

Unveiling the influence of peers and organizational dynamics on innovation in knowledge-intensive business services

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Abstract

Purpose – This study aims to examine the impact of peers, including competitors, ecosystem members and other firms in the industry, on innovation in knowledge-intensive business services (KIBS) and investigates the role of human capital practices and organizational structure in this relationship.

Design/methodology/approach – This research is based on a survey of 400 KIBS firms in Russia. It uses logit regression models to analyze the likelihood of various innovation types, including product and business process innovations. Key variables include the influence of peers, human resource management (HRM) practices and organizational structure.

Findings – The use of peer knowledge is positively associated with business process innovations, particularly in creating external networks and partnerships. However, their impact on product innovation is negligible. Firms using peer knowledge do not exhibit higher sensitivity to HRM practices. The organizational structure, specifically a higher proportion of top management, is negatively associated with innovation for peer-dependent firms.

Originality/value – This study uniquely addresses the role of peer influence on innovation within KIBS, distinguishing it from other external sources of knowledge. It contributes to understanding the mediating effects of HRM practices and organizational structures, emphasizing the nuanced interplay between peer knowledge and innovation processes. This research highlights the importance of strategic network creation and a balanced organizational hierarchy for fostering innovation in service-oriented firms.

Keywords Peer effect, Open innovation, Innovation strategy, KIBS, Human capital, Organizational dynamics

Paper type Research paper

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1. Introduction

Open innovation has transitioned from an emerging model to a fundamental concept in the realm of innovation management research (Hwang *et al.*, 2023). The open innovation framework emphasizes collaboration, establishing networks and cultivating ecosystems to foster innovation opportunities (Clausen *et al.*, 2013; Bacon *et al.*, 2020). The degree of a company's openness and its ability to draw value from information flows and associated activities are closely intertwined with innovation development (Lütjen *et al.*, 2019). Such innovation may involve creating new ecosystems or transforming existing ones by redefining their value proposition, restructuring links and reallocating roles (Silva *et al.*, 2024). Observing other companies can provide valuable insights and access to updated knowledge and can help maintain competitiveness, ultimately driving innovation (Wang *et al.*, 2024).

Extensive literature studies the interconnection between innovation behavior and the company's openness (Wang *et al.*, 2024). While collaborations with universities, clients and supply chain members, as well as general strategies of using external sources, have been well

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explored in the innovation research, literature on the role of peer companies or competitors in the innovation process remains scarcer and with mixed evidence (Ardito *et al.*, 2020; Fernandes *et al.*, 2017; Marques *et al.*, 2022; Sivam *et al.*, 2019). At the same time, evidence suggests that peers influence innovation. In uncertain environments, firms may consider it optimal to follow their peers within horizontal networks, as these actors often possess more high-quality information. We use a broader definition of peers, referring to them not only as competitors, as they are usually defined, but also as members of the ecosystem and other companies in the industry (Huo *et al.*, 2022). Actors within the ecosystem serve as a valuable source of knowledge, as they are involved in the continuous process of idea generation, joint value creation and distribution (Primario *et al.*, 2024). Competitors are an essential part of the ecosystem because cooperating with them enables greater learning and risk sharing and accelerates entrance to new markets (Bacon *et al.*, 2020).

In the services sector, the nature of innovation activities differs from other industries (Vincenzi & da Cunha, 2021). Knowledge-intensive business services (KIBS) companies possess specific professional knowledge and often develop innovation in close cooperation with clients to tailor it to their needs (Amancio *et al.*, 2024; Duan *et al.*, 2024). They also operate in a highly competitive, complex and rapidly changing environment and must respond quickly to challenges, which prompts them to use heterogeneous innovation modes (Crupi *et al.*, 2020; Corrocher *et al.*, 2009). The effective application of external knowledge depends on the ability to transmit it across organizational boundaries, implying the crucial role of organizational and human resource measures (Pace and Miles, 2020).

Empirical studies show that various human resource (HR) management measures support organizational changes and are positively associated with the firm's innovation performance by increasing innovation capability (Le, 2024). Such measures improve creativity and commitment, increase proactive behavior and boost employee motivation (Le, 2024; Nguyen *et al.*, 2022). Training activities and various mechanisms aimed at managing emerging ideas and fostering collaborations also play an essential role (Jotabá *et al.*, 2022). Innovative enterprises are gradually embracing new organizational models that are characterized by a high level of intrapreneurship and working in smaller independent units, as well as a more frequent use of decentralized structures (Krippendorff and Garcia, 2023). Although there is plenty of research on the role of human capital in innovation development, especially given the growing race for digital transformation and employees being one of the main drivers of innovation, the particular implications for companies that use various knowledge sources have been less developed (Le, 2024).

From a dynamic capabilities perspective, HRM practices act as internal mechanisms that facilitate the transformation of external knowledge into firm-level innovation outcomes. In open innovation contexts – particularly in those involving horizontal flows such as peer-based learning – these practices are central to enhancing absorptive capacity. Training, incentives for collaboration and systems to capture and disseminate new ideas ensure that peer knowledge does not remain peripheral but is actively integrated into organizational routines.

Organizational structure can also play a crucial role in absorbing external information and affecting the innovation processes. While more expert employees gain autonomy and actively participate in decision-making (Schildt, 2022), excessive centralization can stifle creativity in the workplace, which, in turn, can hinder innovation (Teece, 2010). To respond quickly to changes in the market, companies need to increase the agility and flexibility of their organizational structure (Van Veldhoven and Vanthienen, 2022). To remain competitive, many service companies adopt decentralized, fractal teams to take advantage of knowledge generated inside and outside the company. However, a board or C-suite that is larger than optimal can impair their performance (e.g. Cheng, 2008).

In this context, the research questions are as follows:

- RQ1. How do external sources of information, such as peers, affect the firm's propensity to innovate?
- RQ2. Are firms that interact with peers more sensitive to human resources management measures and organizational structure compared to other firms?

The article analyzes how peers (competitors, ecosystem members and other companies in the industry) affect the propensity to introduce different types of innovation into the market. We also investigate the influence of human capital policy and the firm's organizational structure in this relationship.

Innovation in KIBS often stems from complex interactions beyond firm boundaries. Among these, the influence of peer firms – including competitors and ecosystem members – plays a critical role, especially in dynamic and knowledge-intensive sectors. However, leveraging knowledge from peers does not come automatically: it depends on a firm's internal capabilities to absorb and transform external inputs. This study takes the influence of peers as its central phenomenon of interest and examines how internal factors, particularly human resource management (HRM) practices and organizational structure, condition firms' ability to convert peer knowledge into innovative outcomes. By adopting this perspective, we bridge the external dimension of open innovation (i.e. peer learning) with the internal dimension of organizational preparedness, highlighting the interplay between context, capability and innovative behavior.

This study engages with three converging research streams. First, it builds on the strategic management and economics literature on peer effects, which has traditionally focused on financial or operational imitation across firms (Bakhtiari and Breunig, 2017; Machokoto *et al.*, 2021; Xiao *et al.*, 2022). Second, it draws from the open innovation and absorptive capacity perspective (Cohen and Levinthal, 1990; Menton, 2011), which emphasizes the role of internal capabilities in processing external knowledge. Third, we incorporate insights from the HRM and organizational behavior literature, which examines how human resource practices and organizational structure condition innovation outcomes (Le, 2024; Nguyen *et al.*, 2022). While these streams have mainly developed in parallel, few studies have integrated these perspectives to explain how peer knowledge is internalized and transformed within knowledge-intensive service firms, such as KIBS. Our study addresses this gap by combining these approaches and empirically testing their interaction in the KIBS context using original survey data that distinguishes peer knowledge from other external knowledge sources.

