R&D MANAGEMENT

Intellectual capital-driven innovation: the influence of servitization degree

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While intellectual capital's (IC) impact on innovation has been well-established, increasing understanding of related contingencies would yield great benefits to both research on and the practice of innovation and IC management. With the rise of the service economy, servitization degree – i.e., the degree of relevance of service provision compared with the delivery of manufactured goods – represents an important contingency, with significant potential to shed more light on and improve the understanding of the IC-performance relationship in the context of research and development. This paper examines how servitization moderates IC's impact on innovation performance by testing related hypotheses on a sample of 180 Spanish companies through a statistical analysis conducted through structural equation modeling based on partial least squares. The results indicate that servitization moderates the relationship between internal and external relational capital and innovation in different ways: The moderation effect is negative for internal relational capital, but positive for external relational capital, i.e., more service-oriented companies benefit from internal collaboration and coordination to a lesser extent in their innovation endeavors, while external stakeholder communication and networks are crucial for achieving a high rate of innovation performance. The findings help develop a more fine-grained understanding of IC's role in innovation and related firm- and industry-level contingencies, as well as increase the understanding of R&D ecosystem agents.

1. Introduction

Innovation's importance in a company's success has spurred researchers to examine the antecedents of innovation performance more deeply (Damanpour, 1991; Mention, 2011; De Massis et al., 2015; Lin et al., 2020). Innovation is a fundamentally knowledge-related process that entails using knowledge resources to create new assets such as products, services, and processes, among others (Nonaka and Takeuchi, 1995). As a result, it is hardly surprising that research that aims to explain innovation's occurrence increasingly has focused on how knowledge-related resources influence innovation outcomes.

Intellectual capital (IC) theory, which views specific knowledge assets or IC components as conducive to superior performance, has been a common approach to conceptualizing the role of knowledge in innovation (Reed et al., 2006). IC encompasses human, structural, and relational capital (Bontis, 1996, 1998; Sveiby, 1997) as the knowledge resources that the company manages to gain sustainable competitive advantages (Youndt et al., 2004; Subramaniam and Youndt, 2005).

Human capital is inextricably linked to innovation because people with ideas, know-how, ability, creativity, intelligence, experience, and determination are required to create novelties. People are critical in the innovation process because they are the only ones capable of creating knowledge. Part of these knowledge assets can be saved in the form of written procedures and protocols, databases, and information systems, among other things, for future use. This stored knowledge (i.e., structural capital) can support new creations because individuals can refer to it for inspiration and learning. People can also gain knowledge by interacting with others (i.e., relational capital). Individual and company networks are a source of knowledge and useful for contrasting one's own ideas during the innovation process.

While IC's importance in innovation has been well-established (*cf.* Mention, 2012; Buenechea-Elberdin, 2017), an open question remains concerning the degree and nature of IC's relevance in various kinds of settings. IC assets are context-dependent resources and, thus, are 'best understood within the specific context in which they are developed' (Reed et al., 2006, p. 876). This means that firm- and context-related characteristics – such as a company size, its level of technological sophistication, the industry to which it belongs, and the country where it operates – could alter how IC components affect innovation performance. To date, only a few studies have tried to shed any light on this issue by analyzing specific contingencies in the study of the IC-innovation relationship. Ortiz (2009), Daou et al. (2014), and Inkinen et al. (2017) analyzed the IC composition's characteristics in various geographical locations; Buenechea-Elberdin et al. (2018a, 2018b) examined the role of technological sophistication and innovation type; and Andreeva et al. (2021) studied the country context's impact and related resource availability and appropriability regimes.

Along with the well-documented rise of the 'service economy' (e.g., Buera and Kaboski, 2012; Witt and Gross, 2020), the role that services play in employment and value adding has become dominant, and service components' relative importance in product offerings has increased. Considering that IC's efficacy greatly depends on its match with organizational and contextual requirements, a crucial contingency factor deserving special attention for better understanding the IC-innovation relationship is servitization degree, which refers to the degree of relevance of service provision compared to the delivery of manufactured goods. According to Kianto et al. (2010), human capital and IC creation practices are more prevalent in service-oriented businesses than in product-oriented companies, while the opposite occurs with IC protection activities. Kianto and Andreeva (2014) compared knowledge management practices in service-oriented and product-oriented companies, and discovered that service orientation impacts knowledge management practices' efficacy in firms. Building on these findings, we propose that a firm's servitization degree also may condition how IC contributes to innovation performance significantly.

The servitization field can be traced back to 1988 (Vandermerwe and Rada, 1988), and since then, it has received increasing attention due to services' relevance to manufacturers (Baines et al., 2017). As customer and competitive demands become more challenging, servitization is a way to offer bundles of products and services that are unique and help sustain competitive advantage (Baines et al., 2009; Santamaría et al., 2012). Following Santamaría et al. (2012) and Baines et al. (2017), the provision of services, in contrast to manufacturing goods, requires different approaches and capabilities. The IHIP paradigm (Zeithaml et al., 1985; Edgett and Parkinson, 1993; Moeller, 2010) holds that services, unlike products, are intangible, heterogeneous, inseparable, and perishable, and these four characteristics can affect how IC components influence innovation performance. In a remote technical assistance company, for example, the service is created, provided, and consumed when the employee delivers it to the customer (real-time production and consumption, i.e., inseparability). Moreover, the employee must tailor the solution offered to the needs of each customer at each time (high degree of customization, i.e., heterogeneity). In this scenario, employees' ability to understand customers' needs and adapt to them instantly makes the human factor an essential ally in the development of new services. Nevertheless, extant literature has not paid attention to this contingency variable when studying the IC-innovation linkage.

Consequently, this paper addresses the following research question: How does firms' servitization degree moderate the relationship between IC and innovation performance? By means of having a more nuanced understanding of how IC components influence the creation of new products and services, the paper could identify relevant actors in a research and development (R&D) ecosystem, and managers could benefit from more focused criteria to deploy knowledge resources conducive to innovation. Considering that IC assets are context-dependent resources, and taking into account the already known and expected changes in IC components between service-oriented and product-oriented businesses, it makes sense to investigate how servitization moderates IC's impact on innovation performance. The first set of hypotheses establishes a link between all IC elements and product/service innovation performance, and the second set examines whether servitization degree influences the previously mentioned link. We tested our hypotheses through a multi-industry survey study conducted in Spain at manufacturing and service companies with at least 100 employees. The findings, analyzed using structural equation modeling based on partial least squares (PLS-SEM), reveal a significant moderating effect in the relationship between internal and external relational capital vis-à-vis innovation when servitization degree comes into play, paving the way for further research on this topic.

2. Theoretical background

2.1. Intellectual capital and innovation

IC theory, also known as IC view, aims to comprehend the main tenets of organizational performance on the basis of specific knowledge assets known as IC components (Reed et al., 2006). The fundamental aspect of IC theory is IC, which refers to the knowledge-related resources that a corporation manages or can access to establish long-term competitive advantages (Youndt et al., 2004; Subramaniam and Youndt, 2005). This theory is appropriate for providing managers with guidance on how to improve results because it focuses on specific knowledge resources (Priem and Butler, 2001; Reed et al., 2006).

A rather wide consensus appears to exist among researchers that IC's most important elements are human, structural, and relational capital (Bontis, 1996, 1998; Sveiby, 1997; Subramaniam and Youndt, 2005; Hsu and Fang, 2009). Human capital refers to individuals' knowledge, skills, experience, and motivation (Edvinsson and Malone, 1997; Bontis, 1998). Structural capital embraces the codified knowledge accumulated in documents, procedures, databases, and information systems (Sveiby, 1997). Relational capital includes knowledge created and managed through networks of relationships among individuals within the company (i.e., internal relational capital) and between the company and external agents (i.e., external relational capital) (Bontis, 1996; Nahapiet and Ghoshal, 1998).

