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To cite this article: Mohammad Javadinia Azari , Arild Aspelund & Ann Elida Eide | (2020) Knowledge integration in international SMEs – The effects on firm innovation and performance, Cogent Business & Management, 7:1, 1849890, DOI: [10.1080/23311975.2020.1849890](https://doi.org/10.1080/23311975.2020.1849890)

To link to this article: <https://doi.org/10.1080/23311975.2020.1849890>



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Published online: 22 Nov 2020.



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Received: 15 May 2020
Accepted: 05 November 2020

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Reviewing editor:
Len Tiu Wright, De Montfort University Faculty of Business and Law, United Kingdom

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MANAGEMENT | RESEARCH ARTICLE

Knowledge integration in international SMEs – The effects on firm innovation and performance

Mohammad Javadinia Azari^{1*}, Arild Aspelund¹ and Ann Elida Eide¹

Abstract: This study aims to investigate the differential effects of internationalization and knowledge integration on the innovation capabilities and firm performance of international small- and medium-sized enterprises (SMEs).

A K-means cluster analysis is performed on quantitative survey data from a sample of international SMEs in Norway followed by three-year-lagged data on the firms' financial growth. The study's findings show that it is the level of knowledge integration, rather than the degree of internationalization, which determines the range of sources for knowledge acquisition, and the innovation capabilities of international SMEs. However, both the degree of internationalization and knowledge integration are efficient differentiators for firm performance. SMEs that score high on both these two factors demonstrate significantly higher levels of firm performance in terms of innovation, internationalization, and growth.



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PUBLIC INTEREST STATEMENT

SMEs internationalize, not only to expand sales but also to acquire knowledge from a wider, richer, and more diverse international market context. However, the results of this study show that passive presence in international markets does not provide the firm with the knowledge that can be exploited; it is rather the active strategy of knowledge integration that renders international SMEs to search for and use a variety of knowledge sources. The results of the research further reveal that knowledge integration plays a major role in driving the innovation capabilities and firm performance in international SMEs. In addition, they suggest that the more that SMEs internationalize, the more essential is for them to integrate knowledge effectively. Hence, it is recommended that managers in international SMEs set up efficient organizational procedures for knowledge-management practices; this will benefit them in creating strong innovation capabilities, rapid international expansion, and overall firm performance.

Subjects: Information / Knowledge Management; Innovation Management; Small Business Management; International Business

Keywords: internationalization; export; knowledge integration; small- and medium-sized enterprises; knowledge acquisition sources; innovation capabilities; firm performance; differential effects

1. Introduction

The internationalization of small- and medium-sized enterprises (SMEs) has become commonplace. The motivation for this development is not only to expand sales but also to acquire knowledge from a wider, richer, and more diverse international market context (Esteve-Pérez & Rodríguez, 2013; Golovko & Valentini, 2011). This knowledge can be used to develop both the innovative and international capabilities of the firm (Danis & Shipilov, 2012). Hence, the quest for new knowledge becomes a driving force for firms' innovation and internationalization (Andersen, 1993; Johanson & Vahlne, 1977; Ruzzier et al., 2006) and a platform for competitive growth (Casillas et al., 2009; Zahra et al., 2000). Moreover, it could be argued that the role of knowledge management is especially important for international SMEs as, unlike large multinationals, they have limited resources to acquire and implement knowledge-management systems (Villar et al., 2014).

While knowledge management remains a fundamental antecedent for firm innovation and performance in international companies (Bengoa & Kaufmann, 2016), the underpinnings of the relationships among them are not well understood in the current research (Tell, 2011). Hagen et al. (2012) ask for further typological studies investigating the connection between international SMEs' strategic activities and competitiveness. They emphasize that analysis of the connection between SMEs' various strategic activities and their competitiveness in international markets is an important yet neglected issue for entrepreneurs, managers, and policy-makers. This study seeks to contribute to filling this gap by investigating the differential effects of internationalization and knowledge integration on international SMEs' innovation capabilities and firm performance.

Previous empirical studies suggest that international SMEs often develop a strong innovation capability in order to survive, remain competitive, or even outperform competitors (Knight & Cavusgil, 2004; Lefebvre et al., 1998; Lim et al., 2006). Furthermore, research suggests that these firms often follow an "open innovation model" to fuel their innovation processes (Kumar et al., 2012), meaning that they benefit from both internal and external sources of knowledge and information to obtain and sustain innovation (Wynarczyk, 2013). Hence, international SMEs may use a variety of sources to acquire knowledge to be innovative (Branzei & Vertinsky, 2006; Danis & Shipilov, 2012; Wynarczyk, 2013). Those that operate in various institutional contexts have greater access to valuable knowledge that can be used to enhance firm innovation and international competitiveness.

Departing from the knowledge-based view of the firm (Grant, 1996a, 1996b), this study aims to investigate the differential effects of internationalization and knowledge integration on international SMEs' innovation capabilities and firm performance. We do so by making a typology of international SMEs based on two defining variables: the degree of internationalization and knowledge integration. We then investigate differences related to sources of knowledge acquisition, innovation capabilities, and firm performance.

The study continues as follows. First, we present the theoretical background and develop three hypotheses. Second, we present our methodological approach and the empirical analyses. Finally, we discuss the theoretical and empirical implications.

2. Theoretical background

The modern economy increases the importance of knowledge for firms contending in increasingly competitive markets (Grant, 1997). Knowledge has become especially important for international

firms due to the growing competitiveness of international markets (Ruzzier et al., 2006; Saarenketo et al., 2004) and to the fact that these firms operate in markets with variations in institutional context (Johanson & Vahlne, 1977; Ruzzier et al., 2006).

Hence, to secure their competitiveness in cross-border commerce, firms are required to develop knowledge-management capabilities. That is, they must identify valued knowledge from internal or external sources, integrate it into new or existing business practices, and turn it into competitiveness (Bengoa & Kaufmann, 2016; Danis & Shipilov, 2012). As the knowledge-based view of the firm (Grant, 1996a, 1996b) underscores the significance of knowledge in the development of firm competitiveness, it provides a good starting point to better understand the role of knowledge for international SMEs. The knowledge-based view treats knowledge as the firm's most important resource and emphasizes knowledge management as a source of competitive advantage. In international firms, the role of identifying, assessing, and integrating knowledge has been empirically proven to be a vital source of competitiveness (Zahra et al., 2000). These firms also have better access to new knowledge as their international activities provide them with a wider, richer, and more diverse information platform from a variety of foreign market contexts (Esteve-Pérez & Rodríguez, 2013; Golovko & Valentini, 2011).