Building on this theoretical positioning, our research makes three specific contributions to the literature. First, we contribute to the literature on peer effects by providing empirical evidence that peer firms act as a significant source of influence on innovation within the KIBS sector. While prior research (Bakhtiari and Breunig, 2017; Machokoto *et al.*, 2021; Xiao *et al.*, 2022) has demonstrated peer influence across industries, studies focusing specifically on KIBS remain scarce. Our findings show that peer knowledge is positively associated with business process innovation, particularly in developing external networks and partnerships with competitors and other actors. We further demonstrate that using peer knowledge can mediate the relationship between organizational factors and innovation propensity.

Second, we extend prior survey-based research on innovation information sources by analyzing peer influence separately from other external actors (e.g. customers, suppliers). Prior studies on KIBS (e.g. Cappelli *et al.*, 2014; Ciliberti *et al.*, 2016; Demircioglu *et al.*, 2019; Doloreux *et al.*, 2018; Moya-Fernández and Seclen-Luna, 2023; Radicic *et al.*, 2020) often aggregate these sources. By contrast, our approach distinguishes peers and explores how their influence interacts with internal structures and practices, particularly in the context of KIBS, where professional knowledge and imitation play central roles.

Third, we contribute to the literature on organizational structure and HRM by investigating how internal workforce composition and human capital practices affect a firm's capacity to benefit from peer knowledge. Using a relative measure of organizational structure (i.e. the proportion of top managers, senior professionals and mid-level professionals), we find that a higher share of top management is negatively associated with innovation among firms that draw on peer knowledge. Additionally, we find that HRM measures aimed at fostering creativity and productivity have a significant positive effect on innovation propensity.

The paper is organized as follows. Section 2 describes relevant literature and outlines research hypotheses. Section 3 describes the data and methodology. Section 4 describes the results. Finally, Section 5 contains the discussion and conclusion.

2. Literature review and research hypotheses

2.1 Sources of information for innovation development

The concept of innovation has long attracted scholarly interest, particularly from early theorists such as [Schumpeter \(1942\)](#), who introduced the notion of "creative destruction" to describe how novel combinations of knowledge and resources disrupt existing markets and stimulate economic progress. [Galbraith \(1952\)](#), in turn, emphasized the importance of organizational structure and information processing for shaping the innovation capacity of firms. These classical contributions laid the groundwork for contemporary studies of innovation sources, offering a foundational lens through which firm behavior and knowledge flows can be understood. In this study, we build on this lineage by focusing on how peer-based knowledge exchange – a relatively underexplored horizontal channel – contributes to innovation within the specific context of KIBS firms.

According to the Oslo manual, a company can leverage both internal and external information sources for innovation ([OECD, 2018](#)). Internal sources include data from the company's R&D department, marketing and other divisions; internal documents and databases; and knowledge of employees ([Zieba et al., 2017](#)). As for external resources, information can be gathered from other companies (supply chain members, competitors), customers, universities, scientific organizations, government agencies, professional events, databases, social media and other Internet sources ([Battisti et al., 2015](#)). There are also vertical (suppliers) and horizontal (competitors) ([Svetina and Prodan, 2008](#)) or soft (other firms) and hard (own R&D) knowledge flows ([Doloreux et al., 2018](#)).

By integrating external resources into internal knowledge, the firm can make better use of both internal and external knowledge, depending on its human capital, technological competence, research and development effort and business model ([Lin and Wu, 2014](#)). When studying the open innovation strategies of firms operating in different markets and at different times, attempts were made to isolate the role of competitors ([Cappelli et al., 2014a](#); [Ciliberti et al., 2016](#); [Demircioglu et al., 2019](#)).

Services are a significant focus of research on innovation strategies. KIBS often act as innovation drivers in developing economies by providing access to innovative technological solutions across industries ([Miles et al., 2017](#)). At the same time, innovative configurations of KIBS companies can differ from those of other industries. For example, in-house R&D may have a minor impact on the innovation of KIBS compared to that of manufacturing companies. Some studies suggest that different sources of innovation affect KIBS differently – professional, such as management and legal services, or technological, such as IT and engineering ([Zieba et al., 2017](#)).

[Doloreux et al. \(2018\)](#) examine the relationship between innovation, R&D expenditure and internal and external information sources using a sample of Canadian KIBS enterprises. They find a positive association between market-oriented innovation sources and innovative propensity. [Savic et al. \(2020\)](#) state that interactions with regional informal and business-

related sources enhance innovation propensity. [Radicic et al. \(2020\)](#) examine the interdependence between product and business process information, finding that the number of external sources used by the firm has a mixed effect, depending on the sector (KIBS benefit from a greater number of sources), innovation type and whether firms introduce both product and business process innovation concurrently.

[Battisti et al. \(2015\)](#) find that external sources influence innovation leaders and followers differently. For firms that introduced novel services but did not patent their outcomes, using external sources matters. KIBS enterprises' openness to innovation strategies correlates with their independent versus collaborative innovation mode ([Rodriguez et al., 2017](#)). [Moya-Fernández and Seclen-Luna \(2023\)](#) state that competitors positively affect product and business process innovation in KIBS companies but do not affect manufacturing companies. KIBS companies benefit from internal R&D in terms of business process and product innovation. [Mention \(2011\)](#) examines coopetition in the UK financial services sector and finds that information from competitors does not have a positive effect on innovation.

The innovative behavior of Russian knowledge-intensive businesses has been analyzed to determine innovation configurations, absorptive capacity and drivers of innovation ([Chichkanov, 2021](#); [Miles et al., 2017](#)). These works have not primarily focused on competitors either.

In this paper, we conceptualize peer influence as a horizontal form of open innovation – one that enables firms to access and adapt market-relevant knowledge generated outside organizational boundaries. However, drawing value from peer knowledge requires internal mechanisms capable of absorbing, interpreting and applying external insights. In this sense, we frame HRM practices and workforce composition not merely as control variables, but as central organizational capabilities that shape how firms process and act upon peer-derived information. The following sections elaborate on these dimensions in detail.

2.2 Peer effect and innovation

Like other aspects of firm-level behavior – such as investment decisions or corporate disclosures – innovation is subject to peer influence. Peers are typically defined as competing firms within the same industry and of the same size ([Roth et al., 2019](#)). Geographic proximity can also be taken into account ([Wang et al., 2024](#)). A peer company's influence can be more pronounced than other observable factors ([Leary and Roberts, 2014](#)). In R&D behavior, small or young firms may follow more mature firms to catch up and maintain a competitive position ([Machokoto et al., 2021](#)). Innovation investment can have a strong spillover effect, as such investment is usually risky and with a high degree of uncertainty ([Xiao et al., 2022](#)). However, while following other firms can be beneficial under certain circumstances, it may also lead to herd behavior, where all firms repeat the observed actions of others, their actions provide less and less information, and everything ends up in a non-winning state ([Banerjee, 1992](#); [Leary and Roberts, 2014](#)).

Although the literature analyzing peer effects on corporate innovation is relatively scarce, some studies have already established this relationship. However, the services sector has not been the focus of such studies. Research on peer effect in innovation usually includes companies from many industries piled into one sample and implies empirical data on R&D expenditure, the ratio of R&D to total assets, innovative investment and other related indicators, often lagged. The peer effect is represented by an increase or decrease in the level of indicators above in response to a change in the peers' indicators. [Machokoto et al. \(2021\)](#) found a significant peer effect in R&D expenditures based on a large sample of US firms from 1968 to 2018. They also discovered that market competition increases the peer effect. [Bakhtiari and Breunig \(2017\)](#) showed a positive effect of R&D expenditure among geographically close Australian peer competitors and clients. For Chinese listed companies, [Xiao et al. \(2022\)](#) showed that peers influence investment in innovation and that this influence is more substantial in innovative zones. Broadening the scope of peers by

including ecosystem members would allow analysis of knowledge exchange in horizontal relationships and its effect on innovation outcomes (Huo *et al.*, 2022; Primario *et al.*, 2024).

