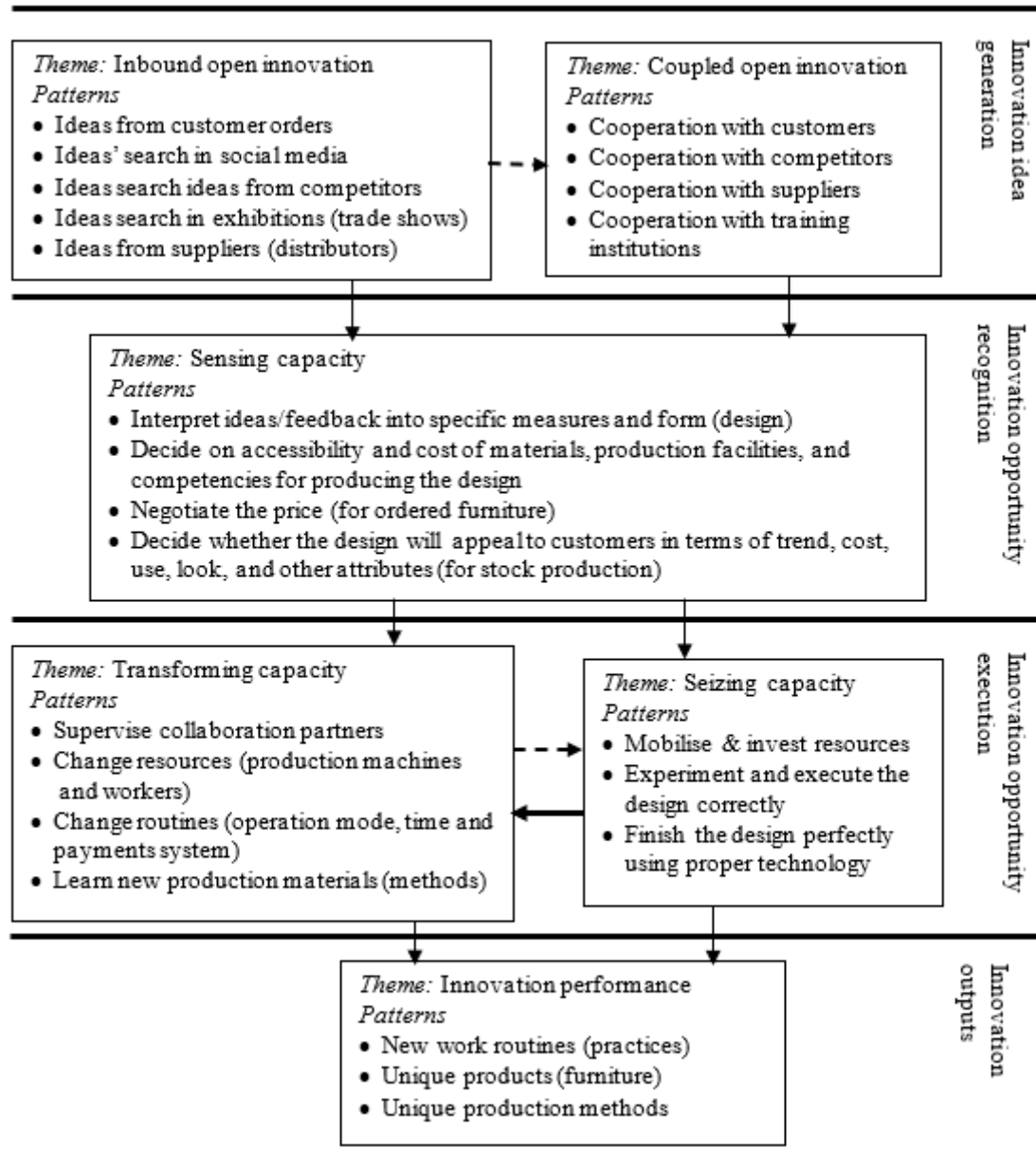
Following Neuman (2014) and Skocpol (1984), first, the study adopted the conceptual framework in figure 1 as an analogy of full-line empty boxes and full-line arrows. Second, the researchers read the data transcripts repeatedly, applied thematic analysis to extract empirical themes related to inbound OI idea sourcing and their processing to innovation performance, and categorised the themes into generic concepts. Appendix 2 illustrates this study's thematic coding. Along with the themes, the researchers extracted verbal quotes from interviewees to demonstrate the origin of themes from respondents (Creswell, 2009; Sandelowski, 1998). The researchers coded the interviewees anonymously using the letter "M" for a manager, followed by an Arabic number's subscript to indicate the interview order, from 1 for the first to 10 for the tenth interview. After the number, letters A or D or M followed to identify the Arusha, Dar es Salaam, and Mbeya cities of origin of the interviewee. For example, the code for the ninth manager's interview who operates in Dar es Salaam is M9D.