So far, theoretical (Casillas et al., 2009; Inkpen, 1998; Koch, 2011; Tell, 2011) and empirical (Casillas et al., 2015; Esteve-Pérez & Rodríguez, 2013; Rundquist, 2012; Tzabbar et al., 2013) studies have shown that degree of internationalization and knowledge integration influence firms' knowledge acquisition behavior and innovation capabilities. For international SMEs, knowledge acquisition and integration can contribute to more learning and more innovation. On the one hand, international exposure provides SMEs with greater access to new sources of knowledge and market information, which they can integrate into new or existing operations (Love & Ganotakis, 2013). This mechanism, known as *learning-by-exporting*, is empirically shown to contribute to firms' innovation capabilities and growth (Love & Ganotakis, 2013; Monreal-Pérez et al., 2012; Wang & Tao, 2019). On the other hand, increases in international sales provide SMEs with economies of scale. Hence, costs associated with innovative activities can be spread out over more units of output and make them more profitable (Esteve-Pérez & Rodríguez, 2013; Golovko & Valentini, 2011). This mechanism, often referred to as the *scale effect*, means that more international sales allow SMEs to increase their innovation capabilities (see Golovko & Valentini, 2011; Govindaraju et al., 2013).

2.1. Sources of knowledge acquisition among international SMEs

Among the variety of strategies that international SMEs use to overcome liabilities of foreignness, innovation is one of the most common (Azari et al., 2017; Knight & Cavusgil, 2004; Yeoh, 2014). However, for innovation management to be effective, firms need access to appropriate sources of information to know where to guide their efforts (Dibiaggio & Nasiriyar, 2009; Wyncarczyk, 2013). Empirical research has shown that SMEs rely less on formal innovation, as well as research and development (R&D) processes than their larger counterparts (Acs & Audretsch, 1988; Rosenbusch et al., 2011). Instead, they often adapt an *open innovation model* (Kumar et al., 2012), meaning that they acquire knowledge and information for innovation processes from both internal and external sources (Branzei & Vertinsky, 2006). Regarding external knowledge sources, empirical research has found that international SMEs actively cooperate with and acquire knowledge from universities, suppliers, customers, and competitors to succeed in foreign markets (D'Angelo, 2012; Danis & Shipilov, 2012; Reiljan, 2007; Wyncarczyk, 2013).

Results of empirical studies show that an increasing degree of internationalization provides greater access to wider and more diverse sources of knowledge (Esteve-Pérez & Rodríguez, 2013; Golovko & Valentini, 2011). In addition, the ability of firms to seek and effectively make use of new knowledge and information is largely determined by their strategic orientation toward knowledge integration (Yang, 2005). In other words, firms with high levels of knowledge integration actively seek more and more varied sources of knowledge acquisition (Ju et al., 2006). Active knowledge

acquisition can consequently provide firms with platforms for successful knowledge integration that they can exploit for innovation and international growth strategies (Dahiyat, 2015; Zahra & George, 2002). Hence,

Hypothesis 1: International SMEs pursuing high levels of internationalization and knowledge integration will rely on a more varied set of sources of knowledge acquisition.

2.2. Innovation capabilities

Theoretically, innovation is argued to be one of the most important organizational capabilities for staying competitive in international markets (Love & Roper, 2015; Monreal-Pérez & Sánchez-Marín, 2012). Knowledge integration is also theoretically considered to be positively related to firms' innovation capabilities (Grant, 1996a, 1996b; Tell, 2011), since by integrating knowledge, firms may be able to successfully turn their resources into innovation (Morone & Taylor, 2012). Recent studies have also found empirical evidence to support these theoretical arguments (e.g. Azar & Ciabuschi, 2017; Jones, 2017; Marques et al., 2017; Park et al., 2015).

Nevertheless, most empirical studies on international SMEs and innovation have been limited to product innovations (e.g. Alegre et al., 2012; Cassiman & Golovko, 2011; D'Angelo et al., 2013; Freel, 2000). The same can be said about the relationship between knowledge integration and innovation (e.g. Lin & Chen, 2006; De Luca & Atuahene-Gima, 2007; Rundquist, 2012; Tsai et al., 2015; Yang, 2005). Yet there is no reason to assume that international SMEs' innovative activities in international markets are restricted to product innovation (Love & Roper, 2015). For example, the Oslo Manual (OECD, 2005, p. 46) defines an innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." This definition provides the opportunity to take a more fine-grained approach to studying innovation in SMEs (Chetty & Stangl, 2010), and to examine whether there is a differential ability for international SMEs to implement different types of innovations. Clearly, different types of innovation deliver different advantages in the foreign market (Azari et al., 2017; O'Cass & Weerawardena, 2009). For example, product and service innovations may allow the firm to differentiate itself from its competitors. Process and organizational innovations may provide the firm with cost advantages. Business model innovations may help the firm to reach its foreign customers more creatively and, potentially, to disrupt existing competition (Love & Roper, 2015).

We defined the first hypothesis on the assumption that a high degree of internationalization provides access to variety in institutional contexts and market knowledge, and a high level of knowledge integration is associated with more sources of knowledge acquisition. We also argued that both degree of internationalization and knowledge integration can be positively related to the firm's innovation capabilities through different mechanisms. Applied to international SMEs, with the assumptions described above, we hypothesize they will influence firm innovation capabilities in the following manner:

Hypothesis 2: The innovation capabilities of international SMEs—defined in terms of product, service, process, and business model innovations—will be highest in firms that concurrently pursue high levels of internationalization and knowledge integration.