In the context of KIBS, where external knowledge flows are key to innovation, peers, including competitors and ecosystem actors, represent an important source of insights, benchmarks and strategic signals. Because of their proximity in terms of market positioning and knowledge base, peers can influence firms' innovation behavior through observation and imitation.

Most existing studies on peer effects focus on sectors where innovation is tangible, codified and easily measurable, often emphasizing financial performance indicators or product imitation (Bakhtiari and Breunig, 2017; Machokoto *et al.*, 2021). In contrast, innovation in KIBS is usually processual, relational and co-created with clients, requiring continuous adaptation and recombination of professional knowledge (Amancio *et al.*, 2024; Crupi *et al.*, 2020). In this context, peer firms serve not merely as benchmarks but as ongoing referents for strategic and operational learning. By analyzing the peer effect in KIBS, this study contributes to a theoretical reconceptualization: peer knowledge is viewed not as a passive signal but as a relational asset that requires internal organizational capabilities to be effectively leveraged. This perspective allows us to connect open innovation dynamics with internal absorptive mechanisms in a knowledge-intensive services setting.

We therefore hypothesize that firms that use knowledge from peers are more likely to engage in innovative activities. In this context, we present the first research hypothesis:

- H1.* Firms that use knowledge from peers, including competitors, ecosystem members and other industry actors, are more likely to introduce innovations compared to firms that do not.

2.3 Human capital and innovation

Human capital is considered to be one of the most critical innovation resources, playing a more intensive role than technology, management and the like (Boxall, 1996; Teece *et al.*, 1997). Definitions of human capital vary, but most of them encompass knowledge and information held by workers, technical and soft skills, culture and other capabilities brought into the working process (Galunic and Anderson, 2000; Palacios-Marques *et al.*, 2011). The roots of the human capital construct can be traced back to classical economic theory. Schultz (1961) and Becker (1964) conceptualized human capital as knowledge, skills and abilities accumulated through education, training and experience, enhancing individual productivity and economic performance. This foundational perspective has shaped much of the subsequent discourse on the role of individuals as repositories of knowledge in modern organizations.

In the context of knowledge-intensive firms, human capital has been increasingly viewed as a core component of intellectual capital. Edvinsson (1997) and Sveiby (1977) emphasize that human capital, along with structural and relational capital, constitutes a critical dimension of organizational value creation. Building on this perspective, Bratianu (2018) conceptualizes knowledge as a dynamic and multidimensional construct, highlighting the fluid and integrative nature of human capital within the broader knowledge economy. This view underscores the importance of organizational mechanisms capable of transforming individual knowledge into collective capabilities. Andriessen (2004) further argues that human capital is not only an input to organizational knowledge but also a value shaped by interaction, context and relevance to strategic goals.

Human resources are fundamental to the services sector, as they contribute to the creation, documentation and storage of knowledge as well as the internalization of external knowledge (Corrocher *et al.*, 2009; Koch and Strotmann, 2008). The presence of highly qualified scientific, technical and managerial personnel positively affects the innovative

development of KIBS companies and successfully guides them through innovation barriers (Freel, 2006; Llopis and D'Este, 2022).

Empirical research shows that improvement of human capital via various forms of education and learning is positively associated with innovation through the influence on absorptive capacity – the ability to use, assimilate and draw value from new information (Cohen and Levinthal, 1990). Partial coverage of training expenses or release from work increases the propensity to innovate for German establishments (Bauernschuster *et al.*, 2009). Skills acquired both from formal and workplace training affect the process of transformation of innovative output into productivity during the final stages of production (Mason *et al.*, 2020). Investment in workers' training increases R&D efficiency and leads to a higher propensity to innovate among Spanish manufacturing firms (González *et al.*, 2016). According to Demartini and Paoloni (2011), employees' initial education and further training within the company significantly affect the quality and quantity of innovation projects. New knowledge and skills, as well as professional ties with colleagues acquired by employees during the working process, have a positive impact on the creation of efficient teams with motivated and committed members (Ruzzier *et al.*, 2007).

HRM practices are an essential element of the company's successful strategy. According to Wright and McMahan (2011), HRM measures can improve skills and loyalty as well as create a flexible and creative environment, fostering decision-making among employees of different levels. Continuous learning, for example, is possible to achieve by the implementation of continuous improvement systems and the development of training plans (Rastogi, 2000). On the other hand, specific tools such as remuneration schemes and promotion systems, task rotation, multidisciplinary teamwork, etc., can be used (Bohler and Hall, 2008).

Service firms can substantially benefit from using a broad range of HRM practices, such as employment security, selective hiring, training and performance-based compensation schemes, by interacting them with knowledge management measures, including knowledge accumulation, sharing and utilization (Theriou and Chatzoglou, 2009). Collaborative HRM measures, such as appreciation of teamwork capability, idea-sharing practices and group-based incentives, were also found to have a positive effect on innovation activity (Nieves *et al.*, 2016). Training of employees improves their problem-solving skills and increases their ability to adapt, significantly contributing to the innovation performance of service firms (Vijande *et al.*, 2021).

To benefit from open innovation, organizations need to use collaborative HRM practices, encouraging knowledge exchange and bottom-up decision-making. At the same time, the intensity of usage also matters. Haneda and Ito (2018) showed that organizational and HRM practices in R&D, as well as their number, are positively associated both with product and business process innovation. Open innovation strategies, such as cooperation with other innovation actors, have a positive effect on product innovation, with HRM measures acting as an essential mediator (Ferreira *et al.*, 2024). For firms that use external knowledge from market-based actors, e.g. social media, modern HRM practices are necessary to maintain innovativeness (Zubielqui *et al.*, 2019).

However, the ability to transform peer knowledge into innovative outcomes depends on internal organizational practices. HRM practices that promote creativity, initiative and cross-functional collaboration can strengthen a firm's absorptive capacity. These include training programs, team autonomy and systems for managing new ideas, all of which facilitate the recombination and application of internal knowledge.

We therefore hypothesize that the positive effect of peer knowledge on innovation is amplified in firms that implement supportive HRM practices. This leads us to the second research hypothesis:

- H2. The positive relationship between peer knowledge and innovation is strengthened in firms that adopt HRM practices that foster creativity, collaboration and continuous learning.

2.4 Organizational structure, top management teams and innovation

Organizational structure encompasses the distribution of authority, decision-making rights and communication flows within a firm. While traditional conceptualizations emphasize formal hierarchy, centralization, or functional design, our study focuses on what we define as personnel structure – the relative distribution of employees across different organizational levels (e.g. top management, senior professionals and mid-level professionals). This approach allows us to examine how authority and expertise are concentrated or diffused in the firm, which has direct implications for how knowledge from peers is interpreted, validated and applied internally. In this sense, personnel structure operates as a structural enabler (or a constraint) of absorptive capacity in the context of open innovation.

Organizational structure determines how decision-making power is authorized, how rules and procedures are implemented and how members and work are integrated. It reflects the patterns of connections among its members and influences flexibility, knowledge exchange and the degree of contact and openness (Chen *et al.*, 2010). A less rigid and hierarchical organizational structure is beneficial for companies, as it facilitates the fluid exchange of ideas and information between levels and departments, leading to greater innovation (Gentile-Lüdecke *et al.*, 2020; Hamid *et al.*, 2022).

A more flexible organizational structure is one of the cultural factors that encourage the generation of ideas and support for innovative initiatives (Gentile-Lüdecke *et al.*, 2020; Olson *et al.*, 2005; Thwaites, 1992; Uzokurt *et al.*, 2013). Decentralized organizations can facilitate an environment fostering the emergence of new ideas from different levels and departments, their sharing and implementation, which, in turn, can positively affect knowledge creation (Jansen *et al.*, 2006; Kastl *et al.*, 2013; Uzokurt *et al.*, 2013). On the contrary, the hierarchical structure of top management acts as a negative moderator between knowledge diversity and innovation performance (Walrave *et al.*, 2024). A negative relationship between centralization and knowledge performance implies that employees' greater empowerment and autonomy are beneficial for innovation (Pertusa-Ortega *et al.*, 2010).

