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Open Innovation in Young Ventures

Abstract

The purpose of this article is to identify the role start-ups play in the OI (OI) context by reviewing the existing body of research. Since the OI literature on young ventures is nascent, a stepwise review approach is applied, using the already more evolved findings of small and medium sized enterprises (SMEs) in order to derive similarities or differences. The findings indicate that if empirical studies with a similar research focus are conducted, similar results are likely to be obtained in both SMEs and young ventures. Generally, young ventures have a higher application of OI activities compared to large firms as it boosts their innovation performance enabling them to overcome the liability of smallness and newness. Because of this importance, combined with the limited number of quantitative studies available, ongoing research is required to further understand young ventures role in the OI context.

Keywords: SME; OI; Young; Young Venture

Introduction

Corporate environments and customer needs are evolving rapidly, which makes innovation essential for businesses to survive in the market (Bhaskaran 2006). However, SMEs face several challenges in differentiating their products from their competitors. SMEs lack the required financial capabilities and technical capabilities to effective imbed innovation within their business models (Hitchen et al. 2017). They must therefore collaborate with external partners to innovate successfully, to develop new income sources and to increase their profitability in relation to their competition (Ahn et al. 2015). Open Innovation (OI) is thus a logical step for many SMEs to undertake (Vanhaverbeke et al., 2012).

This applies to entities of every size within any industry, and the key question according to Chesbrough (2003a) that must be solved is how businesses manage the difficult process of innovation. Over recent years, the approach of OI has gained momentum and is discussed by both both researchers and practitioners (Dahlander and Gann 2007). "*OI is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firm look to advance their technology*", is the definition offered by Chesbrough (2003a: xxiv) who is regarded as the founder of this approach.

OI, therefore, represents the mindset of switching from a closed in-house research and development (R&D) approach to a much broader model of innovation where both internal, as well as external ideas, knowledge, and technologies, are combined in order to develop new organisational products and services (Laviolette et al. 2016). Cooperating actors and networks are represented by, for example, customers, competitors, suppliers, and research institutes which all can drive and improve the entrepreneurial innovation process of an entity (Chesbrough 2003a; Eggers et al. 2018). Over the years, based on increasing research in this field, Chesbrough and Bogers (2014: 17) published an updated definition describing OI as "[…] *a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model*".

These knowledge flows can be categorised into knowledge or technology inflows, where expertise is acquired from outside the organisation's boundaries, which is known as inbound OI (Huizingh 2011; Hochleitner et al. 2016). Besides internal R&D activities, businesses are also constantly on the outlook for new technologies and knowledge in their environment (Jones et al. 2014). Furthermore, organisations can also open up their innovation process by referring to the use of outbound OI where the firm commercializes internal developed ideas or technologies with external partners (Huizingh 2011). These knowledge flows can also be combined within the company by coupling external knowledge sources and additionally exerting commercialization activities (Chesbrough and Bogers 2014).

While in the 20th century, the Closed Innovation approach was predominant, stating that innovation must be controlled within the business (Ham et al. 2017). Within this approach, the business creates, develops and then commercializes its ideas itself. The mobilization of the workforce and the increase in private venture capital have driven the evolution of innovation behaviour. The new model of OI emerged where firms, according to Chesbrough (2003b), do not only commercialize their own internal ideas but also innovations from external partners in order to bring them to market by designing pathways outside the organisation's current business.

The existing research on OI relates largely to large businesses, especially in high-technology industries, although there is an increasing number of firms outside the sector that constitute early adopters (Chesbrough 2003a). Thus, the field of application is no longer limited to high-technology industries but extends to more traditional and mature industries (Chesbrough and Crowther 2006). The actual influencing factors and their concrete effects on innovation activities in small and medium sized enterprises (SMEs) and start-ups receives minimal attention in the literature (Lee et al. 2010). However, a growing number of studies focusing on these types of enterprise demonstrate the relevance of an OI approach to improving overall innovation performance (Hossain and Kauranen 2016).

SMEs are defined differently around the globe (Ayyagari et al. 2007) According to the European Commission (2016), SMEs are companies with less than 250 employees and an annual turnover of no more than 50 million Euro or for which the total balance sheet does not exceed 43 million Euro. If one looks at the published statistics of SMEs, their global relevance is evident. Overall, 99% of all businesses in the European Union can be characterized as SMEs (European Commission 2016). However, compared to large companies, SMEs contend with divergent structural conditions resulting in restrictions due to size, resource scarcity and limited technological assets (Jones et al. 2014; Woschke et al. 2017). Therefore, it is essential to specifically address the SME sector with its characteristics, as the implementation of OI can be an opportunity for SMEs to overcome the above-mentioned challenges. Previously, Spithoven et al. (2013) and Brunswicker and Vanhaverbeke (2015) demonstrated that SMEs benefit more significantly from OI activities than large businesses.

However, young venture focused research is less predominant within the literature (Harms et al. 2007). Blank (2010) defines a young venture as "*an organization formed to search for a repeatable and scalable business model*". Young ventures have to contend with limited resources based on their size and novelty (Woschke et al. 2017). Adopting an OI strategy offers several benefits to young ventures supporting them to overcome the liabilities of smallness and newness and is even more important at this stage of the venture than in large enterprises (Usman and Vanhaverbeke 2017). Thus, this literature review focuses on OI in young ventures.