Although it has been defined in a variety of ways, from various perspectives, and through a variety of approaches, innovation ultimately entails generating something new (Lee and Tsai, 2005; Crossan and Apaydin, 2010; Sáenz and Aramburu, 2011). An examination of research that links IC and innovation illustrates the diversity in approaches to innovation, which has been analyzed from a results-oriented perspective, e.g., creation of new products, services, and processes, as well as from the perspective of the innovation process itself, e.g., ways to innovate and the capabilities required (Buenechea-Elberdin, 2017). Some studies have opted to examine the degree of radicality or change in the new creation (e.g., radical or incremental), while others have focused on innovativeness, i.e., a business's intention to innovate (Buenechea-Elberdin, 2017). To sum up, innovation has been conceptualized in many ways within IC research. In this paper, the choice has been made to focus on the results-oriented perspective, and more specifically, on the degree of product/service innovation success vis-à-vis competitors.

The relationship between knowledge and innovation can be viewed as a cycle because knowledge is a necessary input and a result of the innovation process (Nonaka and Takeuchi, 1995). *Innovation* can be defined as the 'multi-stage process whereby organizations transform ideas into new/improved products, services, or processes' (Baregheh et al., 2009, p. 1,334), while knowledge functions as both a necessary source in the innovation process and as a consequence of it. The link between knowledge and innovation has been analyzed in depth in the literature and, given that IC refers to firms' knowledge resources, IC-related antecedents of innovation also have received considerable attention.

Extant research has demonstrated human capital's direct influence on innovative performance, service innovativeness, innovative propensity and culture, and new product development performance (Chen et al., 2006; Cabello-Medina et al., 2011; Carmona-Lavado et al., 2013; Chahal and Bakshi, 2015). Considering that knowledge fundamentally is related to people (Nonaka and Takeuchi, 1995), any new development is dependent on the availability of people with the capacity to carry out this development. Following Delgado-Verde et al. (2016), human capital is a great enhancer of radical innovations, and 'individual creativity and talent is the first stage of the overall innovation process'. Employees' skills, capabilities, novel ideas, creativity, attitudes, and values contribute to the development of new products through customer capital (Chen et al., 2014), structural capital (Costa et al., 2014; Kianto et al., 2017), and organizational learning capabilities (Hsu and Fang, 2009), among other options.

Codified knowledge accumulated in databases and information systems is a source of ideas, insights and learning in the innovation process. For example, a company may analyze its customer database and, based on their preferences, design a new service that customers will value. Certain studies have used only structural capital in their models as they sought to deepen into the specificities of how elements that build structural capital affect innovation (Aramburu and Sáenz, 2011; Delgado-Verde et al., 2011), while other researchers prefer to analyze structural capital's influence on innovation when the model includes other IC components. Wu et al. (2008) and Zerenler et al. (2008) found that structural capital directly enhances innovation, while Buenechea-Elberdin et al. (2018a) proved that the direct link between structural capital and innovation performance only holds with firms that belong to low-technology sectors. This intangible asset also can assume a mediator role in the relationship between human capital and innovative performance (Wu et al., 2007), as well as indirectly impact technological innovation through supply chain learning (Zhang and Lv, 2015).

In the case of relational capital, the literature mainly has focused on how relationships with agents external to the firm affect innovation. Carmona-Lavado et al. (2013) found that relationships with other companies could enhance service innovativeness only when the firm collaborates actively with customers. Martin-de-Castro et al. (2013) also examined customers' relevance, identifying customer relational capital as a key element in product innovation. Knowledge embedded in relationships with customers, suppliers, and strategic partners is a key source of product innovation (Chen et al., 2006). Other studies have analyzed knowledge created in relationships among employees vis-à-vis innovation. While internal relational capital's impact on innovation could be direct (Delgado-Verde et al., 2014), it also could be mediated by other elements, such as knowledge management capabilities (Hsu and Sabherwal, 2011). Furthermore, Elsetouhi et al. (2015), Menor et al. (2007), and Zhang and Lv (2015), among other studies, have examined both external and internal relationships as relevant knowledge sources for innovation. As for knowledge sharing as a means of encouraging innovation, Dost et al. (2016, p. 687) contended that 'when some individual experts work independently, they might not share their valuable ideas with colleagues, and this could be counterproductive for the organizations'. People and organizations benefit from sharing their learnings, thoughts, ideas, and points of view both inside and outside the company through professional associations and other types of networks because it can lead to the creation of novel knowledge assets that help them innovate.

To sum up, previous studies have demonstrated broadly that human, structural, and relational capital (including both internal and external relational capital) positively impact innovation. Therefore, the following hypothesis is proposed:

H1 IC (comprising human, structural, and both internal and external relational capital) is positively related to product/service innovation performance.

2.2. *Servitization degree*

IC assets are context-dependent resources, i.e., their value depends on the context in which they are created and developed (Reed et al., 2006). Subramaniam and Youndt (2005) recognized the need for a contingency approach, particularly when analyzing the relationship between IC and innovative capabilities. Considering that 'the links between intellectual capital and innovative capabilities are complex and contingent upon several multifaceted organizational actions and attributes' (Subramaniam and Youndt, 2005, p. 460), excluding them from the analysis elicits only a partial answer to how IC influences innovation. Nevertheless, apart from the few studies that have tried to disentangle the impact of technology level and type of innovation on the IC-innovation linkage (Buenechea-Elberdin et al., 2018a, 2018b), this contingency approach has often been omitted.

One contingency variable that could affect the IC-innovation relationship is servitization degree, which refers to services' relevance when compared with the products that the company offers. *Servitization* is the 'transformation of a manufacturer's business strategy towards increasing service provision' (Turunen and Finne, 2014, p. 603), producing 'integrated product-service offerings' (Baines et al., 2009, p. 547). Thus, the traditional distinctions between manufacturing and service companies become somewhat blurred. The literature recognizes Vandermerwe and Rada as the first to introduce the concept in the late 1980s (Neely, 2008; Baines et al., 2009), and since then, servitization has aroused several research communities' interest (Lightfoot et al., 2013). Vandermerwe and Rada (1988, p. 314) held that companies should look 'at their customers' needs as a whole, moving from the old and outdated focus on goods or services to integrated "bundles" or systems'. Offering these product and service packages is a way for companies to survive and defend themselves against competition by being able to better meet customer demands (Neely, 2008; Santamaría et al., 2012). Servitization's impact on the IC-innovation linkage will be examined below.

In the case of human capital, it seems reasonable to expect that increased servitization will strengthen human capital's influence on innovation. Services are characterized by their inability to separate their production and consumption (Zeithaml et al., 1985), making human capital's role crucial in guaranteeing service quality. As Nijssen et al. (2006, p. 242) put it, 'Due to services' real-time production, new services go hand in hand with modifications of the service delivery process and changes in frontline employees' skills'. Furthermore, considering that services are heterogeneous, i.e., difficult to standardize (Edgett and Parkinson, 1993), service quality depends greatly on the abilities of the employees providing them. Industrial machinery cleaning services are an example of these two distinct features because the service is provided concurrently with its creation and the cleaner must adapt the cleaning to the characteristics and specific condition of each machine. Therefore, employees and their complex pieces of knowledge and combinations of abilities become particularly relevant to the development and delivery of new services (Kianto et al., 2010). Human capital is viewed as a valuable storehouse of knowledge that is difficult to duplicate and essential for innovation (Prajogo and Oke, 2016). Santamaría et al. (2012) found that training employees and offering them the chance to acquire new knowledge are critical for service innovation.