Apart from the corporate hierarchy, the size of top management teams (TMTs) and board size affect various dimensions of firm performance. Board size negatively affects the probability of implementing product innovation (Galila and Zenou, 2012) and other types of innovation (Chindasombatcharoen *et al.*, 2022). In the case of digital innovation, the negative effect of TMT size is larger when the team has more vertical levels (Firk *et al.*, 2022). There may also be a U-shaped relationship between the team size and firm performance, whereby the performance may worsen if the team is smaller than optimal, and members may leave if it is larger than optimal. Researchers attribute these effects to the lack of agreement between team members and the decreasing comprehensiveness of the decision-making process (Iaquinto and Fredrickson, 1997). Larger team size can also lead to cognitive conflict because of members' divergent feelings, views and goals, which, in turn, can jeopardize consensus and result in less optimal outcomes for the firm (Amason and Sapienza, 1997). Larger teams exhibit lower levels of behavioral integration, e.g. collaboration, effective information exchange and joint decision-making (Simsek *et al.*, 2005). Large board size can negatively affect the process of new ideas selection and, because of higher agency expenses, can even lead to underinvestment in R&D (Sierra-Morán *et al.*, 2024). In an open innovation environment, smaller boards can more easily reach a common agenda and thus more efficiently manage external relations and networks (Wincent *et al.*, 2009).

In the studies mentioned above, TMT size is usually measured in absolute terms, e.g. in the number of executives. In our study, we use the share of top management in the total workforce, as our sample comprises firms of different sizes, and a relative indicator would provide a more balanced approach (Chaurasia *et al.*, 2020; Foss and Saebi, 2017; Hsiao and Wu, 2020). While the term “organizational structure” is often associated with broader coordination systems (e.g. degree of centralization, hierarchy and decision rights), our study operationalizes it through personnel structure – specifically, the relative share of employees at different hierarchical levels (e.g. top management, senior professionals and mid-level professionals). This approach enables us to capture how decision-making authority and knowledge access are distributed across the firm, influencing its ability to leverage peer knowledge in practice.

Organizational structure also influences how external knowledge is processed internally. A higher concentration of top management may limit decentralized decision-making and slow experimentation. In contrast, a more distributed workforce composition involving mid- and senior-level professionals may enhance the firm’s agility and responsiveness to peer-based signals.

Thus, we hypothesize that the effect of peer knowledge on innovation varies depending on the workforce composition and that a higher proportion of top management may dampen this effect. In this context, we present the third research hypothesis:

- H3.* The effect of peer knowledge on innovation varies depending on the firm’s organizational structure. Specifically, a higher share of top management in the workforce is associated with a weaker relationship between peer knowledge and innovation propensity.

3. Methodology

3.1 Data

The study is based on the results of a survey conducted in 2019 by the Institute for Statistical Studies and Economics of Knowledge (ISSEK) of the Higher School of Economics (HSE University). Based on the standard KIBS classification (Miles *et al.*, 2017), ten industries were included: technological KIBS, such as IT, engineering and architecture (T-KIBS); creative services, including marketing and advertising (KICS); and professional KIBS, such as legal, accounting and auditing services (P-KIBS). The survey was conducted in the most prominent Russian cities with populations of at least 900,000 citizens and high regional GDP levels. Quotas for industry and size were established. The sample was also controlled for the distribution of companies by location, limiting it to 11 of the 16 largest Russian cities.

The sample comprised 633 responses in total. Fifty observations from KICS were deleted because companies worked in B2C mode rather than B2B and did not belong to KIBS. Some observations were deleted because the companies did not answer questions about age, size, other firm-specific variables and innovation activities. As a result, the final sample comprised 400 observations (Table 1).

3.2 Questionnaire and variables

The questionnaire consists of four sections. The first section collects general information on the company’s activities, including size, age, operating market, structure of the personnel, etc. The company is asked to indicate which share of its employees (in percentage) is allocated to each of the four categories: top management, senior professionals, mid-level professionals and operating staff. In the model, the first three of these shared indicators were used.

Table 1 Description of the sample

<i>Variable</i>	<i>Share of the sample, %</i>
IT, engineering, architecture (T-KIBS)	68
Legal, accounting, management consulting, auditing (P-KIBS)	19
Located in Moscow	42
Operate in the international market	25
Small size (less than 50 employees)	67
Medium size (50–249)	24
Large size (more than 250)	9
Introduced product innovation	55
Introduced at least one type of business process innovation	87
Source(s): Authors' own work	

The second section measures innovation according to the Oslo Manual and Community Innovation Survey methodology (OECD, 2018). The firm is assigned a value of 1 if it has introduced a novel type of good or service to the market (product innovation) or various types of business process innovation, and zero otherwise. Six types of innovation are considered: product innovation, which involves developing innovative products or services, is the first type. The other five types include business process innovation: a new way to create a product or service; a new way to interact with customers in the service delivery process; organization innovation, which includes new strategic, operational, financial or knowledge management tools; marketing innovation, which provides for new marketing methods, pricing strategies and sales channels; and finally, external cooperation innovation – creation of network forms of strategic alliances, partnerships and other types of cooperation with competitors and other actors. This variety of innovation types allows flexibility for a researcher, either by consolidating business process innovation into broader categories or analyzing more detailed distinctions to outline specific innovation determinants.

The information sources that the firm uses to create innovation are divided into six groups: its R&D department, marketing or customer relations division, peers, which are defined as ecosystem partners, competitors and other companies in the industry, consumers, scientific organizations, government authorities and professional and industry associations. Each variable equals one if the company used a particular source and zero otherwise.

Descriptive statistics of the main variables and the correlation matrix are provided in the Appendix (Tables A1, A2 and A6).

The contribution of different activities of the company to the implementation of innovation in the past two years before the survey is measured on a seven-point Likert scale, where one stands for the least substantial contribution and seven for the most substantial. They include research and development, engineering, design, marketing, IP management and innovative management, among others. The contribution index is calculated as the first component of these options (Table A5 in the Appendix). Different actors the company cooperated with during innovation development include consumers, suppliers, competitors, scientific organizations and other actors. Each variable equals one if the company cooperated with a particular category of actors and zero otherwise.

The next section of the survey contains two categories of HR management measures. The first category includes training and education measures: career development programs, training of new employees, collaboration with universities, outside workshops, providing funding for training, etc. The second category includes various work organization methods: creating multidisciplinary teams, using multiple project management tools, versatile modes of work, incentives for employees to innovate, etc. The company chooses one if it used a specific measure and zero otherwise. Then, two breadth indicators are calculated – the total count of education measures and work organization measures used. For example, a

company using three work organization measures and five education measures would have indicators of three and five, respectively. The descriptive statistics on the use of HR management practices are provided in the [Appendix \(Tables A3 and A4\)](#).

3.3 Model

The logit model is evaluated with the firm's propensity to introduce a specific type of innovation as a dependent variable. Independent variables include sources of information, personnel structure as described in Section 3.2 (measured by the share of top management, senior professionals and mid-level professionals), the number of HRM measures (education and work organization measures as separate indicators), the contribution of various activities to innovation (expressed as an index) and control variables such as size, age, exporting to foreign countries and location in Moscow [see [equation \(1\)](#)].