2.3. Firm performance

Firm performance is notoriously difficult to study. Previous research in the domain of international SMEs reviewing this issue has demonstrated that firm performance can be associated with several factors, from strategies to learning activities (see, e.g. Dobbs & Hamilton, 2007; Ruzzier et al., 2006; Singh et al., 2008). Among these factors, internationalization (Dobbs & Hamilton, 2007; Singh et al., 2008) and knowledge integration (Tanriverdi & Venkatraman, 2005), particularly for international firms (Toften & Olsen, 2003) have significant contributions.

Our argument here is that, in addition to internationalization (see Ruzzier et al., 2006), knowledge integration can also contribute to an improvement in firms' innovation competitiveness and performance, and especially those that are operating in foreign markets (Tell, 2011). Knowledge integration enables the firms to connect with multiple external sources for knowledge acquisition, to draw knowledge from a varied institutional context, to internalize this new knowledge, and to employ it in innovative activities in foreign and domestic markets (Zahra et al., 2000). Over the past couple of decades, the foundation of organizational competitiveness has shifted from tangible resources to knowledge (Wong & Aspinwall, 2005). As results of empirical studies show, engagement in knowledge integration activities helps companies to achieve innovation performance (Dahiyat, 2015; De Luca & Atuahene-Gima, 2007; Nunes et al., 2006), increased international market competitiveness (Mac & Evangelista, 2017; Maranto-Vargas & Gómez-Tagle Rangel, 2007; Marques et al., 2017), and improved financial performance and growth (Nonaka & Takeuchi, 1995; Tanriverdi & Venkatraman, 2005; Zahra et al., 2000).

In summary, based on the argument above we expect international SMEs that simultaneously pursue strategies with high levels of internationalization and knowledge integration outperform their counterparts that pursue these strategies to a lesser extent. This hypothesis is based on the assumption that their degree of internationalization and effective knowledge-management capabilities make them more innovative, which should leave them more competitive in international markets.

Hypothesis 3: International SMEs concurrently pursuing high levels of internationalization and knowledge integration will outperform firms that pursue these strategies to a lesser extent.

3. Method

3.1. Database and sample

The population of the firms was extracted from the Kompass Norway database (available at: www.kompass.com), with the identification criteria limited to Norwegian international companies, which had 4–250 employees. The search criteria yielded 2262 SMEs. The companies' key information such as their contact information, location, size, and executives was also acquired through the same database.

In early 2014, we developed a questionnaire to investigate issues concerning the firms' innovation and internationalization strategies, as well as their knowledge-management practices. All measures were used in the previous research (see Appendix Tables A1 to A6 and below for a detailed description). The questionnaire was pre-tested on a smaller sample of 10 firms to check the robustness of the items and to eliminate sources of potential ambiguity from the language or other sources of misunderstanding.

In April 2014, the questionnaire was sent to all 2262 firms in the sample. It was addressed to the firms' chief executive officers (CEOs) or top managers, as companies' CEOs are presumed to provide reliable information about the company (Zahra & Covin, 1993). Respondents could choose between a paper-based response (an envelope with pre-paid return mail was included) or an online version (an email including the Internet link to the questionnaire). A large majority chose the latter. Reminders were sent out twice by email, and phone calls were made to increase the response rate.

This procedure yielded a total of 380 usable responses, corresponding to a 16.8% response rate. The sample is a representative, cross-sectional sample of the population of Norwegian international (predominately exporting) SMEs from different industries. The initial survey was finished in September 2014; it was complemented in 2018 with publicly available financial data (available at: www.forvalt.no) to assess the firms' growth. The main characteristics of the sample and their operating industries are described in Tables 1 and 2 respectively. The firms in the sample are small

Table 1. Sample characteristics

	Mean	Median	Std. Dev.	N
Year of establishment	1971.51	1981.50	28.944	374
Number of employees in 2013	37.46	19.00	48.632	372
Share of foreign sales (% in 2013)	42.38	33.00	35.140	285

Table 2. Operating industries

Industry/Industrial Sector	Frequency	Percent
Agriculture, forestry and fishing	1	0.3
Mining and quarrying	7	1.8
Manufacturing	202	53.2
Electricity, gas, steam and air conditioning supply	1	0.3
Water supply; sewerage; waste management and remediation activities	3	0.8
Construction	5	1.3
Wholesale and retail trade; repair of motor vehicles and motorcycles	72	18.9
Transporting and storage	11	2.9
Accommodation and food service activities	1	0.3
Information and communication	24	6.3
Real estate activities	2	0.5
Professional, scientific and technical activities	37	9.7
Administrative and support service activities	1	0.3
Education	3	0.8
Human health and social work activities	7	1.8
Other services activities	2	0.5
Valid	379	99.7
Missing	1	0.3
Total	380	100

(on average 37 employees), and 90% of the firms in our sample have less than 100 employees. However, they have a relatively high foreign sales share (on average 42%). While the sample consists of a broad range of industries, the manufacturing sector dominates with more than half of all respondents (202 of 380).

3.2. Statistical approach

In order to compare firms with different levels of internationalization and knowledge integration, we used a cluster analysis approach on two variables: *Foreign Sales' Share* and *Knowledge Integration*. More specifically, we used a K-means clustering method. As one of the most commonly used algorithms for clustering, it is appropriate for our analysis and has been used in several

studies investigating SMEs' foreign market strategies, innovation, and performance (see, e.g. Aspelund & Moen, 2005; Denicolai et al., 2015; Hagen et al., 2012). The method aims to partition a sample's observations into K clusters in which each observation belongs to the cluster with the nearest mean, serving as a member of the cluster (Jain, 2010). In order to do so, the algorithm computes the squared distances between the inputs (also called input data points) and centroids (also called cluster centers), and assigns inputs to the nearest centroid. Therefore, the goal of K-means is to minimize the sum of the squared error over all K clusters (see Jain, 2010; Žalik, 2008).

To obtain a proper comparison of the firms in terms of their internationalization and knowledge integration levels, four clusters were extracted in the analysis so that low and high degrees of the defining variables could be compared among the clusters. In this regard, Hagen et al. (2012, p. 373) highlight that "the K-means cluster procedure searches for the best configuration of the predefined groups placing similar observations together, forming a cluster." Before creating the clusters, we standardized the variables according to their ranges in order to prevent the clustering algorithm from giving too much priority to variables with large variances. As empirically shown by Steinley (2004, p. 58), compared to other types of standardization, "standardizing variables by their range is the most effective standardization method" in K-means clustering, and it helps to make the results of the analysis more robust. For the comparison analysis, we utilize a one-way analysis of variance (ANOVA) with Bonferroni tests to examine both variance and mean value differences among the clusters (Aspelund & Moen, 2005).