Third, the researchers filled into the analogy of concepts, the empirical themes that suit the concepts in the analogy, as shown with full line boxes and arrows in figure 2. Non-fitting empirical themes and their relations resulted in emerging themes for modifying the theories' analogy, as shown by dotted line arrows and boxes in figure 2. According to Neuman (2014), empirical themes and patterns of their relationships that fit and unfit the analogy verify and modify the theory (framework) respectively. Thus, this comparison of case results to the analogy from the theory helps to confirm, modify or reject it as the case may apply (Neuman, 2014).

The results in figure 2 indicate that inbound OI explains innovation performance through a systematic process linking dynamic capabilities serially. Inbound OI generates innovation ideas that sensing capacity, and seizing capacity or transforming capacity in this order, process to recognise opportunities and execute them into innovation outcomes, as detailed henceforth.

Figure 2

Interview results



Source: Created by the authors (20210).

Notes

- > Relationships not predetermined but emerged from interview results
- > Predetermined relationships modified due to lack of empirical support

Innovation idea generation

The MSFIs start the open innovation process by searching for ideas for furniture products or processes innovation and receiving them as customer orders or promotion information. As M₁M and M₁₀D state, the MSFIs search and receive ideas and information

mainly from social media and market-based external parties (customers, competitors, distributors, and suppliers).

Producing furniture starts with customers who bring us furniture pictures saved on mobile phones for production orders. If the pictures embed unique furniture ideas, we produce innovative furniture. (M₁M)

...technology has opened everything; customers bring us unique furniture they download from social media or pictures from friends for order. Also, we visit social media apps, especially Pinterest and Carpenters, to source new furniture designs or processes. (M₁₀D)

Innovation opportunity recognition

Having generated external ideas or information for innovation, the MSFIs assess if such ideas and information constitute an opportunity. The MSFIs use knowledge of industry practices and technology trends to interpret the ideas and information's specific furniture designs. This interpretation is crucial because the ideas and information come in pictures, suggestions, orders, and complaints.

After the interpretation, the MSFIs assess the availability and costs of competencies, materials, and facilities for producing the design and negotiate its price with customers. If the MSFIs cannot produce the design or the customer fails to pay the price, then no opportunity exists. The design remains ideal because the MSFIs produce furniture on order and rarely produce without order when anticipating potential markets. Speaking of the opportunity sensing phase, M₉D said the following;

Once a customer orders a piece of unique furniture (inbound OI), we articulate its specific measures, form, and materials to know if we can make it and estimate its cost. After that, we negotiate the deal with the customer (sensing capacity). If the customer does not afford the cost, there is no deal even if we can produce the furniture because we produce only on order. Likewise, if we cannot produce the furniture, there is nothing else we can do except tell the customer to look for a carpenter elsewhere. (M₉D)

Sometimes the MSFIs, due complexity of ideas from inbound OI, collaborate with external parties to assess and interpret the furniture design or process embedded in the complex ideas. This cooperation may expose the shared ideas and information to opportunist competitors and customers for stealing. For example, customers that disagree with their MSFIs take the shared ideas for the order to competitors.

Nevertheless, due to their varied skills and knowledge of industry technologies, materials, and information, the external cooperation parties assist the MSFIs in interpreting the design embedded in the complex ideas. Subsequently, the MSFIs proceed alone or with their

cooperation partners to decide the cost and affordability of the design or process. Failure to interpret the complex idea or perceive its affordability in production competencies and customers' payment renders the MSFIs to abandon the idea. The interview quotes from M_{7D} and M_{8D}, respectively, support the good and bad of cooperation in enhancing sensing capacity for complex innovation ideas and risking their leakages.