Review Approach

As the literature focusing on OI in young ventures is nascent, it was decided to structure this literature review by undertaking a stepwise research approach (Cook and West, 2012). Therefore, OI in established SMEs is also considered in the literature review in order to provide a broader perspective. Although there are differences between young ventures and established SMEs, these are often similar in terms of their resources and structure, which allows realistic conclusions to be drawn.

The first step in the literature search was to use the EBSCO host databases. The relevant keywords defined were OI, SME*, Venture, Young, Start*, and Small*, thus forming various search strings. The search process was further reduced to title search in order to limit the outcome of articles in advance and to ensure that only articles that addressed the topic of OI as a core area in one of the two business categories were identified. Furthermore, the results were limited to peer-reviewed journal articles published in the English language. This first search produced 67 results. In order to ensure an enhanced completeness of the publications in this area, the databases JSTOR, Science Direct, Emerald

Insight and Wiley Online Library were also searched in a next step according to the same criteria as described above. This further search produced a total of 48 manuscripts. After excluding multiple entries, the literature search resulted in a sample consisting of 76 journal articles. From this total, 66 articles were identified from the general SME literature and the remaining 10 related to OI in young ventures. Referring to Bouncken et al. (2015), in order to provide a quality threshold, only articles published in academic journals ranked with a level of "C" or higher in at least one of the three leading journal rankings applied, were retained in the sample.

See Figure 1 Here

This includes the German Academic Association for Business Research (VHB) "Jourqual 3" where journals where used with a ranking of C or higher (VHB 2018). The UK Chartered Association of Business Schools (CABS) "Academic Journal Guide (2018)" where Journals remained in the sample with a ranking of two or higher. Finally, the Clarivate "Journal Citation Reports (JCR) Impact Factors" including Journals ranked 0.7 and above (Clarivate Analytics 2019). The conversion table between Impact Factors and German letter rankings as used by Bouncken et al. (2015) is provided in Figure 1 above. However, it must be noted that the quality threshold was only applied to journals with articles on OI within the SME sector. Since the sample in relation to OI in young ventures was restricted to 10 manuscripts, the application of the journal rankings was waived in this case.

Based on defined limitations, 23 articles were excluded from the sub-sample of 66 articles focusing on OI in SMEs because they were published in unranked or too low rated journals. The resulting revised sample then contained a total of 50 articles – 40 on OI in SMEs and 10 on OI in young ventures. As the field of OI research in SMEs with 40 other articles is already developed, the sub-sample has been condensed into the use of quantitative research articles only. In this respect, a total of five reviews and 11 qualitative research studies were excluded from the overall sample, as well as another quantitative study in which no full text could be identified, leaving 23 articles with the core focus on OI in SMEs. Regarding the second sub-sample of OI in young ventures, in total two from the 10 articles were additionally excluded after scanning the full text because of non-fitting the overall research theme. Finally, this leads to a final sample of 31 articles – 23 articles on OI in SMEs and eight articles on OI in young ventures. The entire literature search process, including all restrictions and exclusions made, is graphically illustrated in Figure 2.

See Figure 2 Here

Mapping the Field

Despite the general scarcity of literature in the fields of OI research in SMEs and young ventures, a surplus was noted in SME research by comparing the number of publications in both firm categories. While the first study on OI in SMEs was published in 2009 in the sample of 31 articles, the first study on young ventures was not published until 2015. Figure 3 highlights that the number of publications in both categories of enterprises has increased continuously in recent years. In the case of start-ups, however, this trend initiates from 2016, while in the SMEs segment this was already the case from 2014. In general, when considering Figures 3 and 4, it is apparent that research on OI in young ventures is nascent in contrast to research into SMEs which is already advanced, which is reflected in the number of publications and presence of numerous quantitative studies.

See FIGURE 3 Here
See FIGURE 4 Here

When paying attention to the origin countries of the studies used in the sample, as shown in Figure 4, it was apparent for SMEs and young ventures that the majority originated in Europe and Asia. It was noticeable that articles from North America were limited to a single study in the sample and were underrepresented in the available sample.

Findings

To lay the foundation for this study, the findings of OI in SMEs were first considered. Thereafter, the following section refers to OI in young ventures in order to examine their role in OI processes as well as possible influences and effects. This stepwise research approach is employed to identify potential similarities or differences to young ventures using the more advanced literature results in OI SME research (Cook and West 2012). This comparison with SMEs will make it possible in a next step to draw conclusions with regard to OI behaviour in young SMEs.

A Review of OI in SMEs

Publications dealing with OI in SMEs as a core field are, as already mentioned, are still limited in quantity, but the existing ones in the previously defined journals cover broad subject areas in various industries and countries. Table 1 displays the selected quantitative studies and their major findings. In the following table, their main arguments and results are discussed and summarized.