The extended logit model includes interactions of peers as information sources for variables such as three indicators of the personnel structure and the number of HRM education and work organization measures, in addition to the variables mentioned above [see [equation \(2\)](#)]:

$$\begin{aligned} \text{Innovation_propensity} = & \alpha + (\beta_1 \dots \beta_6) * \text{Information_source} + (\gamma_1 \dots \gamma_3) * \text{Personnel_structure} \\ & + \delta_1 * \text{No_HR_edu} + \delta_2 * \text{No_HR_org} + \delta_3 * \text{Contribution} \\ & + (\lambda_1 \dots \lambda_4) * \text{Controls} + \varepsilon_i \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Innovation_propensity} = & \alpha + (\beta_1 \dots \beta_6) * \text{Information_source} + (\gamma_1 \dots \gamma_3) * \text{Personnel_structure} \\ & + \delta_1 * \text{No_HR_edu} + \delta_2 * \text{No_HR_org} + \delta_3 * \text{Contribution} \\ & + (\mu_1 \dots \mu_3) * \text{peer} * \text{Personnel_structure} \\ & + \nu_1 * \text{peer} * \text{No_HR_edu} + \nu_2 * \text{peer} * \text{No_HR_org} \\ & + (\lambda_1 \dots \lambda_4) * \text{Controls} + \varepsilon_i \end{aligned} \quad (2)$$

Logistic regression (logit) models are widely used in innovation studies where the dependent variable is binary and where the aim is to assess the likelihood of innovation occurrence based on organizational or strategic inputs ([Galia and Legros, 2004](#); [Laursen and Salter, 2006](#)). This approach is particularly well-suited for capturing the probabilistic effects of managerial practices and knowledge sources on innovation performance. This method allows us to assess how the use of peer knowledge, internal personnel structure and HRM practices are statistically associated with the propensity to innovate, while controlling for firm-level characteristics. Interaction terms are included to evaluate the conditional effect of internal factors (e.g. HRM measures, personnel composition) on innovation, depending on whether the firm draws on peer knowledge. Although our model does not claim causal inference, it is designed to reflect the structure of the theoretical hypotheses and provide a transparent framework for testing associative relationships consistent with our research aims. In this regard, the model structure adheres to established standards for explanatory research in organizational settings, balancing parsimony and explanatory power while incorporating theoretically grounded key interaction terms.

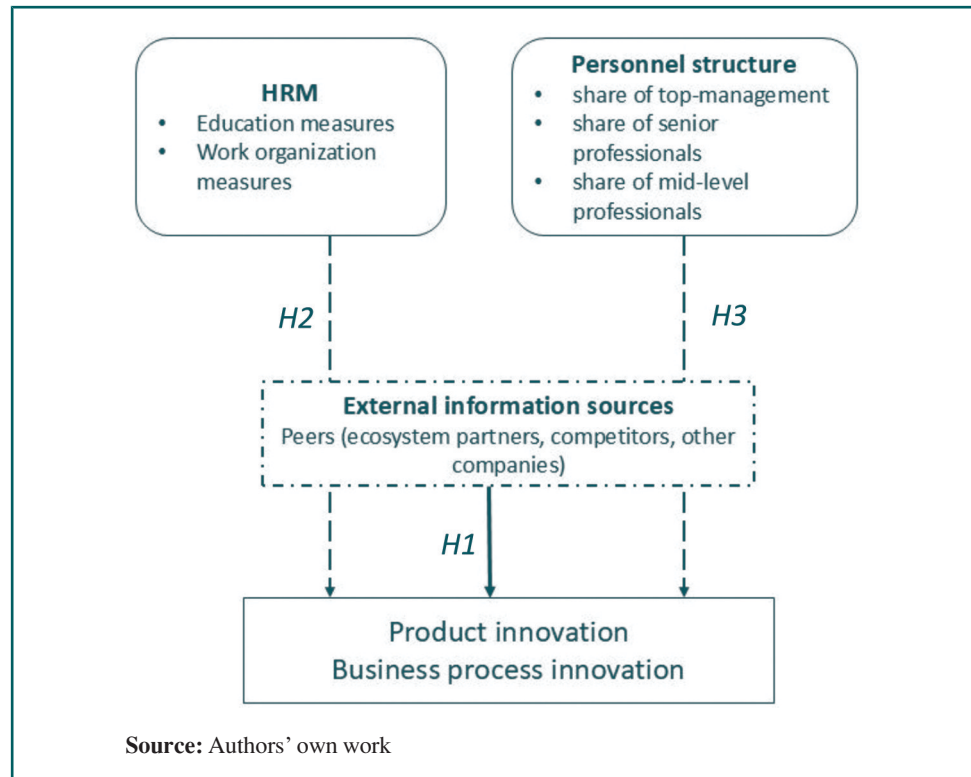
[Figure 1](#) describes the hypotheses and the model.

4. Results

4.1 Basic analysis

The results of the estimation of the logit model are presented in Table II. Peers as an information source are positively associated with the likelihood of introducing new forms of interaction with ecosystem partners and competitors. This result is consistent with *H1*,

Figure 1 Conceptual model of the research



suggesting an association between the use of peer knowledge and business process innovation. However, peers are not significant for product innovation or other types of business process innovation.

Other information sources have a mixed effect on product and business process innovation. Considering external sources, consumers of services provided by private and state companies positively affect product innovation and innovation in the service delivery process. Firms that rely on information from scientific organizations are less likely to introduce innovations in interaction with customers and organizational innovation but are more likely to introduce external cooperation innovation. Government authorities and their databases have no significant effect on the probability of introducing innovation. Finally, industry associations are positively associated with the likelihood of introducing innovation in developing services.

Considering internal information sources, the company's own R&D department positively affects product innovation and negatively influences organizational innovation. On the other hand, marketing and customer interaction units have a uniform positive effect on four of six types of business process innovation and no effect on product innovation.

We observe a strong positive connection between the number of HRM work organization measures and product innovation, as well as business process innovation, such as service delivery and organizational innovation. At the same time, the number of HRM education measures proved to be non-significant.

Regarding control variables, larger companies are prone to developing new products and introducing marketing innovations. Firms located in Moscow are less likely to introduce innovations concerning interactions with customers in service delivery. This geographic variable has no effect on other types of innovation. Finally, competing in the foreign market has no significant effect on any type of innovation.

In the extended model, the same variables are estimated. In addition, interactions of peers as an information source and variables related to the workforce structure and HRM measures are included (Table 3). For firms that use peers as a source of information, the number of HRM education as well as work organization measures is not significant, which leads to rejection of *H2*. At the same time, the interaction of peers as an information source and the share of top management in the workforce are associated with a lower probability of developing marketing innovation. These findings support *H3*, indicating a negative association between the top-management share and innovation when firms rely on peers.

In both the basic and extended models, the number of HRM education and HRM work organization measures was used. Tables A7 and A8 of the Appendix contain the estimation of the basic model where, instead of the breadth indicator, separate dummies for HRM education (Table A7) and HRM work organization measures (Table A8) were used. Of the ten HRM education measures, none affected product innovation, while the influence on different types of business process innovation was mixed. Such practices as support programs for young employees and training from external experts are positively associated with innovation in service delivery and organizational innovation, respectively. On the contrary, cooperating with specialists from scientific organizations and higher education institutions for mutual projects and internal training programs is negatively associated with innovation in service delivery; the latter practice is also negatively related to external cooperation innovation.

As for HRM work organization measures, there was no significant negative effect on any innovation type. Such measures as concentration of innovation in a specialized R&D unit and agile project management are positively associated with product innovation. Cross-functional and interdisciplinary teams, as well as the delegation of decision-making authority to project managers and employees, have a positive association with innovation in the process of developing services and organizational innovation.

As there are two different types of KIBS in the survey, it is worth investigating whether the obtained results hold for IT, engineering and architecture (technical KIBS) and professional KIBS (legal, accounting and auditing). For technical KIBS, the effect of peer knowledge is significant and even higher than in the general sample (Table A9 in the Appendix). The R&D department does not significantly increase innovation propensity and is negatively associated with marketing innovation. The number of HRM education measures is negatively associated with marketing innovation, which differs from the results obtained for the general sample. In contrast, the number of HRM work organization measures is positively associated with product innovation and two types of business process innovation.