Cooperation with big furniture producers (coupled OI) is not beneficial to MSFIs. The big furniture producer steals ideas from the small producers. In the words of manager M_{7D}, company x (a disguised name) welcomes MSFIs, needing more capital to implement their furniture ideas for manufacturing capacity building. However, they become frustrated after losing their ideas to the institution as it develops and sells them to other institutions (potential for idea leakage during coupled OI). (M_{7D})

Customers sometimes order us furniture in pictures we do not understand (inbound OI). In this case, we seek advice from other carpenters or the ordering customers to interpret the picture (coupled OI) before we can agree on the deal (sensing capacity). (M_{8D})

Innovation opportunity execution

Sensing the opportunity in itself is not an end. Figure 2 shows that sensing opportunities lead to their execution to attain innovation performance in three mechanisms. The first mechanisms involve the MSFIs seizing (seizing capacity) the identified opportunities by mobilising and allocating financial and other resources. The MSFIs mobilise funds from customer advance payment, credits, and savings for purchasing production materials and paying labour and machinery expenses.

The mobilisation of resources and their coordinated allocation enables the MSFIs to cut, mould, join and finish the materials perfectly and stylishly. The cutting, moulding, and joining of the materials to components and furniture require the MSFIs' competence in choosing furniture materials, skilled personnel, and using technologies. Also, the MSFIs need skills in evolving finishing technologies, such as sending fillers to finish the furniture best. Otherwise, lag in technology for furniture finishing is a challenge that most MSFIs in developing nations face. Given the seizing capacity, the MSFIs mobilise and invest resources well to produce the desired innovative furniture. The following quotes from M_{6A}, M_{7D}, and M_{3M} unveil the role of seizing capacity-related tasks in executing innovation opportunities to achieve innovation performance.

Having agreed with the customer about a specific furniture design and its cost, including contingencies for timber breakage and execution mistakes (sensing capacity), we negotiate advance payment from the customer. Then, we use the payment as capital to buy materials and every other resource for doing the job (seizing capacity). (M_{6A})

The purchase of timbers follows their grinding and cutting to components with smoothness, length, and shape that fit customer requirements upon joinery. Unlike in the old age of hand-based tools, we now do these tasks using machines fast, simple, and perfect (seizing capacity). Hence, skill in how to use modern machines is crucial. (M_{7D})

...an essential set of finishing activities must follow joinery to decorate what customers see. Without proper finishing, customers reject even the best-joined furniture and claim a refund of their advance payment. Poor finishing may sometimes resume the joinery process or interpretation of customer requirements. That is why innovation eventually fails or ends in multiple versions of trial and error. (M_{3M})

The results of seizing innovation opportunities, connected to their sensing and idea and information generation, entail the following relationships. Inbound OI contributes to sensing capacity. Subsequently, sensing capacity contributes to seizing capacity that contributes to innovation performance. Another relationship is that due to generating complex ideas, inbound OI contributes to coupled OI. Coupled OI contributes to sensing capacity that contributes to seizing capacity. Seizing capacity contributes to innovation performance. The former relationship supports the previously developed proposition 1, while the later relationship adds a new proposition 4:

Proposition 1 (P1): Inbound OI positively affects innovation performance through sensing and seizing capacity.

Proposition 4 (P4): Inbound OI positively affects innovation performance through coupled OI, sensing capacity, and seizing capacity.

Alternative to seizing identified opportunities (sensing capacity), figure 2 shows that the MSFIs' respond by transforming existing resources (transforming capacity), which leads to innovation performance, at least in the short run. This response results mainly from constraints in mobilising new resources (seizing capacity). Instead, MSFIs reconfigure existing resources (transforming capacity) to execute the opportunities. For example, selling old machines that no longer suit industry technology trends leads to adopting new or improved operation modes or routines. These new routines constitute business process innovation, often called management innovation. To illustrate the attainment of business process innovation after reconfiguring old resources in response to innovation opportunities, M_{1M} remarked the following:

Looking at trending furniture production machines on social media and among fellow carpenters (inbound OI), I realised the need for a modern machine (sensing capacity). Then, I sold the two old hand-based machines quickly before many carpenters could become cautious enough not to buy the machine (transforming capacity). Because the proceeds from selling the old machines fell short of the price of the modern machine, I started outsourcing the services I was executing in-house using the old machine (new production routine as management innovation) for some time. After saving enough funds to add to the one from selling the old machine, I bought the modern machine (transforming capacity enabling seizing capacity). (M₁M)

The results of transforming existing resources to attain business process innovation, connected to sensing opportunities and their idea and information generation, reveal the two relationships. One relationship is that inbound OI contributes to sensing capacity. Then, sensing capacity contributes to transforming capacity that contributes to innovation performance. Another relationship is that due to generating complex ideas, inbound OI contributes to coupled OI, which contributes to sensing capacity. Sensing capacity, in consequence, contributes to transforming capacity, which leads to innovation performance. The former relationship verifies the previously developed proposition 2, but the latter relationship adds a new proposition 5:

Proposition 2 (P2): Inbound OI positively affects innovation performance through sensing capacity and transforming capacity.