SEE TABLE 1 HERE

SMEs OI Networks

Today's globalized economy requires businesses to adapt as quickly and appropriately as possible in order to remain competitive – this applies to SMEs in particular. According to Wynarczyk (2013), the speed of converting new ideas into marketable products is crucial in order to differentiate from competitors and to remain competitive in the global marketplace. Based on this, integrating OI practices by establishing cooperation with universities and other firms assists SMEs to overcome this challenge and to create innovative products in an open manner. Moreover, Theyel (2012) suggests businesses can adopt divergent OI strategies regarding technology, product development, manufacturing, and commercialization. Here, the authors demonstrated that SMEs prefer partnerships with customers to those with suppliers (Santoro et al. 2018). Furthermore, businesses are said to increase their innovativeness when they embark on collaborations with suppliers when it comes to technology and with customers respecting product development. Generally, Lee et al. (2010) state in their research that networking supports SMEs in engaging in OI activities because getting to know potential partners and building initial trust is thereby facilitated.

SMEs' OI profiles

Concerning adopting OI, different strategic approaches are identified in the literature (Colombo et al. 2014). Brunswicker and Vanhaverbeke (2015) define based on inbound OI five different levels of engagement with different external sourcing partners: minimal-searcher, supply-chain-searcher, technology-oriented-searcher, application-oriented-searcher and full-scope searcher. They conclude that the more SMEs condense their OI strategy, the greater the likelihood that they will improve their innovation performance. Verbano et al. (2015) identifies three different OI profiles referring the openness of the innovation process phases and the involvement of external partners, which are characterized as selective low open, unselective open upstream, and mid-partners integrated open. With regard to opening up the innovation process in an integrated manner, the level technology-intensity of the firm is cited as a key driver that fosters the engagement in OI practices. By investigating different innovation types in complementary OI processes between SMEs and large firms, Jang et al. (2017) further identify four different arrangements: bilateral, one-way, outsourcing, and integrated OI. The researchers found that complementary OI provides benefits for both large

companies as well as for SMEs in order to promote growth and therefore firms' survival which leads to an enhancement of competitiveness.

Antecedents of OI

Huang and Rice (2009) and Presenza et al. (2016), identify absorptive capacity as to be of vital importance in order to facilitate the effectiveness of OI processes in SMEs and therefore further to make use of external sources. Moreover, Martinez-Conesa et al. (2017) demonstrate that knowledge management is positively influenced by information technology-supported activities as well as commitment-based human resources practices that further contribute to the improvement of OI in SMEs. Furthermore, the researchers identified a dependence on OI development on environmental dynamism, which means that SMEs adopt OI strategies more often when environmental dynamism is high. Pervan et al. (2015) additionally characterize government supported developments as well as market dynamics as important influences on OI in SMEs. However, financial resources, as well as academic and industry collaborations, are not significantly linked to influence innovation in this type of business.

SMEs' engagement in OI

Spithoven et al. (2012) suggest that SMEs have a higher density of OI practices and that they are more effective in using various OI activities concurrently in comparison to larger firms. Väyrynen et al. (2017) demonstrates contrasting findings in that they highlight large businesses are more likely to exert OI whereas SMEs typically rely on internal activities in order to enhance their innovativeness. Pullen et al. (2012) and Freel and Robson (2016) additionally underline that management emphasis on appropriation is crucial in this regard in order to switch from a Closed to an OI strategy.

SMEs' preference of inbound vs. outbound OI

Preliminary to cognitive dimensions and absorptive capacity, Scuotto et al. (2017) identified the knowledge-driven approach as most influential in resulting in a preference for informal inbound OI in SMEs. Moreover, Popa et al. (2017) show that the existence of a good innovation climate, which is significantly supported by commitment-based human resource, practices positively contributes to inbound as well as outbound OI in SMEs. Moreover, environmental dynamism also has a positive impact on outbound OI practices. Therefore, the authors of this study concluded that OI in SMEs positively influences firm performance.

SMEs' innovation performance and output

By analyzing inbound OI activities (technology sourcing, vertical and horizontal technology collaboration, technology sourcing), Parida et al. (2012) identified that all four are positively contributing to increasing SMEs' innovation performance. However, by contrast, Ham et al. (2017) offers a different conclusion, stating that knowledge sourcing approaches in regard to OI are negatively linked to the innovation performance of SMEs whereas a closed innovation process is more likely to increase innovation performance. Presenza et al. (2016) highlight in regard to low-technology SMEs, that OI activities increase the firm's ability to innovate and that customers are regarded as the most important external source for innovation. Besides increasing innovativeness, Ramirez-Portilla et al. (2017) demonstrate that adopting OI practices further supports SMEs to become more sustainable and resource-efficient and increases their overall competitiveness. Furthermore, Kim and Park (2010) found that adopting external R&D corporations has a positive significant impact on SME's innovation output, whereas external ideas have a negative impact and external knowledge has no impact.

Barriers of adopting OI in SMEs

Bigliardi and Galati (2016) identified four groups of barriers SMEs are confronted with which potentially prevents them from adopting OI: knowledge, collaboration, organizational, financial, and strategic barriers. The appearance of these barriers is dependent on the firm's profile which differs in regard to size and industry. Bigliardi and Galati (2016) found that knowledge barriers typically occur in knowledge-intensive firms whereas financial and strategic risk refers often relate to medium-

innovation enterprises. Finally, collaboration and organizational barriers were mainly identified in less innovative businesses.