For the extended model, the interaction of the peer knowledge dummy and the share of top management has the same negative sign for the marketing innovation (Table A10 in the Appendix). The interactions with the peer knowledge dummy and the number of HRM education and work organization measures remain insignificant, as in the general sample.

The estimation results should be considered more cautiously for professional KIBS companies because of the small number of observations. Peers do not significantly affect the probability of introducing innovation (Table A11 in the Appendix). At the same time, the number of HRM education measures shows a significant and positive connection with external cooperation innovation. In contrast, the number of HRM work organization measures shows no statistical significance. The estimations of the extended model could not be conducted because of the low number of observations belonging to P-KIBS.

5. Discussion

This study is among the first to empirically examine the role of peer influence in the innovation process of KIBS companies.

Table 2 Estimation of the basic model (marginal effects)

<i>Independent variables</i>	(1) <i>Product innovation</i>	(2) <i>Innovation in developing services</i>	(3) <i>Innovation customer interaction service delivery</i>	(4) <i>Organizational innovation</i>	(5) <i>Marketing innovation</i>	(6) <i>External cooperation innovation</i>
<i>Information source for innovation</i>						
R&D	0.167*** (0.0636)	0.0610 (0.0622)	-0.0596 (0.0617)	-0.127*** (0.0468)	-0.119* (0.0628)	0.0857 (0.0611)
Marketing and customers interaction division	0.00510 (0.0635)	-0.0598 (0.0648)	0.171*** (0.0641)	0.125** (0.0610)	0.171*** (0.0662)	0.188*** (0.0640)
Peers	0.0503 (0.0581)	0.0144 (0.0593)	0.0511 (0.0585)	0.0380 (0.0488)	0.0544 (0.0595)	0.174*** (0.0566)
Consumers	0.126** (0.0552)	0.124** (0.0546)	0.0682 (0.0564)	0.0430 (0.0461)	0.104* (0.0570)	0.0940* (0.0531)
Scientific organizations	-0.0419 (0.0804)	-0.0844 (0.0845)	-0.277*** (0.0850)	-0.115** (0.0543)	0.0228 (0.0845)	0.202* (0.0878)
Government authorities	0.0439 (0.0971)	0.0634 (0.0943)	-0.0277 (0.0921)	-0.0330 (0.0737)	0.0291 (0.0974)	0.0403 (0.0897)
Industry associations	-0.0603 (0.0584)	0.122** (0.0601)	0.0264 (0.0609)	0.00154 (0.0519)	-0.0147 (0.0622)	0.103* (0.0581)
<i>Workforce structure</i>						
Share of top management	0.000651 (0.00290)	-0.00113 (0.00340)	0.00453 (0.00303)	0.00108 (0.00202)	0.00132 (0.00292)	-0.00489* (0.00281)
Share of senior professionals	0.00281* (0.00160)	0.00160 (0.00179)	-0.00182 (0.00167)	-0.00112 (0.00120)	-0.000741 (0.00170)	-0.00221 (0.00154)
Share of mid-level professionals	0.00238 (0.00181)	0.000715 (0.00199)	0.00316* (0.00187)	0.00177 (0.00146)	0.000240 (0.00191)	-0.00162 (0.00178)
<i>Human capital measures</i>						
No of HRM education measures	-0.0222 (0.0148)	-0.0102 (0.0153)	0.0210 (0.0150)	-0.00498 (0.0126)	-0.0128 (0.0154)	-0.00326 (0.0144)
No of HRM work organization measures	0.0366** (0.0166)	0.0506*** (0.0164)	0.00497 (0.0169)	0.0653*** (0.0150)	0.0328* (0.0173)	0.0143 (0.0164)
Contribution index of activities in innovation	0.0245 (0.0185)	0.0303 (0.0190)	0.00600 (0.0189)	0.00376 (0.0146)	0.0312* (0.0187)	0.0344* (0.0181)
<i>Controls</i>						
Age	0.00267 (0.00397)	0.000190 (0.00416)	0.00204 (0.00409)	0.00356 (0.00318)	-0.00764* (0.00403)	0.00507 (0.00381)
Size (natural log)	0.0504** (0.0208)	0.00992 (0.0219)	-0.0395* (0.0213)	-0.00563 (0.0178)	0.0509** (0.0219)	0.0364* (0.0208)
Moscow	0.0153 (0.0539)	-0.00611 (0.0559)	-0.146*** (0.0527)	0.0557 (0.0433)	-0.0155 (0.0555)	0.0419 (0.0522)
International	0.0717 (0.0608)	-0.0625 (0.0617)	0.0418 (0.0608)	0.0199 (0.0505)	0.0964 (0.0622)	0.109* (0.0596)
Pseudo R^2	0.133	0.0855	0.128	0.190	0.104	0.181
Hosmer–Lemeshow (HL) test (p-value)	0.0694	0.2674	0.2046	0.0250	0.2746	0.3819
Observations	323	326	326	326	326	326

Note(s): Standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own work

Table 3 Estimation of the extended model with interactions (marginal effects)

Independent variables	(1) Product innovation	(2) Innovation in developing services	(3) Innovation customer interaction service delivery	(4) Organizational innovation	(5) Marketing innovation	(6) External cooperation innovation
<i>Information source for innovation</i>						
R&D	0.160** (0.0634)	0.0544 (0.0619)	-0.0469 (0.0620)	-0.122*** (0.0476)	-0.120** (0.0611)	0.0840 (0.0609)
Marketing and customers interaction division	0.00773 (0.0629)	-0.0584 (0.0642)	0.175*** (0.0640)	0.123** (0.0613)	0.163** (0.0645)	0.180*** (0.0636)
Peers	0.0375 (0.323)	0.448 (0.337)	-0.358 (0.329)	-0.0630 (0.230)	0.295 (0.333)	0.422 (0.334)
Consumers	0.137** (0.0550)	0.128** (0.0543)	0.0669 (0.0564)	0.0436 (0.0460)	0.110* (0.0558)	0.0930* (0.0532)
Scientific organizations	-0.0669 (0.0799)	-0.0933 (0.0841)	-0.274*** (0.0873)	-0.113** (0.0553)	0.0345 (0.0842)	0.214** (0.0892)
Government authorities	0.0507 (0.0985)	0.0906 (0.0953)	-0.0383 (0.0929)	-0.0408 (0.0765)	0.0654 (0.0933)	0.0516 (0.0903)
Industry associations	-0.0600 (0.0581)	0.106* (0.0604)	0.0289 (0.0609)	0.00154 (0.0521)	-0.0215 (0.0605)	0.103* (0.0581)
<i>Workforce structure</i>						
Share of top management	-0.000240 (0.00372)	0.00244 (0.00414)	0.000710 (0.00400)	0.000130 (0.00295)	0.0101** (0.00406)	-0.00129 (0.00363)
Share of senior professionals	0.00344* (0.00181)	0.00316 (0.00212)	-0.00288 (0.00195)	-0.00157 (0.00149)	-0.000922 (0.00193)	-0.00223 (0.00177)
Share of mid-level professionals	0.00168 (0.00211)	0.00121 (0.00248)	0.00221 (0.00228)	0.000890 (0.00181)	0.00148 (0.00224)	-0.000836 (0.00207)
<i>Human capital measures</i>						
No. of HRM education measures	-0.0280* (0.0161)	0.00312 (0.0172)	0.0241 (0.0171)	-0.00400 (0.0142)	-0.0131 (0.0170)	-0.00296 (0.0156)
No. of HRM work organization measures	0.0284 (0.0188)	0.0370* (0.0191)	0.00526 (0.0195)	0.0679*** (0.0177)	0.00566 (0.0194)	0.0105 (0.0182)
Contribution index of activities in innovation	0.0233 (0.0187)	0.0319* (0.0190)	0.00320 (0.0190)	0.00224 (0.0147)	0.0426** (0.0181)	0.0388** (0.0180)
<i>Interactions</i>						
Peer effect x Share of top management	0.00112 (0.00577)	-0.0113 (0.00841)	0.0113 (0.00780)	0.00193 (0.00409)	-0.0218** (0.00869)	-0.0127 (0.00868)
Peer effect x Share of senior professionals	-0.00494 (0.00372)	-0.00610 (0.00384)	0.00452 (0.00369)	0.00109 (0.00259)	0.000286 (0.00377)	-1.53e-05 (0.00371)
Peer effect x Share of mid-level professionals	0.000710 (0.00408)	-0.00177 (0.00416)	0.00368 (0.00413)	0.00314 (0.00327)	-0.00627 (0.00405)	-0.00386 (0.00416)
Peers x No. of HRM education measures	0.0332 (0.0365)	-0.0509 (0.0351)	-0.0216 (0.0355)	-0.00930 (0.0294)	-0.0123 (0.0352)	-0.00305 (0.0393)
Peers x No. of HRM work organization measures	0.0148 (0.0415)	0.0517 (0.0414)	0.0163 (0.0407)	-0.00897 (0.0377)	0.0834* (0.0430)	0.0145 (0.0438)
<i>Controls</i>						
Age	0.00152 (0.00399)	0.000851 (0.00416)	0.00258 (0.00411)	0.00360 (0.00325)	-0.00749* (0.00400)	0.00542 (0.00385)
Size (natural log)	0.0493** (0.0208)	0.0102 (0.0216)	-0.0439** (0.0216)	-0.00533 (0.0183)	0.0531** (0.0217)	0.0379* (0.0207)
Moscow	0.0242 (0.0536)	0.00383 (0.0557)	-0.147*** (0.0528)	0.0533 (0.0435)	-0.0140 (0.0546)	0.0379 (0.0522)
International	0.0740 (0.0603)	-0.0558 (0.0613)	0.0395 (0.0608)	0.0143 (0.0508)	0.117* (0.0609)	0.115* (0.0596)
Pseudo R2	0.150	0.102	0.136	0.194	0.147	0.191
Hosmer-Lemeshow (HL) test (p-value)	0.0686	0.2298	0.1489	0.0002	0.3237	0.3590
Observations	323	326	326	326	326	326