Proposition 5 (P5): Inbound OI positively affects innovation performance through coupled OI, sensing capacity, and transforming capacity.

Apart from leading to innovation performance, changing existing resources (transforming capacity) facilitates seizing capacity. M₁M's previous quote indicates sell of old machine (transforming capacity) added to savings to facilitate purchase of a new machine (seizing capacity). In some cases, the MSFIs retrench existing workers and hire new ones (transforming capacity) to gain competencies for seizing opportunities (seizing capacity) to produce innovative furniture. Also, activities such as learning online how to operate a new machine (transforming capacity) enhance its usage to execute opportunities (seizing capacity) into innovative furniture. The following interview quotes from M₂M and M₄A clarify how sensing opportunities leads to transforming capacity, and seizing capacity, in this order, to attain innovation performance:

To attend to customer orders that embed unique and complex furniture designs (inbound OI), I cooperate with other carpenters (coupled OI) to enhance my understanding of complex design (sensing capacity). For this cooperation to work, I must adjust my work routine to accommodate the cooperation partners' timetable and extend my supervision role to the

cooperation partner (transforming capacity). My supervision hides the customer from competitors but rests all responsibilities to the customer on my shoulder. (M_{2M})
In this digital era, getting ideas about what is happening around the globe is very easy. If I am facing problems with production processes and want to buy a new machine, I search for a furniture machine that can do the work I am interested in doing on the internet via my mobile phone (inbound OI). Through this search, I can learn about various latest machines, especially Chinese ones, and learn online how they operate and their prices (transforming capacity). Satisfied with my knowledge, I can order one online, ready for use upon its arrival (seizing capacity), and produce the desired furniture (innovation performance). (M_{4A})

The results of transforming resources and subsequently seizing innovation opportunities, in connection to their sensing and idea and information generation, underlie the following relationships. First, inbound OI contributes to sensing capacity that contributes to transforming capacity. Transforming capacity contributes to seizing capacity that contributes to innovation performance. Second, inbound OI for generating complex ideas contributes to coupled OI which contributes to sensing capacity. Sensing capacity contributes to transforming capacity, which contributes to seizing capacity. Seizing capacity, in the end, contributes to innovation performance. The first relationship modifies the sequencing of the DCs from sensing-seizing-transforming capacity to sensing-transforming-seizing capacity in the previously developed hypothesis 3. The second relationship adds a new proposition 6:

Proposition 3 (P3): Inbound OI positively affects innovation performance through sensing capacity, transforming capacity, and seizing capacity.

Proposition 6 (P6): Inbound OI positively affects innovation performance through coupled OI, sensing capacity, transforming capacity, and seizing capacity.