A Review of OI in Young SMEs

The following section presents the results of the second step of the undertaken stepwise research analysis on young ventures and OI based on the full texts of the eight selected articles. Six categories were defined in order to group the findings namely: knowledge flows, OI networks, antecedents, inbound vs. outbound OI, innovation performance and influence of entrepreneurial background.

Knowledge flows in start-up's OI processes

Young ventures can benefit significantly from engaging in OI activities as the exchange with external partners supports them in order to overcome initial problems occurring due to their liability of newness. Alberti and Pizzurno (2017) demonstrate in this context, the exchange of knowledge, multiplexity as well as heteromorphism. Moreover, Alberti and Pizzurno (2017) identified three types of OI knowledge, which are unevenly exchanged in the cluster, and therefore, young ventures play heterogeneous roles based on different type of knowledge. The study demonstrates that young ventures are a valuable source of knowledge for large firms, especially in the areas of market and technological knowledge, due to their specialization and aggressive expansion strategy in search of global niches. However, in terms of managerial knowledge, it is start-ups that can benefit from an exchange with large, established businesses.

Exchanging these types of knowledge, however, often cannot be clearly separated, since different types of knowledge are inextricably connected. Due to this multiplexity, knowledge leaks are the result which are defined by Alberti and Pizzurno (2017: 73) as *"an involuntary and sometimes unconscious exchange of types of knowledge other than the one meant for exchange in OI networks"*. Moreover, technological knowledge is identified as the main driver for market and managerial knowledge leaks.

Eftekhari and Bogers (2015) were able to determine three OI approaches, based on managing knowledge flows, that are directly affecting start-ups' market survival. Firstly, using the ecosystem for collaboration to gain relevant market knowledge is an essential step for young ventures where they get the possibility to generate knowledge flows. As a result, resource constraints, as well as missing knowledge, can be overcome more easily which further increases the likelihood of survival. Moreover, allowing user involvement which means giving them some room for suggestions and feedback and therefore closely interacting with them will assist the venture to overcome the challenge of commercialisation because with user involvement it is more likely to create successful products/services and bring them to the market. Furthermore, the positioning of the start-up is also crucial for market survival. Operating in an open environment increases the access to relevant exchange knowledge sources among different disciplines and therefore promotes the development of new solutions and ideas and furthers the survival of the venture.

Eftekhari and Bogers (2015) identify another variable which does not directly influence the market survival of young ventures but rather acts as moderating variable between ecosystem collaboration, user involvement, and open environment and is expressed as the entrepreneur's mindset. This means that entrepreneurs with an open mindset have improved possibilities in searching for and exploiting opportunities as well as establishing new ideas. This way of thinking has a positive influence on the three mentioned openness variables and therefore indirectly contributes to the survival chances of the start-up.

Start-ups' OI network

Di Pietro et al. (2016) noted crowd equity investors have a great influence on the performance of young ventures by providing their knowledge, expertise, competence and network ties. Which type of crowd input is chosen, i.e. whether knowledge exploitation or network exploitation, is determined by the founders' and start-ups' characteristics. Di Pietro et al. (2016) found out that entrepreneurs who are equipped with managerial and industry experience are prone to exploit the crowd's network ties. This is due to the fact that this type of founder has already acquired a more specialized knowledge

base and therefore, requires the investor's network in order to ensure start-up growth based on arranging additional financing as well as creating public awareness. Moreover, young ventures are also more interested in exploiting crowd networks which also applies to B2B businesses.

However, B2C businesses, in general, are more likely to opt for exploiting knowledge activities from the crowd in order to support them with product, strategy, and market know-how. Furthermore, the favoured crowd input additionally depends on the development stage of the young venture. SMEs in the embryonic stage are more interested in knowledge exploitation whereas firms in the growth stage typically prefer the exploitation of network ties of the crowd, (Di Pietro et al. 2016). Thus, the researchers can highlight that start-ups which are involving the crowd in network and knowledge activities are more likely to be successful two years later compared to firms which do not acquire external inputs. Therefore, the use of equity-funding OI platforms represents an effective tool which facilitates the exchange of investors and young ventures (Di Pietro et al. 2016).

Antecedents of OI in Start-ups

By conducting a qualitative case-based research in the medical technology sector in Sweden, Hasche et al. (2017) identified trust as an antecedent to ensure ongoing OI collaborations between the start-up and its collaboration party. In this sense, trust can be distinguished into three different parts – contractual, competence-based trust and goodwill antecedents. Contractual antecedents meaning to draft a form of contract by written words or orally between the collaboration parties shows a kind of fundamental commitment. Moreover, competence-based trust antecedents refer to the ability to meet the expectations concerning deliveries or technologies whereas goodwill-trust antecedents refer to the condition that all collaboration parties fully rely on one another. Here, previously made experiences have a high influence on how a new situation is going to be interpreted. According to Hasche et al. (2017), these three parts of trust are essential in order to continue collaborations between parties and if only one component of the three trust antecedents is not fulfilled, it immediately leads to the termination of the partnership.