Note(s): Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own work

Our results indicate a positive association between peer knowledge and business process innovation, specifically, new forms of networking and cooperation with competitors. This confirms *H1* and supports the extant research demonstrating that KIBS firms rely on competitors as an external information source both for product and business process innovation (Moya-Fernández and Seclen-Luna, 2023) or on market sources of information in general (Battisti *et al.*, 2015; Rodríguez *et al.*, 2017). Therefore, the results contribute to the literature on KIBS innovation strategies and configurations. The relationship between the openness of the company to external knowledge and innovation was also highlighted in the research on coopetition in innovation ecosystems, which celebrates knowledge sharing and offers opportunities to draw value from collaboration with competitors as well as other partners (e.g. Bacon *et al.*, 2020). While the majority of research considers different forms of organizational innovation as one concept (e.g. Chichkanov, 2021), we distinguish a specific type of innovation associated with the creation of network forms of strategic alliances, partnerships and other kinds of cooperation with competitors and other actors. This type of innovation may be essential for KIBS because network relationships play an important role in the open innovation framework (Sareen and Pandey, 2022). At the same time, internal sources of information have a mixed effect on innovation – they are positively associated with product innovation and negatively with certain kinds of business process innovation. This stands in line with previous research on the patterns of innovation in KIBS, where technical KIBS relied on in-house R&D for innovation (Doloreux *et al.*, 2018; Miles *et al.*, 2017; Zieba *et al.*, 2017).

This study contributes to the literature on the role of human capital in the innovation process. For all companies, the breadth of HRM measures aimed at creating an environment fostering innovation is beneficial for product innovation and different forms of business process innovation, including new service delivery and organizational innovation. It means that companies that use a variety of instruments simultaneously, such as agile management, interdisciplinary teams and stimuli to innovate, can capture the results from these measures in terms of innovation outputs. These results align with prior findings on the positive association between HRM measures aimed at improving teamwork and ideas exchange on innovation activity in the services sector (Nieves *et al.*, 2016; Haneda and Ito, 2018). However, the breadth of HRM measures aimed at training and education was not significant in our research, contrary to past research (Vijande *et al.*, 2021). When analyzed separately, HRM work organization measures are positively associated with innovation propensity compared to HRM education measures.

At the same time, there is no significant effect of the HRM education or work organization measures for companies that rely on peers as an information source for innovation, which results in the rejection of *H2*. This implies that in our sample, firms that use knowledge from peers do not differ from other firms in this aspect. This corresponds to the results of Abdul Basit and Medase (2019), who found no positive significance of the interaction of competitors as a knowledge source and human capital.

Our research offers additional insights into the literature on organizational structure and innovation. Among firms that use peer knowledge, a higher share of top management is associated with a lower likelihood of implementing certain types of business process innovation, particularly marketing innovation. This means that *H3* is confirmed. This result aligns with prior evidence suggesting a negative association between board size and innovation outputs (Galia and Zenou, 2012; Chindasombatcharoen *et al.*, 2022; Firk *et al.*, 2022) and further contributes to the more limited research area, introducing the usage of external knowledge from peers as a mediator.

As for control variables, size was found to be positively related to product innovation and marketing innovation. This result stands in line with the literature on innovation patterns in Russian KIBS and manufacturing companies, as large firms have more resources for the smooth innovation process and active investment in R&D (Kratzer *et al.*, 2017). Interestingly,

firms located in Moscow are less prone to introducing innovation associated with new methods of customer interaction in the service delivery process. This may happen because, in a large and saturated market, firms do not generally need to find new ways to interact with customers and have other areas to concentrate on.

From a managerial perspective, our findings suggest that the adoption of diverse HRM practices (especially those focused on work organization) can effectively foster innovation. Managers in KIBS firms should prioritize multidisciplinary team design, autonomy in decision-making and agile project management. Moreover, firms relying on peer knowledge should avoid overly hierarchical structures, as top-heavy management may hinder knowledge absorption.

Policymakers aiming to stimulate innovation among KIBS should promote horizontal knowledge exchange platforms such as peer learning networks or strategic alliances rather than focusing solely on university–industry partnerships.

6. Conclusion

This study explores a relatively underexamined dimension of innovation in KIBS firms by analyzing the influence of peers (including competitors, ecosystem members and other industry companies) on the propensity to introduce various types of innovation. Additionally, the study investigates the role of human capital and the firm's organizational structure in this relationship. Our paper offers a novel perspective on how peer knowledge relates to innovation, highlighting its potential mediating role. The findings indicate that the use of peer-derived information is positively associated with a specific type of business process innovation: creating external networks and partnerships. However, the usage of this knowledge source does not significantly influence the product innovation. Measures aimed at fostering an innovative environment and providing efficient and flexible working conditions positively impact the innovation behavior of all companies. Furthermore, the research finds that organizational structure is crucial for firms using peers as a knowledge source. These findings confirm the first and third research hypotheses while offering no support for the second, suggesting that HRM practices alone may not be sufficient to enhance the effect of peer knowledge on innovation, despite the observed interaction between peer knowledge and internal structure in shaping outcomes.