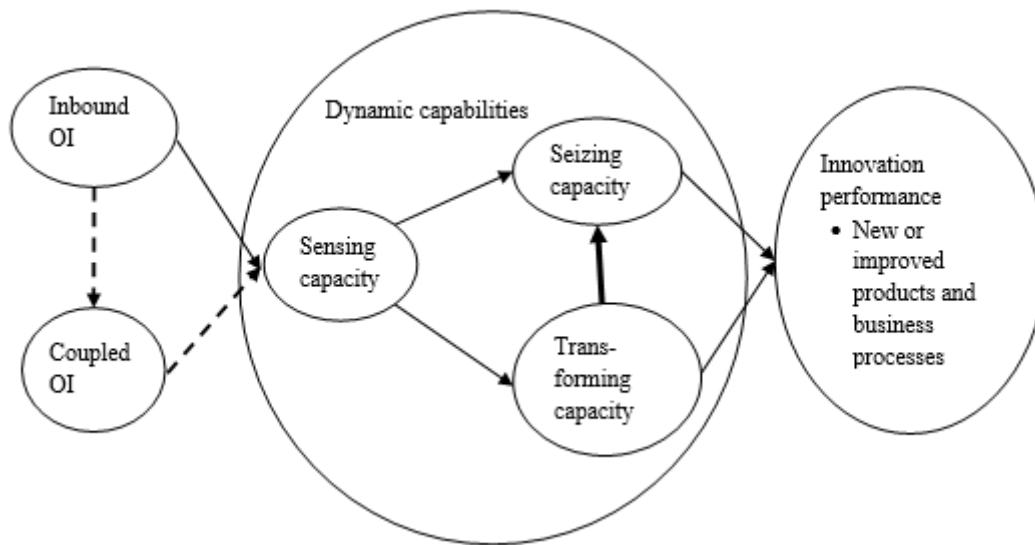
DISCUSSION

This study intended to examine how inbound OI and dynamic capabilities (sensing, seizing, and transforming capacity) work together to explain innovation performance. In line with prior theorisation, this case research has found that inbound OI contributes to innovation performance through systematic processes of dynamic capabilities. The findings support the propositions that inbound OI positively affects innovation performance through; sensing capacity, and seizing capacity (P1); and sensing capacity, and transforming capacity (P2). In extension to prior theorisation, the results modified the third proposition to the statement that inbound OI positively affects innovation performance through sensing capacity, transforming capacity, and transforming capacity (P3). Also, the results revealed three emerging propositions

that inbound OI positively affects innovation performance through; coupled OI, sensing capacity and seizing capacity (P4); coupled OI, sensing capacity and transforming capacity (P5); and coupled OI, sensing capacity, transforming capacity, and seizing capacity (P6). Figure 3 of the modified conceptual framework illustrates the results of this study.

Figure 3

A modified conceptual framework of inbound open innovation, dynamic capabilities, and innovation performance



Source: The authors (2022)

Notes

- Additional relationships that emerged from the data
- Modified prior proposed relationships

The explanation behind the findings of this study is that MSFIs follow a systematic linear innovation process in which success in a previous step leads to success in the next step. The analysis of interviews demonstrated that the MSFIs adopt a distributed innovation approach at the idea generation stage by drawing on ideas and information across various external actors, mainly market-based ones. This initial stage is non-linear, mainly demand-pull-driven (customers) and technology-push-driven (suppliers), where the MSFIs visit social media, competitor’s factories, and exhibitions or trade shows to search for new furniture products or production process ideas. Also, customers' orders for furniture and supplier’s promotion information on production processes often contain ideas for MSFIs’ innovation. MSFIs seek innovative ideas because unique products attract customers, and new processes improve production efficiency and quality.

After generating the innovation idea, the MSFIs process the idea mainly internally and systematically using dynamic capabilities. The analysis of cases of MSFIs consistently showed that the generation of innovation ideas leads to their assessment for execution because not all innovation ideas are actionable. The MSFIs use their sensing capacity that is embedded in the knowledge of industry practices and technologies to interpret the idea's design and assess access to its production competencies, materials, machinery, and customer affordability. If the idea is too complex to assess, the MSFIs cooperate with external parties (coupled OI) to share knowledge for the assessment. The MSFIs sense an innovation opportunity if the assessment shows the idea is worthy of execution; otherwise, the MSFIs will not advance to the next step.

After sensing the innovation opportunity, this study's case-research results showed that it leads the MSFIs and cooperation partners (in cases of cooperation) to use their seizing capacity to mobilise funds and materials, machinery and competencies. Along with mobilising the resources, the MSFIs use their technological and resource coordination competencies to cut, join and finish materials (timber) into the intended furniture innovation. If the MSFIs miss the seizing capacity, they fail to realise the intended furniture innovation. Otherwise, the MSFIs have to transform their existing resources, such as liquidating outdated machines or retrenching incompetent staff and adopt temporary operation modes such as outsourcing.

Adopting temporary operation modes never used by the respective MSFI entails innovation performance. Also, acquiring competent staff after retrenching the incompetent staff enhances the MSFIs' seizing capacity for opportunity execution to realise innovation performance. If the MSFIs fail to implement the transformation, they will fail to seize sensed opportunities and realise innovation performance. These explanations imply mainly a systematic linear innovation process. The MSFIs use inbound OI to generate innovation ideas. The dynamic capabilities complement one another to execute the idea to attain innovation performance so that if any dynamic capabilities fail, the process fails.

This study's findings that market-based external parties such as customers, competitors, and suppliers are the primary source of external innovation ideas in MSFIs are consistent with prior studies' results (Exposito et al., 2019; Almeida, 2021). These prior studies indicated that micro and small businesses source external ideas and information for innovation mainly from market-based external parties such as customers, competitors, and suppliers. The logic behind the results is due to resource inadequacy and respective preference for less informal sources of external ideas and information in micro and small businesses. Institutions such as universities and technology centres require formalised relations to access their ideas or cooperate with them.