An examination of the results illustrates that while contractual antecedents were established between the investigated enterprises, collaborating parties discontinued some collaborations due to a lack of trust in the young venture to meet its competence-based requirements. By contrast, young ventures typically discontinued their collaborations when they experienced a lack of goodwill, whereby the partner company only focused on self-interest and did not act for the benefit of the collaboration. Here, previous experiences had a major impact on how the current collaboration was evaluated and therefore partly defines if would continue or not (Hasche et al. 2017).

Therefore, in order to continue ongoing collaboration it is essential from one perspective, to develop trust in the collaborating party, but by contrast, managers must additionally focus on setting the right activities to also appear as a trustworthy partner. In this respect, a good reputation from former collaboration partners, careful negotiations as well as always sticking to agreed time limits and contractual specification is advantageous. Due to the lack of corporate history in young ventures, it is particularly difficult for them to communicate these points, which means that more attention is paid to their current behaviour and the values lived in OI collaborations (Hasche et al. 2017).

In addition to trust, openness plays a crucial role in adopting OI processes. Michelino et al. (2017) found that openness according to OI practices is typically higher in the start-up phase compared with the consolidated one. This can be beneficial for young SMEs because referring to the researchers *"the higher the level of openness during the start-up phase, the higher the propensity to collaborate with scientific organizations"* (Michelino et al. 2017: 112). Possessing a high number of R&D collaborations, further enables the young venture to have access to more specialized knowledge which leads to the generation of high-quality innovation (Michelino et al. 2017).

Selection of inbound vs. outbound OI

With reference to the transaction cost theory, Hsieh et al. (2016) identified which circumstances must be predominant for young ventures to move towards either inbound or outbound OI. Hsieh et al. found that when both asset specificity, as well as behavioural uncertainty, were high, young ventures tended to increase their outbound OI practices. This reaction can be explained due to their higher transaction costs. However, in contrast with both variables are low, meaning low asset specificity as well as low behavioral uncertainty, young SMEs demonstrate a higher preference for engaging in inbound OI processes. Since the adoption of successful innovation practices is challenging for young ventures, Hsieh et al. (2016) recommend managers select effective OI models that are suitable for the enterprise in order to establish a competitive advantage. In this respect, making use of cooperation platforms can be beneficial for young ventures to establish contact with international manufacturers in order to exchange knowledge. By contrast, Usman and Vanhaverbeke (2017) identify challenges as well as benefits which are interconnected to the adoption of inbound as well as outbound OI practices in young ventures. Therefore, the researchers' findings are summarized in Table 2 below.

SEE TABLE 2 HERE

Usman and Vanhaverbeke (2017) further underline that due to their lack of resources young ventures typically opt for OI activities which requires the organisational processes to be designed in a open manner. Addressing inbound OI, it was found, that ventures use alternate kinds of partners to collaborate with based on different innovation purposes. Therefore, priority must be given to the selection of cooperating businesses, as these are decisive for the success of the start-up.

Start-ups' innovation performance

By comparing young ventures external cooperation activities with those of incumbent firms, Gimenez-Fernandez and Beukel (2017) identified a higher cooperation breadth in young ventures. This means, that young enterprises are more engaged in OI processes in contrast to incumbent firms. This difference can be explained by the lack of financial and human resources young ventures face and because of this, engaging in OI activities is crucial to compensate this deficiency and to improve their innovation performance. Opening up their borders in this sense gets further supported by the flexibility young ventures have in comparison to their counterparts. The fact, that everything in the business is unstructured at the beginning which involves the non-/ or hardly-existence of organisational routines furthermore facilitates the collaboration with external innovation partners and therefore drives the start-ups' innovation performance.

On closer examination of radical and incremental innovation performance, Gimenez-Fernandez and Beukel (2017) demonstrate that both performance types are higher at start-up firms compared to incumbent firms. Based on these findings, it can be concluded that young ventures are more innovative and therefore introduce new products/services to the market more often than incumbent firms. However, this is only relevant for a specific time frame. After a period of approximately five years, radical as well as incremental innovation performance is decreasing in young ventures as they evolve into an incumbent firm. Concerning the decrease of radical innovation performance, it is arguable, that former new ventures lose their initial competitive advantages of flexibility and possessing fewer established organisational rules which complicates the execution of radical innovation. By contrast, Gimenez-Fernandez and Beukel (2017) found that incremental innovation performance is also reduced over the course of the business cycle because former young ventures have already established products on the market, which means that they would cannibalize their own products when keeping incremental innovation at the previous high level. Moreover, in reference to innovation performance, Michelino et al. (2017) states that OI strategies constitutes a valuable source for young ventures because they have an impact on the innovation output. Therefore, adopting OI practices – especially R&D collaborations which scientific organisations – leads to an increase in the quality of the innovation output of the young enterprise.