3.3. Key variables

As mentioned above, all scales and indexes used in this study have been employed and verified in the previous research. However, to verify their applicability in the Norwegian language context we ran a principal component analysis (PCA) and a reliability analysis (Cronbach's alpha) to determine factor loadings and internal consistency. These analyses are reported in [Appendix A](#) (Tables A1–A6). The scores are systematically high and appropriate for further analysis. All the measures utilized in this study in form of scales were 7-point-Likert scale.

3.3.1. Defining variables

In order to measure the degree of internationalization, we used shares of foreign sales (in percentage), which is the most used indicator for the degree of internationalization in the literature (Katsikeas et al., 2000). For knowledge integration, we utilized a measure developed by Zahra et al. (2000) that aims to capture the extent to which the firm uses different activities to systematically identify, evaluate, and exploit experimental knowledge from international activities (see [Table A1](#)).

3.3.2. Variables for comparison

The measure for *Knowledge Acquisition* is based on one employed by Branzei and Vertinsky (2006). It aims to capture a comprehensive picture of the firms' knowledge acquisition sources and to measure the extent to which firms utilize various sources as input for their innovation processes. The sources can be broadly divided into internal, external, academic, and public sources (see [Appendix Table A2](#) for a more detailed description).

In terms of *Innovation Capabilities*, we measured the firms' capabilities for product, service, process, and business model innovation (see [Appendix Table A3](#)). The measures were developed from Weerawardena (2003a, 2003b) and Little (2012). For each type of innovation, the firm's focus (as input) and ability (as output) to be innovative are combined to investigate its innovation capability (see Rosenbusch et al., 2011).

Finally, we measured *Firm Performance* in three dimensions: innovation performance, international performance, and firm growth. We used at least one objective and one subjective measure for each dimension (see [Appendix Tables A4 to A6](#)).

4. Results

Below we report the main findings from our quantitative analysis of the survey data. The presentation will follow the same order as the statistical analysis; we first report the clusters' characteristics, followed by the comparison analysis on sources of knowledge acquisition, innovation capabilities, and firm performance.

4.1. Cluster analysis

According to our research strategy, we performed a K-means least-square cluster analysis on the sample with the two differentiating variables: *Degree of Internationalization* (by means of percentage of foreign sales' share) and *Knowledge Integration* (by means of one to seven scaled factor). As mentioned above, the analysis led to four clusters that were accordingly labeled as *Global Integrators*, *International Integrators*, *Global Non-Integrators*, and *International Non-Integrators* (see Figure 1).

The analysis returned four clusters of comparable size (see Table 3). The largest cluster—the *International Non-Integrators*, comprises 88 firms, while the smallest—the *Global Integrators*, comprises 50 firms. Regarding other basic descriptive statistics, the clusters are also similar. The average firm age in all four clusters ranges between 39 and 47 years at the time of the data gathering. In terms of firm size, the *Global Integrators* and *International Integrators* clusters are slightly larger (on average 53 and 49 employees, respectively) than the other two clusters (with average size 32 and 25). The firms are all clearly within the defined boundaries of SMEs; however, we note, that systematic knowledge integration is more outspread among the slightly larger firms. Another observation important to the interpretation of the results below is the high level of correlation between the share of foreign sales and the number of markets the firm operates in. Clusters 1 to 4 operate in, on average, 24, 12, 18, and 3 different countries, respectively. This means that the two *Global* clusters are exposed to a far more heterogeneous international setting than the *International* clusters, and the *Integrators* are likewise more exposed than their corresponding *Non-Integrators* (see Table 6).

Figure 1 shows the relative position of the clusters and the values of the clusters' centers with respect to the two defining dimensions. Table 3 shows that the four clusters are clearly distinctive in relation to the defining variables (on the 0.001 level); they are, therefore, appropriate for further investigation.

Figure 1. Clusters of the international SMEs.

* Percentage that falls into this category from the total clustered sample; N: Number of firms in the cluster.

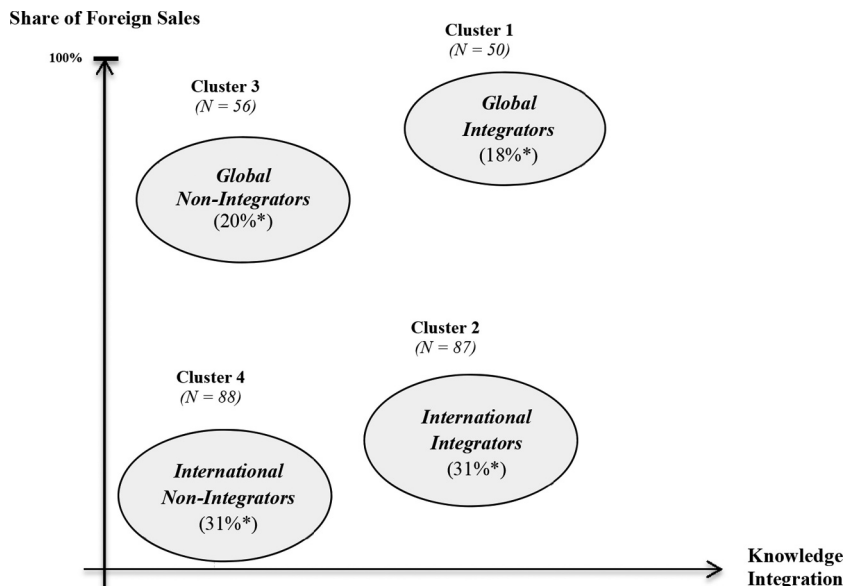


Table 3. Cluster centers' information

	Global Integrators	International Integrators	Global Non-Integrators	International Non-Integrators	F-Value
Share of foreign sales (%)	85.59 ^{2,4} (14.00)	25.50 ^{1,3} (17.36)	80.02 ^{2,4} (16.80)	10.52 ^{1,3} (10.05)	442.629***
Knowledge integration (from 1 to 7)	4.26 ^{3,4} (0.72)	4.14 ^{3,4} (0.70)	2.45 ^{1,2} (0.61)	2.18 ^{1,2} (0.73)	177.289***
Year of establishment	1975 (24.66)	1969 (28.84)	1967 (31.16)	1970 (32.50)	0.654
Number of employees	53 ⁴ (60.27)	49 ⁴ (54.70)	32 (44.84)	25 ^{1,2} (26.37)	5.672**
Number of cases	50	87	56	88	
Valid	281				
Missing	99				