In addition, the findings of this study support only, in part, most extant literature. First, the findings of this study support, partly, Bigliardi et al. (2020), who found that open innovation in food manufacturing Italian SMEs, a low-tech industry like furniture manufacturing, still embrace linear innovation models. In linear innovation models, innovation occurs in successive activities (Bigliardi et al., 2020). Similarly, this study has shown that MSFIs use external information and ideas to generate innovation ideas and subsequently execute them to attain innovation performance in successive processes of dynamic capabilities. However, Bigliardi and her colleague did not integrate the dynamic capabilities in explaining open innovation.

Second, the results of this study support, partly Van Lieshout et al. (2021)'s conceptual model that illustrates the intervention of dynamic capabilities between open innovation and innovation outcomes in deriving competitive advantage. However, Van Lieshout et al. (2021)'s model treats sensing capacity, seizing capacity, and transforming capacity parallel to each other (independent of each other). Nevertheless, this study has shown that the dynamic capabilities work in successive sequences of processes to complement one another. The difference between Van Lieshout et al. (2021) and this study possibly is methodological. The former is a conceptual paper drawing from prior literature. As stated in this study, mainstream literature adopted a variance model instead of a process one. Unlike the process model in this study, the variance model does not accurately trace the sequence occurrence of variables (Niederman et al., 2018).

Third, the results of this study support, in part, the process model of micro-foundations of dynamic capabilities. In this model, Teece (2007) and Chiu et al. (2016), in subsequence, revealed complementary processes of the dynamic capabilities in the order of sensing capacity to seizing capacity and transforming capacity. This study modified the order to sensing capacity, transforming capacity, and seizing capacity. This modification followed the logic that when seizing capacity comes first does not result in transforming capacity, as proposed in Teece (2007); instead, it leads to innovation outcomes. Innovation outcomes, in consequence, lead to transforming capacity to sustain the innovation outcomes, a concept beyond the scope of this study. However, when transforming capacity comes first, it changes existing firm resources. The changes constitute innovation outcomes and, at the same time, improve seizing capacity that leads to innovation outcomes. Hence, apart from the modification, this study extended Teece's process model to add sensing capacity to transforming capacity and sensing capacity to seizing capacity as systematic complementary processes that contribute to innovation performance.

The differences in the sequence of processes of the dynamic capabilities between this research and the prior studies (Chiu et al., 2016; Teece, 2007) are partly conceptual and

methodological. The prior studies encompassed inbound OI in sensing capacity, whereas the present study treated the two concepts separately. This conceptual difference traces to differences in methodology. This study matched its process model to actual firm processes, whereas Teece (2007)'s work was conceptual. In actual firm processes, external idea generation by inbound OI and their analysis to discern opportunities (sensing capacity) occur in distinct phases.

Fifth, the results of this study provide a different perspective on addressing complementarity among OI strategies. Cassiman and Valentini (2016) compared the effect of implementing both inbound OI and outbound OI simultaneously, as opposed to implementing each of the strategies alone, and concluded for non-complementarity. In contrast to this combinative approach, this study has illustrated that implementing the OI strategies sequentially, with inbound OI coming first to generate complex innovation ideas, requires the complementation of coupled OI to enhance sensing capacity for understanding the complex ideas.

CONCLUSION

This study concludes that implementing inbound OI strategy contributes to micro and small firms' innovation performance through dynamic capabilities. The dynamic capabilities complement one another in systematic processes of sensing capacity to seizing capacity, sensing capacity to transforming capacity, and sensing capacity to transforming capacity and seizing capacity to intervene in micro and small firm processing of external ideas and information to innovation performance. When inbound OI ideas and information are complex, firms collaborate with external parties (coupled OI) to enhance dynamic capabilities.