In conclusion, because services require real-time production and consumption, and are difficult to standardize, employees' inner abilities, experience, knowledge, and motivation to provide a high-quality service are important for innovation. Consequently, the following hypothesis is proposed:

> H2 Servitization degree positively moderates the relationship between human capital and product/service innovation performance.

New services, according to Hipp and Grupp (2005), may rely heavily on structural capital in the form of data processing procedures provided by information and communication technology; however, services are viewed as intangible and perishable. On the one hand, this means 'services are performances, rather than objects'; thus, 'they cannot be seen, felt, tasted or touched in the same manner in which goods can be sensed' (Zeithaml et al., 1985, p. 33). On the other hand, 'they cannot be stored for use at a later date' (Edgett and Parkinson, 1993, p. 27). Unlike services, products are tangible and, thus, can be saved for later use and shown to other people at any time. For example, traveling services in contrast with vehicles. While cars can be stored and shown to others, traveling services such as a guided tour must be experienced during the visit itself and cannot be stored like vehicles. Intangibility and perishability seem to affect the role that structural capital ultimately plays in innovation, particularly as servitization degree increases. It could be said that the lower the servitization degree, the higher the knowledge that could be stored in databases and information systems (Kianto et al., 2010). Moreover, the greater degree of personalization distinctive of service provision (i.e., heterogeneity) (Zeithaml et al., 1985; Edgett and Parkinson, 1993) makes it more difficult to rely on previously documented knowledge and procedures.

To sum up, because services are intangible and perishable, relying on stored and codified knowledge to support innovation is difficult. Therefore, the following hypothesis is proposed:

> H3 Servitization degree negatively moderates the relationship between structural capital and product/service innovation performance.

As far as relational capital is concerned, servitization degree affects internal and external relational capital differently (Adler and Kwon, 2002). Although collaboration with external agents helps develop both new products and services (Nieto and Santamaría, 2007; Wu et al., 2007; Wu et al., 2008; Carmona-Lavado et al., 2013; Zhang and Lv, 2015), the impact is greater on service-oriented companies. Services are hard to standardize (i.e., heterogeneous) (Edgett and Parkinson, 1993), as they depend greatly on each customer's different needs and desires (For example, legal services should be tailored to the specific needs of the individual or business who requires them.) The relationship between the service provider and the customer then should be close to guaranteeing that delivery satisfies customers' needs and expectations. In fact, the servitization literature repeatedly has justified the relevance of tacit knowledge regarding clients in the success of services (Vandermerwe and Rada, 1988; Baines et al., 2009; Santamaría et al., 2012).

In the case of manufacturing-oriented firms, internal relational capital plays a key role in innovation success. Product development requires combining different types of specialized knowledge disseminated through company departments; this calls for fluent communication and knowledge sharing, as well as strong coordination between departments. García et al. (2008) demonstrated that a good relationship between marketing and R&D departments helps facilitate new product development.

To sum up, unlike products, services are difficult to standardize, requiring that customers play an important role in describing their needs and desires. However, launching a new product typically necessitates the involvement of a large number of specialized functions and staff members within the organization. Therefore, the following hypotheses are proposed:

H4 Servitization degree negatively moderates the relationship between internal relational capital and product/service innovation performance.

H5 Servitization degree positively moderates the relationship between external relational capital and product/service innovation performance.

2.3. *Control variables*

This research includes size and R&D intensity as control variables. Compared with large companies, small ones follow different kinds of organizational practices (Cohen and Kaimenakis, 2007). Small businesses have simple internal procedures and hierarchical systems with few levels, rendering them more flexible and agile than large corporations (Nooteboom, 1994). Thus, smaller companies can implement innovations faster and more efficiently. As for R&D intensity, Nijssen et al. (2006) and Hipp and Grupp (2005) proved differences between the development of new products and services in terms of R&D intensity configurations. Considering that R&D enhances innovation, this variable should be controlled.

Figure 1 summarizes the research model:

3. Research method

In this article, we follow a quantitative research strategy in which we first define five hypotheses by examining existing literature in the field. We then use survey research to collect data *via* a questionnaire, which then were analyzed using PLS-SEM. The acquired data then were analyzed to validate or refute the proposed hypotheses. Finally, we discuss the study's contribution to IC theory.

3.1. *Data collection and sample*

This study's population comprised Spanish companies with 100 or more employees and whose accounts were published in the SABI database (*Sistema de Análisis de Balances Ibéricos* [System

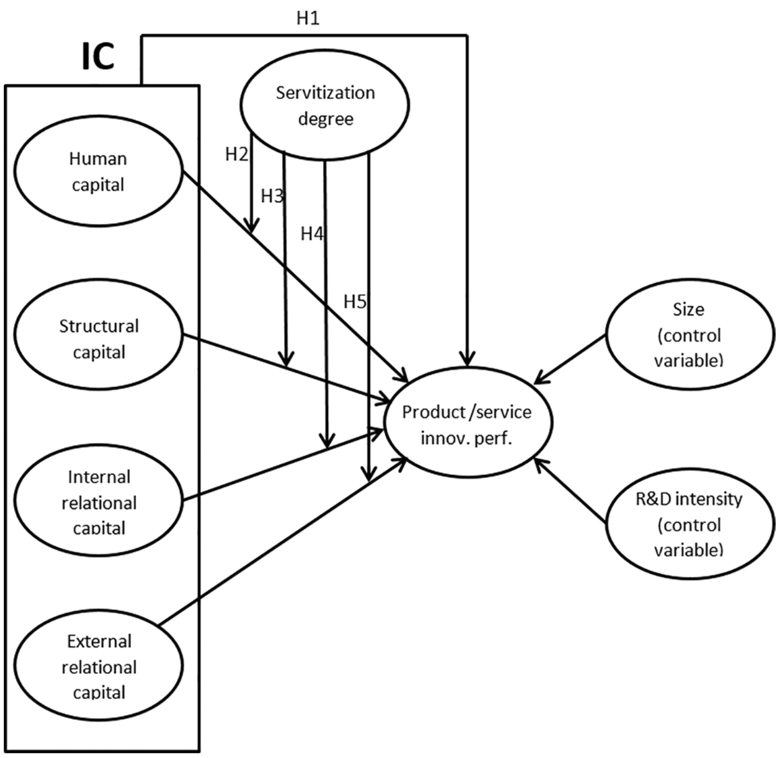

Figure 1. Research model.

of Iberian Balance Sheet Analysis]). Due to budget constraints, out of the 1289 companies that met the established criteria, 700 firms were contacted by phone. Confidentiality was guaranteed to all potential participants. The aim was to obtain a convenience sample in which a balance existed between manufacturing and service companies, as well as companies with different degrees of servitization. The final sample included 180 companies that answered a structured questionnaire (response rate: 25.71%).

The final sample is evenly divided between the manufacturing and service industries (86 vs. 94 firms, respectively). Having companies from both the manufacturing and service sectors is advantageous for the purposes of this study because it provides a more varied degree of servitization. Furthermore, preliminary data analysis revealed that manufacturing sectors are interested in expanding their product offerings by adding services, as more than 20% of the manufacturing firms in the sample have a medium or high level of servitization. In addition, the sample is also varied in terms of company size ranging from 100 to more than 5,000 employees, while most of them are between 150 and 800 employees.