Influence of entrepreneurial background in OI processes

Usman and Vanhaverbeke (2017) suggest the entrepreneurial background and managerial experiences of the young venture owner-manger are crucial to successfully establish OI processes with large firms. By possessing experiences of working in large businesses, young venture owner-managers get the opportunity to develop the essential negotiation skills they require when negotiating with large collaboration partners. In addition, they develop the experience to know when the time has come and to whom they should talk to for arranging innovation collaborations. These managerial experiences offer the young venture owner-managers an important degree of credibility, which is of critical importance in negotiations with large firms. Moreover, it also convinces venture capitalists to potentially invest in the business.

Conclusions

This study provides further evidence regarding the value of OI to young ventures to improve business performance (Hossain and Kauranen 2016). When comparing the findings of OI research in SMEs and OI in young ventures it becomes evident that there are significant differences identifiable especially with regard to the research density and range. OI literature in SMEs is more mature, as evidenced by number of publications in the sample and the quantity of quantitative studies available. Thus, SMEs' research is already much broader and the focus is placed on many different topics in the category of OI. This fact makes it difficult to compare the results of SMEs' OI research with those of young ventures, as the studies usually focus on diverging topics and core areas.

However, when only comparing studies where a similar research focus can be determined, similar results for both business categories can be identified. Usman and Vanhaverbeke (2017) have demonstrated on the basis of young ventures that the owner-manager is decisive for the successful implementation of OI. Freel and Robson (2016) also underlined the relevance of management in the survey spectrum of SMEs in order to change from a Closed to an OI approach. Michelino et al. (2017), Kim and Park (2010) conclude that the OI adoption and in particular the utilisation of external R&D collaborations have a positive influence on the quality of the innovation output for SMEs and for young ventures. Lee et al. (2010) demonstrate that networking promotes the implementation of OI between SMEs, as Di Pietro et al. (2016) also demonstrates based on the study of crowd equity investors in the area of young ventures. Hsieh et al. (2016), Popa et al. (2017) and Scuotto et al. (2017) have also dealt with the research topic of when businesses prefer inbound and outbound OI, but with references to divergent theories. While the transaction cost theory is in the foreground for young ventures, the researchers have focused on the area of SMEs on commitment-based human resource practices and on the knowledge-driven approach for clarifying preferences. Finally, Gimenez-Fernandez and Beukel (2017) and Usman and Vanhaverbeke (2017) additionally demonstrate that besides young enterprises, SMEs also exert a higher density of OI activities in comparison to their larger counterparts.

Based on this correlation, since young ventures and SMEs are similar in configurations, capabilities, and limitations, certain findings of SME OI research can potentially be transferred to young ventures. However, as Spender et al. (2017) notes, it is essential to keep in mind that the arrangement of a young venture represents a temporary form of organisation which makes further research essential in fully understanding the role of start-ups in the OI context. A general overview of the research in the field of OI in young ventures reveals that it remains in its nascent years, as can be seen from the limited literature. Therefore, the initial findings of the published articles appear somewhat superficial as well as broadly dispersed. What is notable, however, apart from the general shortage of studies, is that the existing studies on OI in young ventures usually contains a qualitative research method which underlines the recent emergence of this research field. The somewhat problematic aspect of qualitative studies in this context is that the researchers usually only refer to a very small sample (only referring to one or two case studies or conducting a few interviews) in selected industries (like the aerospace or the bio-pharmaceutical industry). This approach leads to a rather low validity of the research results, which makes it more difficult to derive generalizations in the field of OI research for the entire start-up area.

As all authors in the investigated sample demonstrate, young ventures have to cope with a low level of resources, which increases their relevance to access external collaborations. The researchers also agree that innovation is essential for young ventures to gain a foothold in today's dynamic market and thus survive by overcoming their liability of smallness and newness. In addition to ensuring business survival, Alberti and Pizzurno (2017) highlight that young ventures are also important cooperation partners of OI for large, established businesses due to their frequent and detailed specialization in certain niche areas.

Gimenez-Fernandez and Beukel (2017) suggest these arguments are the reason why young ventures have a higher OI density compared to larger more established counterparts. In terms of future research opportunities, it is necessary to conduct additional and ongoing research in young ventures, primarily by means of quantitative studies, to clarify the impact of a high OI density on the business over time and therefore to determine the role they play in the overall OI context. It should be investigated whether and how young ventures are adopting OI activities and how they are organized and managed within the start-up phase. Moreover, the objective here is to determine the impact of OI activities on the survival of young ventures as well as on its economic and financial success (Dobson et al. 2013). Furthermore, additional research could be conducted to determine the influence of OI strategies on the innovation behaviour of young ventures and its overall organisational performance. In addition, since young ventures are more dependent on external finance, human resources and cooperation than SMEs significant differences could be occurring between the two groupings.