*** P < 0.001; ** P < 0.01; * P < 0.05; (): standard deviation; 1,2,3,4: denote significant differences in Bonferroni test

4.2. Comparative analysis of the clusters

We proceed with the analysis by comparing the clusters on the key aspects of this study, namely, sources of knowledge acquisition, innovation capabilities, and firm performance.

4.2.1. Sources of knowledge acquisition

The first analysis seeks to assess the extent to which the firms in the various clusters use different sources of knowledge acquisition. In regard to internal sources, we observe high and consistent numbers related to using top management for knowledge acquisition; this is similar across all the clusters (see Table 4). Moreover, we observe that the *Global Integrators*—those who are most internationally exposed and most strategically integrate knowledge—use their own employees to a higher degree for knowledge acquisition. This might be related to the fact that the *Global Integrators*, in addition to having the highest shares of foreign sales, have the most internationally diverse company setting, and are present in most markets. Hence, they can use their own employees as a source of new knowledge to a greater extent. Further, we observe that the firms with the highest level of knowledge integration (clusters 1 and 2) also most actively use external, academic, and public sources of knowledge acquisition. In fact, in terms of external and public sources, the highest scores belong to the *International Integrators*, followed by the *Global Integrators*. Hence, overall, hypothesis 1 is partially supported.

4.2.2. Innovation capabilities

The second analysis examines the extent to which the firms in the various clusters are able to turn their international exposure and knowledge integration into innovation capabilities. Table 5 demonstrates that the dimensions are effective in differentiating the innovation capabilities of the clusters, as the ANOVA analysis shows differences in a 0.05-level for all types of innovation. We observe that the *Global Integrators* are the most effective in creating product and process innovations, followed by the *International Integrators*. However, contrary to what we expected, the *International Integrators* rank highest in terms of service and business model innovations. This finding is somewhat surprising and contrary to our hypothesis. It may stem from the concept of *over-internationalization*, which suggests that the information and knowledge the firms become exposed to are so complex and varied that the firms struggle to turn them into actual innovations (Contractor et al., 2003; Zahra et al., 2000). Overall, this analysis provides only partial support for hypothesis 2.

4.2.3. Firm performance

Finally, we investigate potential differences in firm performance among the clusters. We have measured firm performance in several dimensions according to the recommendation of Singh et al. (2008), namely *Innovation Performance*, *International Performance*, and *Growth*. We have also measured each dimension in at least one perceived, self-reported manner, and at least one objective manner (see Table 6).

Viewing the results, the first observation is that, apart from the *Number of Patents*, all firm performance measures are significantly different across the clusters according to the ANOVA analysis. Second, we observe that a pattern repeats itself; the *Global Integrators* systematically score the highest on all firm performance measures, and, equally, the *International Non-Integrators* systematically score the lowest (except in the average of annual turnover growth rate). This is a strong indication that international exposure and knowledge integration significantly contribute to firm performance, which is this study's main inference.

Observing each dimension specifically, we witness that, in the innovation performance dimension, the average *Perceived Innovation Performance* scores follow the aforementioned pattern. The *Global* clusters typically outcompete their corresponding *International* clusters, the *Integrators* typically outcompete their corresponding *Non-Integrators*. Hence, the *Global Integrators* outcompete all. The same pattern also repeats for the objective innovation performance measure (*Number of Patents*); however, due to low numbers, these differences are not statistically significant.

Table 4. Comparison of knowledge acquisition sources

Knowledge Acquisition Sources	Mean				ANOVA F-Value	
	Global Integrators	International Integrators	Global Non-Integrators	International Non-Integrators		
Internal Sources	Management	5.53	5.59	5.51	5.28	1.130
	Employees	5.27 ^{3,4}	5.09 ⁴	4.46 ¹	4.42 ^{1,2}	
External Sources		3.81 ^{3,4}	3.93 ^{3,4}	3.31 ^{1,2}	3.17 ^{1,2}	11.959***
Academic Sources		3.56 ^{3,4}	3.36 ^{3,4}	2.37 ^{1,2}	2.17 ^{1,2}	18.422***
Public Sources		3.80 ^{3,4}	4.11 ^{3,4}	2.84 ^{1,2}	3.37 ^{1,2}	10.499***

** P < 0.05; *** P < 0.001; 1,2,3,4: denote significant differences in Bonferroni test

Table 5. Comparison of different innovation capabilities

Innovation capabilities	Mean				ANOVA
	Global Integrators	International Integrators	Global Non-Integrators	International Non-Integrators	F-Value
Product Innovation	5.63 ⁴	5.36 ⁴	5.03	4.88 ^{1,2}	5.267**
Service Innovation	4.33	5.00 ^{3,4}	3.92 ²	4.28 ²	7.728***
Process Innovation	4.84 ⁴	4.81 ⁴	4.38	4.21 ^{1,2}	3.871**
Business Model Innovation	4.49	4.63 ^{3,4}	4.08 ²	4.02 ²	5.373**