In terms of respondents' profiles, a large percentage (89.44%) comprised managers or directors who held positions of responsibility in their companies, and the remaining 10.56% were regular employees with no management responsibilities. As data for all variables came from the same self-reported survey, common method bias was possible (Podsakoff et al., 2003). To determine whether this could constitute a relevant problem in the data set, a test that Kock (2015) conceived specifically for PLS-SEM was conducted, including both vertical (predictor–predictor) and lateral (predictor-criterion) collinearity analyses. According to Kock (2015), if all variance inflation factors (VIFs) resulting from a full collinearity test are equal to or lower than 3.3, the model can be viewed as free of common-method bias. The highest VIF in our model was 1.596, well below the 3.3 threshold, indicating that common method bias did not represent a relevant issue in the data set.

3.2. Measures

After a comprehensive literature review, we (see Table 1 for specific sources and detailed wording of the items) developed measures for IC stocks that were tested to ensure their operational validity and robustness. The single indicator used to measure product/service innovation was adopted from Weerawardena (2003), and size and R&D intensity were included as control variables. For IC stocks and innovation, five-point Likert scales (in which 1 = strongly disagree and 5 = strongly agree) were used.

All IC components were designed conceptual variables because they were the result of a conceptual abstraction and only existed as ideas, i.e., each IC component was conceived as a combination of different elements. Along these lines, human capital was viewed as a combination of employees' high level of knowledge (expertise), skills, and motivation. Structural capital was conceived as a combination of relevant information systems to support business operations, technological facilities to support cooperation between employees, and availability and accessibility of documented knowledge. Finally, relational capital was viewed as a combination of mutual understanding and frequent and smooth collaboration between both internal and external parties to solve problems. Thus, indicators built up (or defined) the conceptual variables, so a composite measurement model was applied (Henseler, 2017).

In composite measurement, latent variable scores are obtained as linear combinations (i.e., weighted composites) of the indicators comprising the variables without error terms. Two possibilities can be used to estimate indicators' weights: Mode A (i.e., correlation-based) and Mode B (i.e., ordinary least squares regression-based) (Rigdon, 2016). According to Sarstedt et al. (2016), Mode A performs better when R^2 values are small to medium, as is the case in this research (see Table 2). Thus, Mode A was used.

3.3. Data analysis

The proposed hypotheses were analyzed using Structural Equation Modeling based on Partial Least Squares (SmartPLS software, Version 3.2.8) (Ringle et al., 2015). Model 1 linked IC components, servitization degree, and control variables to product/service innovation performance. Model 2 included interaction terms involving servitization degree and IC components.

The analysis comprised two stages – (1) measurement model evaluation and (2) structural model evaluation – to test the proposed hypotheses (e.g., Hair et al., 2017; Henseler, 2017).

4. Results

4.1. Measurement model

In composite measurement, traditional assessment methods that aim to prove that the indicators chosen to operationalize the concepts derive from the

Table 1. Measurement model evaluation Part I (baseline model)

Constructs and measures	Parameters				
Size (Control variable)					
	VIFs	Loadings	*P*-val.	Weights	*P*-val.
Natural logarithm of the number of employees	N.A.	N.A.	N.A.	N.A.	N.A.
R&D intensity (Control variable)					
	VIFs	Loadings	*P*-val.	Weights	*P*-val.
Proportion of R&D staff	N.A.	N.A.	N.A.	N.A.	N.A.
Human capital (Mode 'A' composite)					
Sources: Bontis (1998); Yang and Lin (2009)	VIFs	Loadings	*P*-val.	Weights	*P*-val.
HC1 Our employees are highly skilled at their jobs	1.643	0.874	.000	0.538	.000
HC2 Our employees are highly motivated in their work	1.221	0.664	.000	0.337	.024
HC3 Our employees have a high level of expertise	1.777	0.839	.000	0.364	.002
Structural capital (Mode 'A' composite)					
Sources: Kianto (2008); Kianto et al. (2010)	VIFs	Loadings	*P*-val.	Weights	*P*-val.
SC1 Our company has efficient and relevant information systems to support business operations	1.749	0.780	.000	0.282	.002
SC2 Our company has tools and facilities to support cooperation between employees	1.990	0.819	.000	0.267	.001
SC3 Our company has a great deal of useful knowledge in documents and databases	2.178	0.834	.000	0.300	.000
SC4 Existing documents and solutions are easily accessible	2.479	0.883	.000	0.352	.000
Internal relational capital (Mode 'A' composite)					
Sources: Kianto (2008); Yang and Lin (2009)	VIFs	Loadings	*P*-val.	Weights	*P*-val.
IRC1 Different units and functions within our company – such as R&D, marketing, and production – understand each other well	2.040	0.738	.001	0.091	.415
IRC2 Our employees frequently collaborate to solve problems	2.038	0.945	.000	0.617	.076
IRC3 Internal cooperation in our company runs smoothly	2.468	0.884	.000	0.395	.101
External relational capital (Model 'A' composite)					
Source: Kianto (2008)	VIFs	Loadings	*P*-val.	Weights	*P*-val.
ERC1 Our company and its external stakeholders – such as customers, suppliers and partners – understand each other well	1.827	0.816	.000	0.342	.000
ERC2 Our company and its external stakeholders frequently collaborate to solve problems	1.627	0.873	.000	0.498	.000
ERC3 Cooperation between our company and its external stakeholders runs smoothly	2.112	0.858	.000	0.334	.000
Servitization degree (Moderating variable in Model 2)					
Source: Kianto et al. (2010)	VIFs	Loadings	*P*-val.	Weights	*P*-val.
Scale from 1 (100% product) to 10 (100% service)	N.A.	N.A.	N.A.	N.A.	N.A.
Prod./Serv. innovation performance (Dependent variable)					
Source: Weerawardena (2003)	VIFs	Loadings	*P*-val.	Weights	*P*-val.
PIP Innovation performance in products and services for customers as compared to competitors	N.A.	N.A.	N.A.	N.A.	N.A.

same underlying phenomenon are not applicable. In this case, concepts emerge as a combination of the different elements included in the definition; thus, measurement-model assessment should guarantee that the indicators capture the essence of the conceptual variables (i.e., 'conceptual fidelity').

In this regard, employees' knowledge, skills, and motivation traditionally have been viewed as central constituents of human capital (e.g., Brooking, 1996; Marr, 2006). In the same vein, information systems, technological infrastructure, and documented knowledge have been recognized

Table 2. Structural model evaluation

Model 1	Effects	STDEV	t statistics	*P*-values	5%	95%
Product/Service innovation performance (R^2 = 15.6%)						
Size	**–0.111**	**0.066**	**1.688**	**.046**	**–0.224**	**–0.008**
R&D intensity	**0.136**	**0.062**	**2.190**	**.014**	**0.038**	**0.239**
Human capital	0.052	0.077	0.674	.250	–0.067	0.183
Structural capital	**0.193**	**0.091**	**2.130**	**.017**	**0.044**	**0.340**
Internal relational capital	–0.104	0.105	0.993	.160	–0.352	0.016
External relational capital	**0.217**	**0.081**	**2.668**	**.004**	**0.086**	**0.350**
Servitization degree	0.026	0.074	0.356	.361	–0.097	0.146

Model 2	Effects	STDEV	*t* statistics	*P*-values	5%	95%
Product/Service innovation performance (R^2 = 19.3%)						
Size	**–0.108**	**0.067**	**1.619**	**.053**	**–0.225**	**–0.003**
R&D intensity	**0.132**	**0.062**	**2.147**	**.016**	**0.034**	**0.236**
Human capital	0.030	0.079	0.378	.353	–0.096	0.161
Structural capital	**0.189**	**0.092**	**2.053**	**.020**	**0.033**	**0.340**
Internal relational capital	–0.093	0.098	0.945	.172	–0.305	0.024
External relational capital	**0.228**	**0.084**	**2.711**	**.003**	**0.093**	**0.366**
Servitization degree	0.049	0.072	0.675	.250	–0.070	0.168
Human capital × Servitization degree	0.070	0.096	0.735	.231	–0.074	0.244
Structural capital × Servitization degree	0.040	0.104	0.387	.349	–0.109	0.232
Internal relational capital × Servitization degree	**–0.213**	**0.104**	**2.050**	**.020**	**–0.412**	**–0.077**
External relational capital × Servitization degree	**0.145**	**0.090**	**1.602**	**.055**	**0.000**	**0.293**

Note: Bold values highlight significant relationships.

as key components of structural capital (e.g., Bontis, 1998; Youndt et al., 2004), while quality relationships (e.g., based on mutual understanding, problem-solving oriented, frequent, and smooth) are viewed as the cornerstone of relational capital (e.g., Edvinsson and Malone, 1997; Stewart, 1997; Bontis, 1998; Marr, 2006).