The findings of this study contribute to the literature in understanding the connection between open innovation and dynamic capabilities in explaining innovation performance. Prior studies (Vanhaverbeke & Cloudt, 2014; West & Bogers, 2017) have underscored the potential for complementarity of OI and dynamic capabilities and the need for further research to integrate them for improved explanations of firm performance, including innovation. However, research in response to the need has limited itself in identifying the dynamic capabilities (sensing, seizing, and transforming capacities inclusive) that are relevant for OI (Grimaldi et al., 2013; de Aro & Perez, 2021; Pihlajamaa, 2021) without clear causal explanations on their relationships. Much more attempts to explain causal relationships between OI, dynamic

capabilities, and innovation performance (Teece, 2020; Hutton et al., 2021; van Lieshout et al., 2021) used the dynamic capabilities without complementing them one after another as moderators, predecessors or mediators of OI. This research work has shown that to intervene processing of inbound OI ideas to innovation performance effectively, and the dynamic capabilities have to complement each other in systematic processes of sensing capacity to seizing capacity, sensing capacity to transforming capacity, and sensing capacity to transforming capacity and seizing capacity.

Another contribution of this research work extends and modifies Teece (2007)'s process model of micro-foundation for dynamic capabilities in several ways. First, Teece, in his process model, showed that the dynamic capabilities complement one another in the process from sensing capacity to transforming capacity and then seizing capacity (Chiu et al., 2016). However, this research has modified the process sequence to sensing capacity followed by transforming capacity and seizing capacity in this order. As elaborated in the discussion section, the immediate effect of seizing capacity is innovation outcomes instead of transforming capacity. Contrarily the immediate outcomes of transforming capacity are changes in existing resources that facilitate seizing capacity. Hence modification of the process to sensing capacity followed by transforming capacity and seizing capacity. Also, this work has shown that even the processes from sensing capacity to seizing capacity and sensing capacity to transforming capacity explain innovation performance, at least in the short run.

In addition, the results of this research contribute to the literature on how to approach the complementarity of OI strategies. According to Teece (2020), the OI literature implicitly assumes that the OI strategies are complementary. However, as discussed, prior studies that used a combined approach by comparing the effect of implementing more than OI strategies and one OI strategy (inbound OI and outbound OI Vs anyone) found no evidence of complementarity (Cassiman & Valentini, 2016). This research has shown that if MSFIs enact the OI strategies serially, with inbound OI coming first to generate complex innovation ideas, it requires complementation of coupled OI to enhance sensing capacity for understanding the complex ideas.

Practice-wise, the results of this study contribute to highlighting a potential for selective strategy in building dynamic capabilities. Teece (2007)'s complementary process from sensing capacity to seizing capacity and transforming capacity implies that one needs all three capabilities to realise competitive advantage, including innovation. At the same time, building dynamic capabilities is costly and takes a long time (Teece et al., 1997). Hence, the less the number of dynamic capabilities, the less the cost of building the capabilities. Lessening the cost

of building dynamic capabilities is vital because resource scarcity in micro and small firms is acute. This research has shown that even the dynamic capabilities processes involving sensing capacity and seizing capacity only or sensing capacity and transforming capacity only explain innovation performance. Hence micro and small firms can still benefit from building only two capabilities.

In addition, this research underpins the integrated application of OI and dynamic capabilities in explaining innovation performance in developing countries in southern Africa. Extant literature has suggested that dynamic capabilities and OI processes are contextual (Rangus et al., 2017; Schilke et al., 2018). Except for Chabbouh and Boujelbene (2021)'s study on Tunisian manufacturers, studies integrating OI and dynamic capabilities in Africa are few, raising scepticism on their applicability. This research shows that even in less developed Southern African countries like Tanzania, OI and dynamic capabilities are crucial in explaining innovation. Innovation training and policies in these countries must consider OI and dynamic capabilities.

Although this study has sufficiently illustrated how inbound OI and dynamic capabilities explain innovation performance together, its conceptual framework needs quantitative empirical tests. Further studies may test quantitatively the propositions from this study's conceptual framework. Such quantitative empirical tests will advance knowledge on the significance and relative efficacy of each complementary process of dynamic capabilities in intervening between inbound OI and innovation performance.

In addition, while this research has illustrated that the process of sensing capacity to seizing capacity, sensing capacity to transforming capacity, and sensing capacity to transforming capacity and seizing capacity intervene between inbound OI and innovation performance, it is unclear which process is the most efficient. Thus, further studies may integrate the transaction cost theory to shed light on the costs of each process and its effectiveness in realising innovation performance. This transaction cost perspective will assist resource-scarce micro and small firms in deciding the choice of dynamic capabilities if they cannot develop all of them.