** P < 0.05; *** P < 0.001; 1,2,3,4: denote significant differences in Bonferroni test

Table 6. Comparison of firm performance

Performance	Mean				ANOVA
	Global Integrators	International Integrators	Global Non-Integrators	International Non-Integrators	F-Value
<i>Innovation</i>					
Perceived Innovation Performance	5.28 ⁴	5.08 ⁴	4.74	4.32 ^{1,2}	11.473***
Number of Patents	1.72	1.60	1.19	0.59	1.519
<i>Internationalization</i>					
Perceived International Performance	4.71 ⁴	4.24 ⁴	4.21 ⁴	3.55 ^{1,2,3}	9.929***
Number of Foreign Markets	24.17 ^{2,4}	11.77 ^{1,4}	18.26 ⁴	3.68 ^{1,2,3}	18.645***
Time to Internationalization	6.29 ⁴	14.23	14.57	17.58 ¹	2.786**
International Expansion Ratio	0.77 ^{2,4}	0.35 ¹	0.51 ⁴	0.14 ^{1,3}	14.838***
<i>Growth</i>					
Perceived Growth Likelihood	5.77 ^{3,4}	5.37 ⁴	4.91 ¹	4.76 ^{1,2}	7.710***
Average Annual Turnover Growth Rate 2014–2017 (in %)	3.47 ³	1.71	-5.92 ¹	0.62	2.347*

* P < 0.1; ** P < 0.05; *** P < 0.001; 1,2,3,4: denote significant differences in Bonferroni test

If we look at the internationalization measures, the *Perceived International Performance* measure follows the same pattern described above. The second objective measure, *Number of Foreign Markets*, is highly correlated with *Share of Foreign Sales*, indicating that the *Global* clusters operate in more markets than the *International* clusters. In addition, it is observed that the *Integrators* operate in more markets than their corresponding *Non-Integrators*.

Some interesting findings emerge from the analysis of *Time to Internationalization*. Here we observe that the *Global Integrators* internationalize far more rapidly than the other clusters. Interestingly, among the firms belonging to the *Global Integrators* cluster, only five have a time to the internationalization of over 20 years; the mean value of the time to internationalization for the rest is below 3 years. Moreover, almost half of these firms (21 of the remaining 45) internationalized within a year of establishment. This finding becomes even clearer if we investigate the

International Expansion Ratio—the average number of countries the firms have entered per year since establishment. This finding suggests that knowledge integration plays a major role in explaining the rapid internationalization pattern of SMEs, which is the main subject of studies in the international entrepreneurship domain (Casillas et al., 2009; Madsen & Servais, 1997; Moen & Servais, 2002).

Finally, we investigated the relationship for financial performance in terms of *Firm Growth*. The dominant pattern, described above, is again repeated, with the *Global Integrators* as the growth winners. Interestingly, while the perceived measure follows the typical pattern, there is an anomaly related to the objective measurement of firm growth for the *Global Non-Integrators*, as it is negative and significantly lower than the *Global Integrators*.

Overall, these findings support the third hypothesis of this study. The *Global Integrators* systematically outcompete the other clusters in terms of firm performance. A summary of the hypotheses' results is presented in Table 7.

5. Discussion

The relationship between the organizational resources and capabilities of firms and their strategic behavior and performance is complex. It often includes effects that are reciprocal or in which directionality is hard to establish (see, e.g. Filipescu et al., 2013). The present study also struggles with the complexity of this relationship. However, the intention of this study is not to establish any causality or directionality of effects among the investigated factors. Instead, the major strength of this study is its ability to use two dimensions—degree of internationalization and knowledge integration—to establish a theoretical rationale for how they influence the innovation and performance of international SMEs, and also to empirically show the differentiated effects of the investigated factors. Even though the K-means clustering procedure does not have the ability to control for spurious and mediating effects, the empirical results support the main theoretical argument that knowledge integration plays a major role in turning an integrated internationalization and innovation strategy into firm performance for international firms. These findings are in line with Marques et al. (2017) and Pateli and Lioukas (2019) who found empirical support for the significance of knowledge-management practices, especially knowledge integration, in increasing performance among firms that simultaneously pursue internationalization and innovation

Table 7. Summary of the hypotheses' results of the study

Hypotheses	Detailed results		Overall results
H1: Knowledge Integrators rely on a more varied set of sources of knowledge acquisition.	Internal Sources	PS	PS
	External Sources	NS	
	Scientific Sources	S	
	Generally Available Sources	NS	
H2: Global Integrators score highest in innovation capabilities.	Product Innovation	S	PS
	Service Innovation	NS	
	Process Innovation	S	
	Business Model Innovation	NS	
H3: Global Integrators score highest on firm performance measures.	Innovation	S	S
	Internationalization	S	
	Growth	S	

S: Supported, PS: Partially supported, NS: Not supported

strategies. In addition, this study shows the differential effects of various sources of knowledge acquisition and types of innovations. These effects are discussed in more detail below.

5.1. The determinant role of knowledge integration

According to the knowledge-based view of the firm (Grant, 1996a, 1996b), knowledge is the firm's most valuable asset, and, arguably, the management of knowledge assets becomes key for developing firm competitiveness. Theoretical (Casillas et al., 2009; Tell, 2011) and empirical research (Ju et al., 2006; Marques et al., 2017; Zahra et al., 2000) on firm performance in international companies also supports this conclusion. These studies demonstrate that a knowledge integration strategy enables the firm to create conditions for effective identification, utilization, and dissemination of knowledge, which then transfer into innovation capabilities, and eventually firm performance. In accordance with these studies, we found empirical evidence to support the central role of knowledge integration in enhancing the competitiveness of international SMEs. The two *Integrator* clusters scored systematically higher in all the investigated dimensions than their two corresponding *Non-Integrator* clusters.

5.1.1. Sources of knowledge acquisition

Theoretical studies on knowledge management in international firms commonly assume that a higher degree of internationalization provides more sources for knowledge acquisition due to more heterogeneity in the institutional context (see, e.g. Casillas et al., 2009); internationally acquired knowledge can then be used to boost the firms' innovation capabilities (Tell, 2011). While some empirical studies provide evidence to support this view (e.g. Esteve-Pérez & Rodríguez, 2013; Golovko & Valentini, 2011), this assumption does not seem to hold according to the findings in this study. Rather, in line with Ju et al. (2006) and Yang (2005), we find that it is the strategic orientation of the firm toward knowledge integration that prompts it to acquire knowledge from a broader range of external sources, not the degree of internationalization *per se*. Hence, it is not the passive presence in international markets that provides the firm with the knowledge that can be exploited; it is, rather, the active strategy of knowledge integration that renders international SMEs to search for and use a variety of knowledge sources.