Collinearity between indicators (measured in terms of VIF values) is another aspect to be analyzed. However, this is only relevant in Mode B (i.e., regression-based) estimation, in which case collinearity can affect indicators' weights and could cause reversed signs. When this is the case, the researcher should consider replacing Mode B estimation with Mode A, which collinearity does not affect (Rigdon, 2012, 2016). In our case, such a decision was made beforehand due to the rather small level of variance explained (i.e., R^2) in the dependent variable (see Table 2).

Although using Mode A composites avoids collinearity problems, it prevents analysis of each indicator's relative relevance when making up the latent variable score so as to maximize the amount of variance explained in the dependent variable. In Mode A composites, only each indicator's absolute relevance could be analyzed (i.e., its total contribution regardless of other indicators in the same construct). Such absolute relevance is provided by indicator loadings, which are equivalent to the bivariate correlation between each indicator and the construct (Hair et al., 2017). The above bivariate correlations are the foundation of indicators' weights in Mode A composites: The higher the loading, the higher the indicator's weight, whose final value depends on the number of indicators in the same construct. As Table 1 shows, all indicators' loadings were statistically significant, which also translated into significant weights, except in one case (IRC1).

4.2. *Structural model*

Once the measurement model's quality was ensured, bootstrapping was applied to test the hypotheses. Table 2 provides the results.

In terms of IC's influence on product/service innovation, structural and external relational capital are the only IC components that exerted a positive and significant impact, partially confirming H1, as human and internal relational capital do not indicate this connection.

Regarding moderation effects, servitization degree does not affect the relationship between human capital and innovation, nor structural capital and innovation. Therefore, H2 and H3 are not supported. However, servitization degree does exert a moderating effect on the relationship between internal and external relational capital and product/service innovation performance. In the case of internal relational capital, the effect is negative, while the opposite applies for external relational capital (thereby supporting H4 and H5).

Regarding control variables, size exerts a significant and negative impact on innovation, indicating that small firms achieve better innovation results, and R&D intensity exerts a positive effect, revealing a connection between R&D and the creation of new products and services.

5. Discussion

5.1. Theoretical implications

Overall, our results elicit a greater understanding of IC's role as an enabler of innovation and the nature of agents (internal or external) that best contribute to the R&D ecosystem in the innovation process. These findings contribute to IC theory in several ways.

Our study provides strong empirical support for previous research concerning knowledge-based resources' impact on organizational performance, knowledge creation, and innovation (Subramanian, 2012; Martin-de Castro et al., 2013; Hussinki et al., 2017). In particular, our findings empirically confirm the expectation that higher IC leads to improved product/service innovation performance.

In terms of IC's direct impact on innovation, our findings indicate that both structural and external relational capital positively influence a firm's product/service innovation performance. Contrary to our expectations, and some previous empirical findings (e.g., Carmona-Lavado et al., 2010, 2013; Delgado-Verde et al., 2016), human and internal relational capital do not exert a significant impact. These results extend IC theory by offering a model about how such knowledge-related resources could contribute to the development of new products and services.

The aforementioned unexpected finding, related to the lack of direct influence from human and internal relational capital on innovation, could be due to the interrelationships among IC components. Several extant studies that have addressed more than one IC asset have demonstrated mediated relations among IC elements when influencing dependent variables, with many (Hsu and Fang, 2009; Cabello-Medina et al., 2011; Chen et al., 2014; Buenechea-Elberdin et al., 2017, 2018b) finding human and internal relational capital to be antecedent variables that boost other types of IC elements and, therefore, do not directly impact the final performance variable. We believe this to be the case in our data as well: Employee skills, knowledge, and motivation, as well as the interrelationships and interactions among them, enable a firm to build explicit knowledge assets, structures, and processes, as well as extra-firm networks and collaborations needed for innovating. Thus, while we did not find a direct relationship between human and internal relational capital and innovation performance, it does not mean that these two types of IC elements are unnecessary for innovation.

Along with Buenechea-Elberdin (2017) and Andreeva et al. (2021), we considered that the lack of attention paid to contingency variables could explain previous studies' inconsistent findings regarding various IC elements' role in influencing innovation. How IC influences innovation depends on contextual variables (e.g., company size, geographic location, industry, servitization degree, etc.) that traditionally have been ignored and that could be behind the contradictory models within IC theory research. In this regard, this study sheds light on how the IC-innovation relationship differs between firms with varying degrees of servitization. The results indicate that servitization degree moderates the relationship between relational capital and innovation, with different effects for internal and external relations.

In the case of external relational capital, we found that the moderation effect is positive, meaning that in more service-oriented firms, external relationships are particularly beneficial to innovation performance. Thus, companies that focus on value creation through services should pay extra attention to building beneficial external collaborations, along with the networks, trust, and collaborative norms that go along with such external relational (or social) capital (Nahapiet and Ghoshal, 1998; Adler and Kwon, 2002). In this sense, our findings confirm Mawdsley and Somaya's (2015) observation that the relevance of client-specific knowledge formed through external relational capital is amplified in the service context.

However, our results indicate that the opposite is the case for intra-firm interactions: We found that the moderation effect is negative, i.e., internal relational capital's impact on innovation is diminished in more service-oriented firms. Services are heterogeneous, i.e., they are adapted to each customer (Edgett and Parkinson, 1993). Thus, new services will be successful to the extent that they consider customers' demands. This finding nuances the widespread belief that internal relationships are always of utmost importance for innovation regardless of context.

By bringing up and explaining servitization as an important contingency variable, we contribute to IC theory by building a more in-depth contextualized understanding of knowledge-based issues' role in organizational performance, which several recent studies have called for (Andreeva et al., 2021; Liu et al., 2021). Furthermore, we add to Subramaniam and Youndt's (2005) discussion of contextual factors' importance in comprehending IC. We also contend that our study begins to build a bridge between services and IC discussion, something omitted in the literature to a large extent (Bontis et al., 2015; Abd-Elrahman et al., 2020). In this regard, our study provides interesting results that help contextualize IC in the current service economy setting (Alves et al., 2021).

To sum up, internal and external relational capital's varied roles in terms of innovation depend on servitization degree, indicating that manufacturing and service-oriented businesses require distinct agents to enhance the production of new products and services. This variation is due to the nature of products and services. Compared with services, product development is more in-house-oriented, necessitating knowledge exchange and good cooperation between departments (García et al., 2008). However, services are difficult to standardize and demand a high level of customization, making customer knowledge a critical innovation enhancer (Baines et al., 2009; Santamaría et al., 2012). Knowing how manufacturing and service-oriented businesses may make the most out of the relationships they can foster offers a more nuanced understanding of how to set up a robust R&D ecosystem.

5.2. *Implications for practice*

To practitioners, our results demonstrate that to boost innovation, identifying, building, maintaining, and managing the organization's intellectual capital are of utmost importance. In particular, ensuring knowledge-friendly organizational structures and support systems feeds innovation in all firms.