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VHB Jourqual	ABS	JCR Impact Factor
A+	4*	≥3
A	4*	≥2
B	3*	≥1.5
C	2*	≥0.7
D	1*	≥0

Figure 1: Conversation List of Academic Journal Rankings
Bouncken et al., 2015: 581

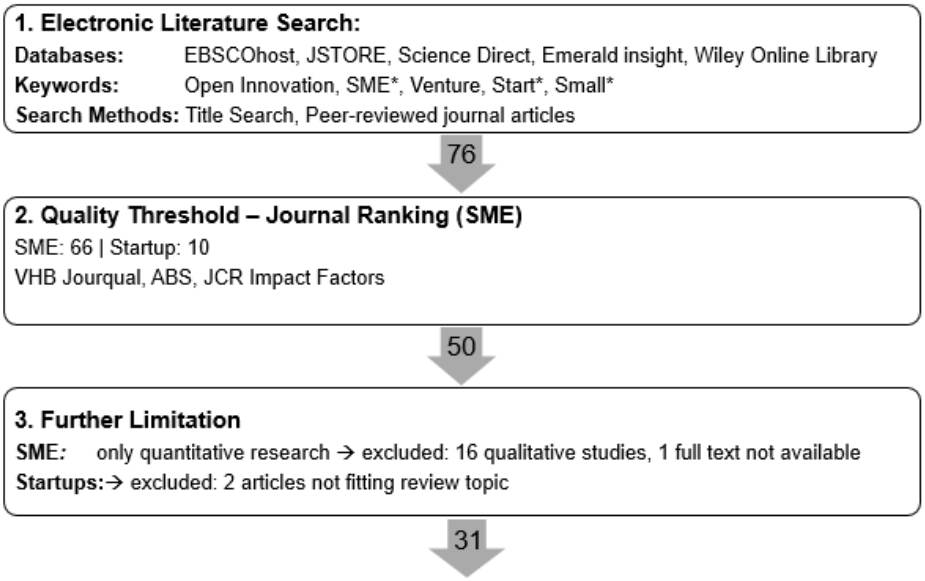

Figure 2: Literature Search Process

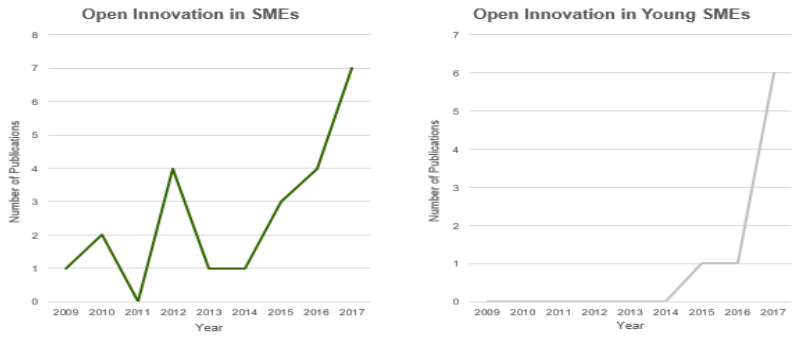

Figure 2: Number of Publications per Year: Open Innovation in SMEs vs. Open Innovation in Young SMEs; own illustration

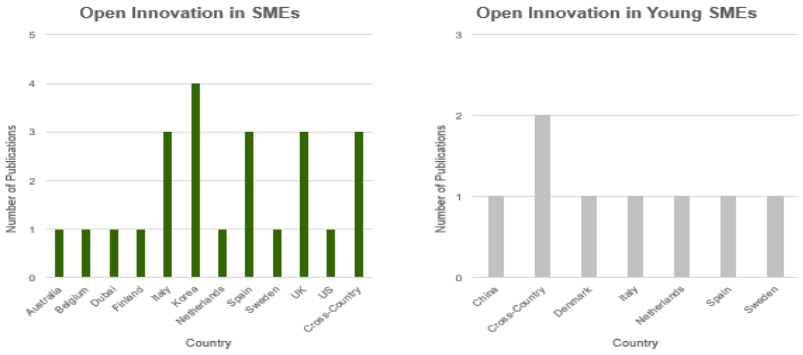

Figure 3: Number of Publications per Country: Open Innovation in SMEs vs. Open Innovation in Young SMEs; own illustration