5.1.2. Innovation capabilities

The reason knowledge acquisition has received significant attention in studies of international SMEs is based on the assumption that new knowledge can be integrated into innovation activities and contribute to the firm's competitiveness (Henderson & Clark, 1990; Kogut & Zander, 1992; Tzabbar et al., 2013). In Chesbrough's words (Chesbrough, 2003, p. 41): "firms that can harness outside ideas to advance their own businesses while leveraging their internal ideas outside their current operations will likely thrive in this new era of open innovation."

Overall, the findings of this study support this notion. However, we also see a clear differential effect between various types of innovation. The evidence upholds the general notion that knowledge integration supports innovation capabilities. Intriguingly, however, the results are differentiated based on what types of innovations we analyze. Recent empirical studies investigating different types of innovation in international SMEs have also found such differential effects based on the type of innovation (Azari et al., 2017; Imbriani et al., 2014; Olmos, 2011). In our research, for typical product and process innovations, we observe the expected outcome that the *Global Integrators* score highest compared to other firms, though they are closely followed by the *International Integrators*. However, for service and business model innovations, it is the *International Integrators* cluster that systematically outperforms the others. This intriguing finding deserves both discussion and further investigation.

There are several alternative explanations to this finding. It may be that the product and process innovations draw on similar internal resources, and hence, are related, as has been suggested by others (see, e.g. Martinez-Ros & Labeaga, 2009). Alternatively, it could be that some types of innovation are associated more with international exposure than others. This is, indeed, also the

finding in a recent empirical study of innovation in international SMEs by Azari et al. (2017). They found that SMEs' service innovation is generally less internationally oriented than product innovation. Other empirical studies have found that a high degree of internationalization does not necessarily correspond with an increased capability for business model innovation (e.g. Imbriani et al., 2014; Sass, 2012; Vila & Kuster, 2007). The result could also be explained by *over-internationalization* in the sense that the firms are exposed to such complex and varied information and knowledge that they find it hard to turn them into actual innovations (see Contractor et al., 2003; Zahra et al., 2000). The research method of the present study does not have the ability to test these alternative explanations, so we have to leave them for future research.

5.1.3. Firm performance

Yet the most interesting finding in this study is the typology's ability to differentiate on firm performance measures. By distinguishing between international SMEs in terms of their degrees of internationalization and knowledge integration, we find strong support for differentiated firm performance. This observation strongly indicates that pursuing a high degree of internationalization combined with developing effective knowledge integration can increase firm performance for international SMEs in a broad range of dimensions. This finding is in line with the results of empirical studies carried out by Marques et al. (2017) and Zahra et al. (2000) demonstrating that pursuing knowledge integration together with internationalization can provide the firm with higher performance in terms of both financial and non-financial outcomes as well as innovation performance.

The present study suggests that following a high degree of knowledge integration improves the firms' self-reported, perceived performances in terms of innovation, internationalization, and growth likelihood. It is also interesting to observe that, in the SMEs' internationalization performance measures, perceived performance closely matches the objective measures in the *Global Integrators* cluster, as these firms operate in more foreign markets, internationalize earlier, and enter new markets more rapidly than the other groups of the firms. This finding indicates clearly that knowledge integration is a key variable in explaining the speed of internationalization—a topic often investigated in the field of international entrepreneurship (see, e.g. Cesinger et al., 2012; Coviello et al., 2011; Knight & Cavusgil, 2004; Madsen & Servais, 1997; Moen & Servais, 2002; Zander et al., 2015). This finding supports a theoretical proposition developed by Casillas et al. (2009) regarding the positive effect of knowledge integration activities on firms' international speed. This result would be even more pronounced in our study if outliers were removed from the sample. More specifically, five firms in the *Global Integrators* cluster differentiate themselves by late internationalization (more than 20 years after establishment). With these firms removed from the sample, the average time to internationalization in this cluster would be less than 3 years, and nearly half of them (21 of the remaining 45) would have internationalized within a year of establishment.

Finally, in terms of the firms' perceived growth likelihood and turnover growth rate, the pattern parallels that of international performance. The *Global Integrators* assume higher growth rates and show higher actual turnover growth rates. This result becomes even more interesting when compared with the *Global Non-Integrators*, which actually experiences negative revenue growth. In this case, we observe the clearest footprints of knowledge integration, suggesting that the more firms internationalize, the more essential it becomes for them to integrate knowledge effectively.

6. Limitations and future research suggestions

The current study has certain limitations, and suggestions for future research. While the clustering procedure is useful for identifying differential effects, as was the main objective in this study, it is not appropriate for unveiling causal relationships and controlling for spurious and mediating variables. We have to leave these investigations to future studies that use other statistical approaches. Second, this study's quantitative approach is not well suited to locating the micro-processes that underpin the firm-level relationships investigated here. In the present study,

directionality and causality are derived from theory; more qualitative, and preferably longitudinal, research is needed to understand the micro-processes that lead up to these distinguishing characteristics. In particular, we suggest that future research focus on the differential effects of innovation capabilities, as argued above. In addition, the variable utilized to measure *knowledge integration* is made of several items (e.g. use of formal reports, face-to-face discussions, formal analysis of the failing/successful projects, etc.; see Table A1), which due to the nature of the study (i.e. to create the clusters), are reduced into one component. Future research can investigate the direct effect of each of these items on the firm performance of international companies. Moreover, the definition of knowledge integration utilized in this study, developed by Zahra et al. (2000), aims to capture the extent to which the firm uses different activities to systematically identify, evaluate, and exploit experimental knowledge from international activities. Future research can investigate the effects of integrating other types of knowledge on the firms' performance—such as tacit/explicit and technical/market knowledge.

A final limitation of the present study is that it is limited to Norwegian companies. Even though the sample is representative of the population of international SMEs in Norway, it is hard to assess whether the same characteristics and findings would emerge in a different country setting. The Norwegian economy is small and open, and it remains to be seen if these findings would be similar in countries with larger domestic markets.