Furthermore, our study points out the usefulness of a firm understanding its underlying value generation logic and planning more specific IC investments based on that logic's requirements. In companies with more service-oriented strategies, it is important to invest in building and maintaining high-quality external relationships. However, in such cases in which most revenues are derived from products, it may be wise to pay more attention to enabling and energizing intra-firm relationships and networks. Therefore, the nature of agents participating in R&D ecosystems, and thus contributing to the creation of new products and services should be adapted to the degree of servitization at stake.

5.3. *Implications for policymakers*

For policymakers, the most interesting finding is the link between external relational capital and the creation of new products and services, particularly in firms with a high degree of servitization. Because of the benefits of knowledge created and shared in networks that extend beyond the boundaries of a company, public policies should encourage these networks to gather, discuss, exchange ideas, and generate new insights. While this is especially true for service-oriented companies, it is also the case for manufacturing-oriented firms. The wick that can light the flame of innovation is an innovation ecosystem that includes various companies and companies of different sizes. In fact, the negative impact of size on innovation highlights the importance of including small businesses as part of these innovation-oriented networks.

5.4. *Limitations and avenues for future research*

This study also has some limitations. First, we utilized subjective assessment for our dependent variable, innovation performance. Even if we statistically controlled for potential biases, future studies could find alternative ways to operationalize and measure innovation performance in a more objective manner. Second, data were collected from Spanish companies only, and expanding the scope to more national and cultural contexts obviously could yield added value. Our hope is that future studies will continue to build a more nuanced understanding of intellectual capital and its management requirements in different contexts.

Data availability statement

Data available on request due to privacy/ethical restrictions.

REFERENCES

Abd-Elrahman, A.E.H., El-Borsaly, A.A.E., Hafez, E.A.E., and Hassan, S.A. (2020) Intellectual capital and service quality within the mobile telecommunications sector of Egypt. *Journal of Intellectual Capital*, **21**, 6, 1185–1208.

Adler, P.S. and Kwon, S.W. (2002) Social capital: prospects for a new concept. *Academy of Management Review*, **27**, 1, 17–40. https://doi.org/10.5465/AMR.2002.5922314.

Alves, H., Cepeda-Carrion, I., Ortega-Gutierrez, J., and Edvardsson, B. (2021) The role of intellectual capital in fostering SD-orientation and firm performance. *Journal of Intellectual Capital*, **22**, 1, 57–75.

Andreeva, T., Garanina, T., Sáenz, J., Aramburu, N., and Kianto, A. (2021) Does country environment matter in the relationship between intellectual capital and innovation performance? *Journal of Business Research*, **136**, 263–273. https://doi.org/10.1016/j.jbusres.2021.07.038.

Aramburu, N. and Sáenz, J. (2011) Structural capital, innovation capability, and size effect: an empirical study. *Journal of Management & Organization*, **17**, 3, 307–325.

Baines, T., Bigdeli, A.Z., Bustinza, O.F., Shi, V.G., Baldwin, J., and Ridgway, K. (2017) Servitization: revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*, **37**, 2, 256–278. https://doi.org/10.1108/IJOPM-06-2015-0312.

Baines, T.S., Lightfoot, H.W., Benedettini, O., and Kay, J.M. (2009) The servitization of manufacturing: a review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, **20**, 5, 547–567.

Baregheh, A., Rowley, J., and Sambrook, S. (2009) Towards a multidisciplinary definition of innovation. *Management Decision*, **47**, 8, 1323–1339. https://doi.org/10.1108/00251740910984578.

Bontis, N. (1996) There's a price on your head: managing intellectual capital strategically. *Business Quarterly*, **60**, 4, 40–47.

Bontis, N. (1998) Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, **36**, 2, 63–76. https://doi.org/10.1108/00251749810204142.

Bontis, N., Janošević, S., and Dženopoljac, V. (2015) Intellectual capital in Serbia's hotel industry. *International Journal of Contemporary Hospitality Management*, **27**, 6, 1365–1384.

Brooking, A. (1996) *Intellectual Capital: Core Asset for the Third Millennium Enterprise*. London: International Thomson Business Press.

Buenechea-Elberdin, M. (2017) Structured literature review about intellectual capital and innovation. *Journal of Intellectual Capital*, **18**, 2, 262–285. https://doi.org/10.1108/JIC-07-2016-0069.

Buenechea-Elberdin, M., Kianto, A., and Sáenz, J. (2018a) Intellectual capital drivers of product and managerial innovation in high-tech and low-tech firms. *R and D Management*, **48**, 3, 290–307. https://doi.org/10.1111/radm.12271.

Buenechea-Elberdin, M., Sáenz, J., and Kianto, A. (2017) Exploring the role of human capital, renewal capital and entrepreneurial capital in innovation performance in high-tech and low-tech firms. *Knowledge Management Research and Practice*, **15**, 3, 369–379. https://doi.org/10.1057/s41275-017-0069-3.

Buenechea-Elberdin, M., Sáenz, J., and Kianto, A. (2018b) Knowledge management strategies, intellectual capital, and innovation performance: a comparison between high- and low-tech firms. *Journal of Knowledge Management*, **22**, 8, 1757–1781. https://doi.org/10.1108/JKM-04-2017-0150.

Buera, F.J. and Kaboski, J.P. (2012) The rise of the service economy. *American Economic Review*, **102**, 6, 2540–2569. https://doi.org/10.1017/CHOL9780521820387.011.

Cabello-Medina, C., López-Cabrales, Á., and Valle-Cabrera, R. (2011) Leveraging the innovative performance of human capital through HRM and social capital in Spanish firms. *The International Journal of Human Resource Management*, **22**, 4, 807–828. https://doi.org/10.1080/09585192.2011.555125.

Carmona-Lavado, A., Cuevas-Rodríguez, G., and Cabello-Medina, C. (2010) Social and organizational capital: building the context for innovation. *Industrial Marketing Management*, **39**, 4, 681–690. https://doi.org/10.1016/j.indmarman.2009.09.003.

Carmona-Lavado, A., Cuevas-Rodríguez, G., and Cabello-Medina, C. (2013) Service innovativeness and innovation success in technology-based knowledge-intensive business services: an intellectual capital approach. *Industry and Innovation*, **20**, 2, 133–156. https://doi.org/10.1080/13662716.2013.771482.

Chahal, H. and Bakshi, P. (2015) Examining intellectual capital and competitive advantage relationship. *International Journal of Bank Marketing*, **33**, 3, 376–399.

Chen, Y.S., Lin, M.J.J., and Chang, C.H. (2006) The influence of intellectual capital on new product development performance – the manufacturing companies of Taiwan as an example. *Total Quality Management and Business Excellence*, **17**, 10, 1323–1339. https://doi.org/10.1080/14783360601058979.

Chen, C.-J., Liu, T.-C., Chu, M.-A., and Hsiao, Y.-C. (2014) Intellectual capital and new product development. *Journal of Engineering and Technology Management*, **33**, 154–173.

Cohen, S. and Kaimenakis, N. (2007) Intellectual capital and corporate performance in knowledge-intensive SMEs. *The Learning Organization*, **14**, 3, 241–262. https://doi.org/10.1108/09696470710739417.

Costa, R.V., Fernández-Jardon Fernández, C., and Figueroa Dorrego, P. (2014) Critical elements for product innovation at Portuguese innovative SMEs: an intellectual capital perspective. *Knowledge Management Research and Practice*, **12**, 3, 322–338. https://doi.org/10.1057/kmrp.2014.15.