Another research area would be to investigate context-specific reasons for the preference of market-based external parties over institutional partners in micro and small firms. The cases of micro and small furniture industries that this study interviewed showed high reliance on market-based external parties such as customers and competitors as opposed to institutional agents such as universities and technological centres. As discussed earlier,

Exposito et al. (2019) and Almeida (2021) echoed similar findings, arguing that the findings were probably due to SMEs' focus on incremental innovation that requires simple collaboration and fewer costs and informality in accessing market external parties. However, these reasons are speculative and not from developing countries' context of Africa. Understanding such context-specific factors is vital for policy action in promoting knowledge transfer from institutional external parties to micro and small firms.

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LIST OF APPENDICES

Appendix 1 - Interview guide for owner-managers

1. Give a brief history of your experience in furniture manufacturing and the current furniture business.
2. From which external parties do you source information and ideas for innovation in furniture products and production processes?
3. Explain step by step (and, where possible, give examples) how you convert sourced external ideas/information to innovative furniture products and processes.
4. In your opinion, what should the government and other stakeholders do to address open innovation challenges (if any) and enhance furniture manufacturing?

NOTE:

Ask questions such as “why, and what follows then or which one of the activities starts” for managers to clarify explanations seeming to lack clear sequences (linkages), and motives

Appendix 2 - Coding of qualitative data

Steps	Categories	No.	Themes	M1 M	M2 M	M3 M	M4 A	M5 A	M6 A	M7 D	M8 D	M9 D	M10 D	
First step (idea generation)	Inbound openness	1	Idea from customer order	√	√	√	√	√	√	√	√	√	√	
		2	Idea search in social media	√	√	√	√	√	√	√	√	√	√	
		3	Idea search from competitors	×	×	√	×	√	×	√	√	√	√	
		4	Idea search at exhibitions	×	×	√	×	×	×	×	×	×	×	
		5	Idea from suppliers' promotions	×	√	×	×	×	×	×	×	×	×	
	Coupled openness	6	Idea sharing with customers	√	×	√	×	×	×	×	×	√	×	×
		7	Idea sharing with competitors	√	√	√	√	√	×	√	√	√	√	
		8	Cooperation with training institutions	×	×	×	×	×	×	×	√√	×	×	×
Second step (innovation opportunity recognition)	Sensing capacity	9	Idea's design interpretation	√	√	√	√	√	√	√	√	√	√	
		10	Materials' access consideration	√	√	√	√	√	√	√	√	√	√	
		11	Technical competence consideration	√	√	√	√	√	√	√	√	√	√	
		12	Estimation of production cost	√	√	√	√	√	√	√	√	√	√	
		13	Negotiation of price with customers	√	√	√	√	√	√	√	√	√	√	
		14	Assessment of market for stocks	×	√	×	×	√	√	√	√	√	×	√
Third step (innovation opportunity execution)	Seizing capacity	15	Mobilise funding	√	√	√	√	√	√	√	√	√	√	
		16	Buy materials	√	√	√	√	√	√	√	√	√	√	
		17	Buy missing facilities	√	×	√	×	×	×	×	×	×	×	
		18	Outsource missing resources	×	√	√	√	×	×	×	×	×	×	
		19	Prepare (cut) the materials	√	√	√	√	√	√	√	√	√	√	
		20	Join cut materials	√	√	√	√	√	√	√	√	√	√	
	Trans-forming capacity	21	Perform finishing	√	√	√	√	×	√	√	√	√	√	
		22	Adjust work schedules	√	×	√	×	×	×	×	√	√	√	×
		23	Change span of control	√	×	√	×	×	×	×	√	√	√	×
		24	Dispose of obsolete machines	√	√	×	√	×	×	×	×	×	×	×
		25	Retrench obsolete skills	×	√	√	×	×	×	×	√	√	√	×
		26	Change payment systems	√	×	×	×	×	×	×	×	×	×	×
		27	Changing mode of operation	√	√	×	×	×	×	×	×	×	×	×
Innovation performance	28	Learn new skills or knowledge	×	√	×	√	√	×	×	×	√	×	×	
	29	Learn new production materials & facilities	×	√	×	√	×	×	×	×	√	×	√	
Fourth step (innovation outputs)	Innovation performance	30	New modes of operation or routines	√	√	√	×	×	×	×	×	×	√	
		31	Unique furniture products	√	√	√	√	√	√	√	√	√	√	
		32	Unique furniture production methods	√	√	√	×	×	×	×	√	×	×	

Source: Created by the researchers (2022)

Notes

√√ latest theme to appear in the data transcript and does not appear again (saturation point)

√ the appearance of the respective theme in the respective MSFI's data transcript

×