Table 1: Literature on Open Innovation in SMEs

Author (Year)	Key Focus	Sample	Industry	Country	Major Findings
Bigliardi/Galati (2016)	Barriers of OI adoption	157	Cross-industry	Italy	■ knowledge, collaboration, organizational, financial and strateg
Brunswicker/ Vanhaverbeke (2015)	Strategic types of external knowledge sourcing	1.411	Cross-industry	Cross-country	■ minimal, supply-chain, technology-oriented, application-orient ■ more engagement leads to higher innovation performance
Colombo et al. (2014)	Factors influencing firm's within-industry diversification	100	Software	Cross-country	■ within-industry diversification is negatively associated with the positively with the number of projects (diversified portfolios)
Freel/Robson (2016)	Management choices	5.781	Service & Manufacturing	UK	■ Management emphasis on appropriation is important for SME strategies
Ham et al. (2017)	Effect of OI on innovation performance	196	Cross-industry	Korea	■ OI approaches have a negative effect on SMEs' innovation pe
Hochleitner et al. (2016)	Relation between inbound OI activities, development of new products, innovation outcomes and entry-timing	8.682	Service & Manufacturing	Spain	■ Cooperation with suppliers, cooperation with competitors and valid openness indicators of how new products are developed ■ Cooperation with customers, external information (consultants have a significant positive influence on non-financial outcomes ■ most innovation activities relate to pioneer behavior
Huang/Rice (2009)	Influencing effects in facilitating OI effectiveness	292	Manufacturing	Australia	■ Absorptive capacity is of vital importance in order to facilitate
Jang et al. (2017)	OI models for complementary cooperation between SMEs and large firms	1.674	Manufacturing	Korea	■ Complementary OI between SMEs and large enterprises is se which leads to an enhancement in competitiveness of firms ■ bilateral, one-way, outsourcing, integrated OI
Kim/Park (2010)	Impact of OI on innovation output	1.140	Manufacturing	Korea	■ positive: external R&D (but less than in large firms); negative: knowledge
Lee et al. (2010)	Innovation activities	2.414	Science & Technology	Korea	■ Networking is seen as an effective way to facilitate OI among
Martinez-Conesa et al. (2017)	Antecedents of OI and the role of knowledge management	3.000	Cross-industry	Spain	■ Information technology-supported operations & commitment-b on knowledge management which is crucial for improving OI ■ Environmental dynamism enhances the development of OI (C
Parida et al. (2012)	Effect of inbound OI activities on innovation performance	252	IT (high-tech)	Sweden	■ All analyzed inbound OI activities (technology scouting, vertic technology sourcing) are positively influencing innovation perf
Pervan et al. (2015)	Examination of environmental determinants in supporting OI	200	Service & Manufacturing	Dubai	■ Important influence of government supported developments & ■ No significant influence of financial resources & academic and

Popa et al. (2017)	Influences of antecedents and innovation climate on OI and firm performance	429	Manufacturing	Spain	■ Commitment-based HR practices have a positive influence on innovation bound and outbound OI ■ Contingent factors like environmental dynamism strengthen the positive e outbound OI ■ OI positively contributes to firm performance
Presenza et al. (2016)	Impact of OI on innovation activity	191	Wine (low-tech)	Italy	■ Low-tech SMEs that access and use OI practices show a greater ability to ating with end customers ■ Absorptive capacity influences innovation development and the use of ext
Pullen et al. (2012)	Examination of network characteristics in relation to innovation performance	60	Medical Device	Netherlands	■ The more a company's NPD profile differs from the ideal profile the lower ■ Goal complementary makes the difference in achieving high innovation pe ■ A "business-like" (result orientation and professionalism) NPD networking novation performance
Ramirez-Portilla et al. (2017)	Adoption of OI from specialized SMEs in mature industries	48	Manufacturing	Cross-country	■ Adopting OI can have an important influence on a manufacturing firm's en mance –can increase their level of innovativeness, become sustainable, r competitive
Scuotto et al. (2017)	Knowledge-driven preferences in informal inbound OI modes	175	ICT (high-tech)	UK	■ Preliminary to cognitive dimensions and absorptive capacity, the knowled strongest determinant in leading to a preference for informal inbound OI
Spithoven et al. (2012)	Impact of OI on the innovative performance of SMEs in comparison to large firms	967	Cross-industry	Belgium	■ SMEs are more effective in using different OI practices simultaneously an OI activities ■ Turnover in SMEs is driven by intellectual property protection, while large search strategies
Theyel (2012)	Adoption of OI practices on different value chain activities and effects on product and process innovation	293	Manufacturing	US	■ Firms that adopt OI for technology and product development are more like and commercialization ■ SMEs prefer relations with customers more than with suppliers ■ Firms are more innovative when they use technology development collabo prove products, and product development collaborations with customers t
Väyrynen et al. (2017)	Effect of knowledge management practices on OI in SMEs and large firms	58	Cross-industry	Finland	■ Large companies are more externally open to innovate and value open di ■ SMEs seem to rely more on developing internal practices to support innov
Verbano et al. (2015)	Identification of different firm's OI profiles	105	Manufacturing	Italy	■ selective low open, unselective open upstream, and mid-partners integrat ■ large and high-tech firms belong to the more open clusters; SMEs are spr with lower technology intensity rarely open the innovative process in an in
Wynarczyk (2013)	Impact of OI practices on innovation capability and export performance	64	Science & Technology	UK	■ International competitiveness is highly dependent on R&D capacity and m tencies coupled with OI practices and the ability to attract government gra velopment ■ To sustain competitive advantage SMEs need to collaborate with universi innovative products

Table 2: Challenges & Benefits for Start-ups in Inbound and Outbound Open Innovation
Usman and Vanhaverbeke, 2017: 82

Start-up as technology seeker inbound open innovation		Start-up as technology provider outbound open innovation	
Challenges	Benefits of open innovation	Challenges	Benefits of open innovation
Limited research capability	Saves on R&D cost	Lack of resources	Do not need funds for development or commercialization
Lack of financial resources	Quick entry into the market	Risk of misappropriation of technology	Royalty income
To earn market reputation/credibility	Technical/logistic support from large company	Little or nil market reputation/credibility	Reputation for future endeavors
Aligning venture capitalists interests	Capitalize on large company's reputation	Convincing potential buyers	Can tap niche markets not targeted by large company