Crossan, M.M. and Apaydin, M. (2010) A multi-dimensional framework of organizational innovation: a systematic review of the literature. *Journal of Management Studies*, **47**, 6, 1154–1191. https://doi.org/10.1111/j.1467-6486.2009.00880.x.

Damanpour, F. (1991) Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, **34**, 3, 555–590.

Daou, A., Karuranga, E., and Su, Z. (2014) Towards a better understanding of intellectual capital in Mexican SMEs. *Journal of Intellectual Capital*, **15**, 2, 316–332. https://doi.org/10.1108/JIC-08-2013-0092.

De Massis, A., Di Minin, A., and Frattini, F. (2015) Family-driven innovation: resolving the paradox in family firms. *California Management Review*, **58**, 1, 5–19. https://doi.org/10.1525/cmr.2015.58.1.5.

Delgado-Verde, M., Amores-Salvado, J., Martin-de-Castro, G., and Navas-Lopez, J. (2014) Green intellectual capital and environmental product innovation: the mediating role of green social capital. *Knowledge Management Research & Practice*, **12**, 3, 261–275. https://doi.org/10.1057/kmrp.2014.1.

Delgado-Verde, M., Martín-De Castro, G., and Amores-Salvadó, J. (2016) Intellectual capital and radical innovation: exploring the quadratic effects in technology-based manufacturing firms. *Technovation*, **54**, 35–47. https://doi.org/10.1016/j.technovation.2016.02.002.

Delgado-Verde, M., Martín-de Castro, G., and Navas-López, J.E. (2011) Organizational knowledge assets and innovation capability: evidence from Spanish manufacturing firms. *Journal of Intellectual Capital*, **12**, 1, 5–19. https://doi.org/10.1108/14691931111097890.

Dost, M., Badir, Y.F., Ali, Z., and Tariq, A. (2016) The impact of intellectual capital on innovation generation and adoption. *Journal of Intellectual Capital*, **17**, 4, 675–695. https://doi.org/10.1108/JIC-04-2016-0047.

Edgett, S. and Parkinson, S. (1993) Marketing for service industries – a review. *The Service Industries Journal*, **13**, 3, 19–39. https://doi.org/10.1080/02642069300000048.

Edvinsson, L. and Malone, M.S. (1997) *Intellectual Capital: Realizing Your Company's True Value by Finding its Hidden Brainpower*. New York, NY: HarperCollins Publishers, Inc.

Elsetouhi, A., Elbeltagi, I., and Haddoud, M.Y. (2015) Intellectual capital and innovations: is organisational capital a missing link in the service sector? *International Journal of Innovation Management*, **19**, 2, 1–29. https://doi.org/10.1142/S1363919615500206.

García, N., Sanzo, M.J., and Trespalacios, J.A. (2008) New product internal performance and market performance: evidence from Spanish firms regarding the role of trust, interfunctional integration, and innovation type. *Technovation*, **28**, 11, 713–725. https://doi.org/10.1016/j.technovation.2008.01.001.

Hair, J.F., Hult, G.T.M., Ringle, C.M., and Sarstedt, M. (2017) *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd edn. Thousand Oaks, CA: Sage.

Henseler, J. (2017) Bridging design and behavioral research with variance-based structural equation modeling. *Journal of Advertising*, **46**, 1, 178–192. https://doi.org/10.1080/00913367.2017.1281780.

Hipp, C. and Grupp, H. (2005) Innovation in the service sector: the demand for service-specific innovation measurement concepts and typologies. *Research Policy*, **34**, 4, 517–535. https://doi.org/10.1016/j.respol.2005.03.002.

Hsu, Y.-H. and Fang, W. (2009) Intellectual capital and new product development performance: the mediating role of organizational learning capability. *Technological Forecasting and Social Change*, **76**, 5, 664–677. https://doi.org/10.1016/j.techfore.2008.03.012.

Hsu, I.-C. and Sabherwal, R. (2011) From intellectual capital to firm performance: the mediating role of knowledge management capabilities. *IEEE Transactions on Engineering Management*, **58**, 4, 626–642. https://doi.org/10.1109/TEM.2011.2111455.

Hussinki, H., Ritala, P., Vanhala, M., and Kianto, A. (2017) Intellectual capital, knowledge management practices and firm performance. *Journal of Intellectual Capital*, **18**, 4, 904–922. https://doi.org/10.1108/JIC-11-2016-0116.

Inkinen, H., Kianto, A., Vanhala, M., and Ritala, P. (2017) Structure of intellectual capital – an international comparison. *Accounting, Auditing & Accountability Journal*, **30**, 5, 1160–1183.

Kianto, A. (2008) Development and validation of a survery instrument for measuring organizational renewal capability. *International Journal of Technology Management*, **42**(1–2), 69–88.

Kianto, A. and Andreeva, T. (2014) Knowledge management practices and results in service-oriented versus product-oriented companies. *Knowledge and Process Management*, **21**, 4, 221–230. https://doi.org/10.1002/kpm.1443.

Kianto, A., Hurmelinna-Laukkanen, P., and Ritala, P. (2010) Intellectual capital in service- and product-oriented companies. *Journal of Intellectual Capital*, **11**, 3, 305–325. https://doi.org/10.1108/14691931011064563.

Kianto, A., Sáenz, J., and Aramburu, N. (2017) Knowledge-based human resource management practices, intellectual capital and innovation. *Journal of Business Research*, **81**, 11–20. https://doi.org/10.1016/j.jbusres.2017.07.018.

Kock, N. (2015) Common method bias in PLS-SEM. *International Journal of E-Collaboration*, **11**, 4, 1–10. https://doi.org/10.4018/ijec.2015100101.

Lee, T.-S. and Tsai, H.-J. (2005) The effects of business operation mode on market orientation, learning orientation and innovativeness. *Industrial Management & Data Systems*, **105**, 3, 325–348. https://doi.org/10.1108/02635570910939399.

Lightfoot, H., Baines, T., and Smart, P. (2013) The servitization of manufacturing: a systematic literature review of interdependent trends. *International Journal of Operations & Production Management*, **33**, 11/12, 1408–1434.

Lin, H., Zeng, S., Liu, H., and Li, C. (2020) Bridging the gaps or fecklessness? A moderated mediating examination of intermediaries' effects on corporate innovation. *Technovation*, **94–95**, June–July 2020, 102018. https://doi.org/10.1016/j.technovation.2018.02.006.

Liu, G., Tsui, E., and Kianto, A. (2021) Knowledge-friendly organisational culture and performance: a meta-analysis. *Journal of Business Research*, **134**, 738–753.

Marr, B. (2006) *Strategic Performance Management: Leveraging and Measuring your Intangible Value Drivers*. Oxford: Butterworth-Henemann.

Martin-de Castro, G., Delgado-Verde, M., Navas-Lopez, J., and Cruz-Gonzalez, J. (2013) The moderating role of innovation culture in the relationship between knowledge assets and product innovation. *Technological Forecasting & Social Change*, **80**, 2, 351–363. https://doi.org/10.1016/j.techfore.2012.08.012.

Martin-de-Castro, G., Delgado-Verde, M., Amores-Salvado, J., and Navas-Lopez, J. (2013) Linking human, technological, and relational assets to technological innovation: exploring a new approach. *Knowledge Management Research & Practice*, **11**, January, 123–132. https://doi.org/10.1057/kmrp.2013.8.

Mawdsley, J. and Somaya, D. (2015) Strategy and strategic alignment in professional service firms. In: *The Oxford Handbook of Professional Service Firms*. United Kingdom: Oxford, Volume 1, pp. 1–32. Retrieved from http://oxfordhandbooks.com/view/10.1093/oxfordhb/9780199682393.001.0001/oxfordhb-9780199682393-e-12

Menor, L.J., Kristal, M.M., and Rosenzweig, E.D. (2007) Examining the influence of operational intellectual capital on capabilities and performance. *Manufacturing & Service Operations Management*, **9**, 4, 559–578. https://doi.org/10.1287/msom.1060.0131.