7. Conclusion and managerial implications

Departing from the knowledge-based view of the firm (Grant, 1996a, 1996b), which asserts that knowledge is the most important asset of the firm, this study aimed to investigate the differential effects of internationalization and knowledge integration on the innovation capabilities and firm performance of international SMEs. We sought to do this through a cluster analysis based on two distinguishing variables: a degree of internationalization and knowledge integration. The approach proved successful in the sense that it effectively differentiated the four resulting clusters on sources of knowledge acquisition, innovation capabilities, and perhaps most significantly, firm performance.

Overall, we observe that the two *Integrator* clusters score systematically higher in all investigated dimensions when compared to their two corresponding *Non-Integrator* clusters. More specifically, the findings suggest, first, that it is not necessarily the degree of internationalization that indicates variation in sources of knowledge acquisition, but rather the extent of focus on knowledge integration. The firms' strategic orientation toward knowledge integration also significantly contributes to their innovation capabilities. In terms of the firms' degree of internationalization, we observe a differentiating effect on their innovation capabilities. This specific finding is hard to explain based on the current statistical method. Hence, we call for more research on this topic. Finally, we found that the internationalization-knowledge integration typology was very effective in differentiating firm performance, measured in terms of innovation, internationalization, and growth. Taken together, these results suggest the central role of knowledge management in developing innovation capabilities and enhancing firm performance in international SMEs.

For managers, the results of this study convey the message that a passive presence in international markets does not provide the firm with the knowledge that can be exploited; it is rather the active strategy of knowledge integration that renders international SMEs to search for and use a variety of knowledge sources. In other words, it is the firm's strategic orientation toward knowledge integration that prompts it to acquire knowledge from a broader range of external sources, not the degree of internationalization *per se*. In addition, the influential role of knowledge integration, observed in this study, suggests that the more that SMEs internationalize, the more essential is for them to integrate knowledge effectively. Hence, it is recommended that managers in international SMEs set up efficient organizational procedures for knowledge-management practices; this will benefit them in creating strong innovation capabilities, rapid international expansion, and overall firm performance.

Funding

The authors received no direct funding for this research.

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Citation information

Cite this article as: Knowledge integration in international SMEs – The effects on firm innovation and performance, Mohammad Javadinia Azari, Arild Aspelund & Ann Elida Eide, *Cogent Business & Management* (2020), 7: 1849890.

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Appendix A. List of the items, loadings, reliabilities, and sources of the factors used in this study

Table A1. Knowledge integration measure

Knowledge Integration To which extent does the company use each of the following activities to capture, interpret, synthesize and integrate what you have learned from your international activities?	Loadings	Cronbach's Alpha	Source(s)
Use of formal reports and memos to summarize learning	0.704	0.849	Zahra et al. (2000, pp. 935–936)
Information sharing in meetings	0.738		
Discussions face-to-face between different teams	0.672		
Use of experts and consultants to facilitate learning	0.647		
Formal analysis of failing international projects	0.726		
Formal analysis of successful projects	0.780		
Formal discussions of the best ways to use what has been learned in developing new products (or upgrading existing ones)	0.801		

Table A2. Sources of knowledge acquisition measure

Sources of Knowledge Acquisition Which of the following have been sources of new/important ideas for your company's development activities?	Loadings	Cronbach's Alpha	Source(s)
External Sources			
Associated companies in the same company group	0.603	0.602	Inspired by Statistics Canada and
I. A. E. I. D. Statistics Canada: Science (2002) as used in Branzei and Vertinsky (2006)			
Suppliers	0.621		
Customers	0.584		
Competitors	0.711		
Consultants	0.600		
Academic Sources			
Universities, colleges and/or research institutes	0.845	0.630	
Conferences and scientific publications			
Public Sources			
Internet	0.859	0.643	
Trade fairs and exhibitions			

Table A3. Innovation Capability Measure

Innovation Capabilities	Loadings	Cronbach's Alpha	Source(s)	
Product Innovation				
Products ¹	0.808	0.730	Weerawardena (2003a, 2003b), Little (2012)	
Improvement of existing product ²	0.778			
Development of new product ²	0.831			
Service Innovation				
Services ¹	0.865	0.857		
Improvement of existing service ²	0.890			
Development of new service ²	0.890			
Process Innovation				
Production Processes ¹	0.836	0.831		
Improvement of existing production process ²	0.878			
Development of new production process ²	0.881			
Business Model Innovation				
Business Model ¹	0.727	0.738		
Improvement of existing business (the way company benefits) ²	0.868			
Development of new business model ²	0.831			

¹Questions asked in the manner: "How would you rate your company's ability to be innovative related to ...";

²Questions asked in the manner: "How much focus does the company have on the development activities listed below ..."

Table A4. Perceived innovation performance measure

Perceived Innovation Performance What impact have the company's development activities (in terms of innovation) had for your company?	Loadings	Cronbach's Alpha	Source(s)
It increased the company's profitability	0.833	0.843	Statistics Canada and I. A. E. I. D. Statistics Canada: Science (2002)
It increased the company's productivity	0.693		
It increased the company's market share nationally	0.586		
It increased the company's market share internationally	0.616		
It made it possible for the company to maintain its profit margin	0.833		
It made it possible for the company to keep up with its competitors	0.805		
Generally, management is very pleased with the company's innovation level	0.738		

Table A5. Perceived international performance measure

Perceived International Performance In terms of your expectations, how satisfied are you with your company's international efforts during the last three years with regard to:	Loadings	Cronbach's Alpha	Source(s)
Achieved market share	0.843	0.919	Madsen (1998), Knight and Cavusgil (2004)
Sales Growth	0.856		
Sales growth compared to competitors	0.847		
Earnings/profitability	0.785		
The image the company has gained	0.770		
Competence building	0.734		
Access to additional new markets	0.645		
All things considered, how satisfied are you with the overall results of the international efforts for the last 3 years?	0.896		

Table A6. Perceived growth likelihood measure

Perceived Growth Likelihood	Loadings	Cronbach's Alpha	Source(s)
Growth is a strong desire for the company's management ¹	0.918	0.836	Strandskov (1994), Andersen and Saat Kheam (1998), Moen et al. (2016)
Growth is a strong desire for the company's owners ¹	0.919		
Growth is necessary for company survival ¹	0.747		
Will be substantially larger than today ²	0.706		



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