Mention, A.L. (2011) Co-operation and co-opetition as open innovation practices in the service sector: which influence on innovation novelty? *Technovation*, **31**, 1, 44–53. https://doi.org/10.1016/j.technovation.2010.08.002.

Mention, A.L. (2012) Intellectual capital, innovation and performance: a systematic review of the literature. *Business and Economic Research*, **2**, 1–37. https://doi.org/10.5296/ber.v2i1.1937.

Moeller, S. (2010) Characteristics of services – a new approach uncovers their value. *Journal of Services Marketing*, **24**, 5, 359–368. https://doi.org/10.1108/08876041011060468.

Nahapiet, J. and Ghoshal, S. (1998) Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, **23**, 2, 242–266. https://doi.org/10.2307/259373.

Neely, A. (2008) Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, **1**, 2, 103–118. https://doi.org/10.1007/s12063-009-0015-5.

Nieto, M.J. and Santamaría, L. (2007) The importance of diverse collaborative networks for the novelty of product innovation. *Technovation*, **27**, 6–7, 367–377. https://doi.org/10.1016/j.technovation.2006.10.001.

Nijssen, E.J., Hillebrand, B., Vermeulen, P.A., and Kemp, R.G. (2006) Exploring product and service innovation similarities and differences. *International Journal of Research in Marketing*, **23**, 3, 241–251.

Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford: Oxford University Press.

Nooteboom, B. (1994) Innovation and diffusion in small firms: theory and evidence. *Small Business Economics*, **6**, 5, 327–347. https://doi.org/10.1007/BF01065137.

Ortiz, M.A.A. (2009) Analysis and valuation of intellectual capital according to its context. *Journal of Intellectual Capital*, **10**, 3, 451–482. https://doi.org/10.1108/14691930910977833.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., and Podsakoff, N.P. (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, **88**, 5, 879–903. https://doi.org/10.1037/0021-9010.88.5.879.

Prajogo, D.I. and Oke, A. (2016) Human capital, service innovation advantage, and business performance: the moderating roles of dynamic and competitive environments. *International Journal of Operations and Production Management*, **36**, 9, 974–994. https://doi.org/10.1108/IJOPM-11-2014-0537.

Priem, R.L. and Butler, J.E. (2001) Is the resource-based "view" a useful perspective for strategic management research? *Academy of Management Review*, **26**, 1, 22–40.

Reed, K.K., Lubatkin, M., and Srinivasan, N. (2006) Proposing and testing an intellectual capital-based view of the firm. *Journal of Management Studies*, **43**, 4, 867–893. https://doi.org/10.1111/j.1467-6486.2006.00614.x.

Rigdon, E.E. (2012) Rethinking partial least squares path modeling: in praise of simple methods. *Long Range Planning*, **45**, 5–6, 341–358. https://doi.org/10.1016/j.lrp.2012.09.010.

Rigdon, E.E. (2016) Choosing PLS path modeling as analytical method in European management research: a realist perspective. *European Management Journal*, **34**, 6, 598–605. https://doi.org/10.1016/j.emj.2016.05.006.

Ringle, C.M., Wende, S., and Becker, J.-M. (2015) SmartPLS 3. Oststeinbek, Germany: SmartPLS GmbH. Retrieved from http://www.smartpls.com

Sáenz, J. and Aramburu, N. (2011) Towards a new approach for measuring innovation: the innovation-value path. In: Vallejo-Alonso, B., Rodríguez-Castellanos, A., and Arregui-Ayastuy, G. (eds), *Identifying, Measuring and Valuing Knowledge-Based Intangible Assets, New Perspectives*. Harrisburg, PA: Hershey. pp. 87–111. https://doi.org/10.1017/CBO9781107415324.004.

Santamaría, L., Nieto, M.J., and Miles, I. (2012) Service innovation in manufacturing firms: evidence from Spain. *Technovation*, **32**, 2, 144–155. https://doi.org/10.1016/j.technovation.2011.08.006.

Sarstedt, M., Hair, J.F., Ringle, C.M., Thiele, K.O., and Gudergan, S.P. (2016) Estimation issues with PLS and CBSEM: where the bias lies! *Journal of Business Research*, **69**, 10, 3998–4010. https://doi.org/10.1016/j.jbusres.2016.06.007.

Stewart, T.A. (1997) *Intellectual Capital: The New Wealth of Organizations*. New York: Doubleday, Currency.

Subramaniam, M. and Youndt, M.A. (2005) The influence of intellectual capital on the types of innovative

capabilities. *Academy of Management Journal*, **48**, 3, 450–463. https://doi.org/10.5465/AMJ.2005.17407911.
Subramanian, A.M. (2012) A longitudinal study of the influence of intellectual human capital on firm exploratory innovation. *IEEE Transactions on Engineering Management*, **59**, 4, 540–550. https://doi.org/10.1109/TEM.2011.2179648.
Sveiby, K.E. (1997) *The New Organizational Wealth. Managing & Measuring Knowledge-Based Assets*. San Francisco, CA: Berrett-Koehler Publishers, Inc.
Turunen, T. and Finne, M. (2014) The organisational environment's impact on the servitization of manufacturers. *European Management Journal*, **32**, 4, 603–615. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0263237313001539
Vandermerwe, S. and Rada, J. (1988) Servitization of business: adding value by adding services. *European Management Journal*, **6**, 4, 314–324.
Weerawardena, J. (2003) Exploring the role of market learning capability in competitive strategy. *European Journal of Marketing*, **37**, 3/4, 407–429.
Witt, U. and Gross, C. (2020) The rise of the "service economy" in the second half of the twentieth century and its energetic contingencies. *Journal of Evolutionary Economics*, **30**, 2, 231–246. https://doi.org/10.1007/s00191-019-00649-4.
Wu, S.-H., Lin, L.-Y., and Hsu, M.-Y. (2007) Intellectual capital, dynamic capabilities and innovative performance of organizations. *International Journal of Technology Management*, **39**, 3/4, 279–296.
Wu, W.-Y., Chang, M.-L., and Chen, C.-W. (2008) Promoting innovation through the accumulation of intellectual capital, social capital, and entrepreneurial orientation. *R&D Management*, **38**, 3, 265–277. https://doi.org/10.1111/j.1467-9310.2008.00512.x.
Yang, C.C., and Lin, C.H.-H. (2009) Does intellectual capital mediate the relationship between HRM & organizational performance? Perspective of a healthcare industry in Taiwan. *The International Journal of Human Resource Management*, **20**(9), 1965–1984.
Youndt, M.A., Subramaniam, M., and Snell, S.A. (2004) Intellectual capital profiles: an examination of investments and returns. *Journal of Management Studies*, **41**, 2, 335–361.
Zeithaml, V.A., Parasuraman, A., and Berry, L.L. (1985) Problems and strategies in services marketing. *Journal of Marketing*, **49**, 2, 33–46. https://doi.org/10.2307/1251563.
Zerenler, M., Hasiloglu, S.B., and Sezgin, M. (2008) Intellectual capital and innovation performance: empirical evidence in the Turkish automotive supplier. *Journal of Technology Management & Innovation*, **3**, 4, 31–40 Retrieved from http://www.jotmi.org.
Zhang, H.Y. and Lv, S. (2015) Intellectual capital and technological innovation: the mediating role of supply chain learning. *International Journal of Innovation Science*, **7**, 3, 199–210. https://doi.org/10.1260/1757-2223.7.3.199.

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