The study has certain limitations. Most firms belong to T-KIBS, while the share of P-KIBS is relatively small, which may explain the absence of peer effect for legal, consulting and audit firms. However, this issue warrants further investigation, as the hierarchical structure in such firms may be traditionally more vertical, as well as characterized by a specific TMT composition. Moreover, we do not investigate the mechanisms of the influence of TMT on innovation, which can also be the subject of future research. We only consider the number of HR organizational and HR management measures and their presence/absence in the company's policy, but not their quality, how frequently they are used, or the expenditure on these measures. The lack of effect of education and training measures on innovation requires further research. Additionally, because of the cross-sectional nature of the data, it is not possible to view the dynamics of the innovation strategies of the enterprises. The survey method does not allow detailed exploration of the companies' motivation to use external or internal information sources.

The following steps for further research could be a qualitative study, such as in-depth interviews with innovation managers and product owners, to gain insights into the process of the knowledge exchange between competitors and ecosystem members and the role of the organizational structure in the innovation process. Cooperation patterns are not the focus of this study, either. Therefore, further research on coopetition–cooperation strategies with competitors for KIBS companies would be beneficial, especially taking into account

controversial evidence of insignificant or even negative implications of cooperation with competitors for technological leaders of the industry (e.g. [Liu et al., 2023](#)).

These findings yield clear and actionable implications for both firm strategy and public policy. For KIBS companies, leveraging peer knowledge effectively requires more than openness – it demands internal structures that can absorb and apply external ideas. Managers should focus on developing HRM practices that support collaboration, creativity and adaptability, as well as maintaining a balanced personnel structure that avoids excessive top-heaviness. To remain competitive in dynamic service ecosystems, firms should invest in decentralization, flexible project teams and continuous workforce development. This aligns with the theoretical framework that positions absorptive capacity and structural flexibility as key mediators between external knowledge and innovation outcomes. From a policy perspective, the results suggest the importance of fostering horizontal knowledge flows between firms through ecosystem-building, peer-learning platforms and innovation cluster initiatives. Additionally, these lessons may inform executive education and training programs aimed at strengthening organizational innovation capabilities in service-intensive industries. Recent studies highlight the increasing relevance of structured partnerships that emphasize skill development and knowledge co-creation, rather than one-off technology transfer events ([Sarpong et al., 2025](#)).

Companies do not operate in isolation but need to create networks and be part of ecosystems. In an open innovation framework, achieving success and maintaining a leading marketing position imply diversifying knowledge sources and incorporating the necessary tools within the organization to process that knowledge. This includes paying special attention to the state of the workforce, constantly monitoring new methods of improving work efficiency and adjusting monetary and non-monetary stimuli in line with the company's current innovation strategy. For knowledge flows to function efficiently inside the organization, its corporate structure needs to be more horizontal than vertical, and the size of the TMT should not be bloated. Policy initiatives aimed at creating an environment promoting interaction between innovation partners could positively affect the creation of strategic networks and ecosystems.

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References

- Abdul Basit, S. and Medase, K. (2019), "The diversity of knowledge sources and its impact on firm-level innovation", *European Journal of Innovation Management*, Vol. 22 No. 4, pp. 681-714, doi: [10.1108/EJIM-10-2018-0232](#).
- Amancio, I.R., Mendes, G.H., de S., Polloni-Silva, E., Morales, H.F., Fischer, B.B. and Sisti, E. (2024), "KIBS deepening and manufacturers' productivity: the moderating role of absorptive capacity", *Regional Studies*, pp. 1-17, doi: [10.1080/00343404.2024.2355999](#).
- Amason, A.C. and Sapienza, H.J. (1997), "The effects of top management team size and interaction norms on cognitive and affective conflict" *In Journal of Management*, Vol. 23, No. 4.
- Andriessen, D. (2004). *Making Sense of Intellectual Capital: Designing a method for the valuation of intangibles*. Routledge.
- Ardito, L., Messeni Petruzzelli, A., Dezi, L. and Castellano, S. (2020), "The influence of inbound open innovation on ambidexterity performance: does it pay to source knowledge from supply chain stakeholders?" *Journal of Business Research*, Vol. 119, pp. 321-329, doi: [10.1016/j.jbusres.2018.12.043](#).

- Bacon, E., Williams, M.D. & Davies, G. (2020), "Coopetition in innovation ecosystems: a comparative analysis of knowledge transfer configurations", *Journal of Business Research*, Vol. 115, pp. 307-316, doi: [10.1016/j.jbusres.2019.11.005](https://doi.org/10.1016/j.jbusres.2019.11.005).
- Bakhtiari, S. and Breunig, R. (2017), "New outsourcing, demand uncertainty and labor usage", *Review of Industrial Organization*, Vol. 50 No. 1, pp. 69-90, doi: [10.1007/s11151-016-9529-9](https://doi.org/10.1007/s11151-016-9529-9).
- Banerjee, A.V. (1992), "A simple model of herd behavior", *The Quarterly Journal of Economics*, Vol. 107 No. 3, pp. 797-817, doi: [10.2307/2118364](https://doi.org/10.2307/2118364).
- Battisti, G., Gallego, J., Rubalcaba, L. and Windrum, P. (2015), "Open innovation in services: knowledge sources, intellectual property rights and internationalization", *Economics of Innovation and New Technology*, Vol. 24 No. 3, pp. 223-247, doi: [10.1080/10438599.2014.924745](https://doi.org/10.1080/10438599.2014.924745).
- Bauernschuster, S., Falck, O. and Heblich, S. (2009), "Training and Innovation", *Journal of Human Capital*, Vol. 3 No. 4, pp. 323-353, doi: [10.1086/653713](https://doi.org/10.1086/653713).
- Becker, G.S. (1964), *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. University of Chicago Press.
- Bohler, J. and Hall, D. (2008), "Evaluation of a decision support training effectiveness measure", *Canadian Journal of Administrative Sciences/Revue Canadienne Des Sciences de l'Administration*, Vol. 25 No. 1, pp. 22-36, doi: [10.1002/cjas.51](https://doi.org/10.1002/cjas.51).
- Boxall, P. (1996), "The strategic hr debate and the resource-based view of the firm", *Human Resource Management Journal*, Vol. 6 No. 3, pp. 59-75, doi: [10.1111/j.1748-8583.1996.tb00412.x](https://doi.org/10.1111/j.1748-8583.1996.tb00412.x).
- Bratianu, C. (2018), "Intellectual capital research and practice: 7 myths and one golden rule", *Management & Marketing*, Vol. 13 No. 2, pp. 859-879, doi: [10.2478/mmcks-2018-0010](https://doi.org/10.2478/mmcks-2018-0010).
- Cappelli, R., Czarnecki, D. and Kraft, K. (2014), "Sources of spillovers for imitation and innovation", *Research Policy*, Vol. 43 No. 1, pp. 115-120, doi: [10.1016/j.respol.2013.07.016](https://doi.org/10.1016/j.respol.2013.07.016).
- Chaurasia, S.S., Kaul, N., Yadav, B. and Shukla, D. (2020), "Open innovation for sustainability through creating shared value-role of knowledge management system, openness and organizational structure", *Journal of Knowledge Management*, Vol. 24 No. 10, pp. 2491-2511, doi: [10.1108/JKM-04-2020-0319](https://doi.org/10.1108/JKM-04-2020-0319).
- Chen, C., Huang, J. and Hsiao, Y. (2010), "Knowledge management and innovativeness", *International Journal of Manpower*, Vol. 31 No. 8, pp. 848-870, doi: [10.1108/01437721011088548](https://doi.org/10.1108/01437721011088548).
- Cheng, S. (2008), "Board size and the variability of corporate performance", *Journal of Financial Economics*, Vol. 87 No. 1, pp. 157-176, doi: [10.1016/j.jfineco.2006.10.006](https://doi.org/10.1016/j.jfineco.2006.10.006).
- Chichkanov, N. (2021), "The role of client knowledge absorptive capacity for innovation in KIBS", *Journal of Knowledge Management*, Vol. 25 No. 5, pp. 1194-1218, doi: [10.1108/JKM-05-2020-0334](https://doi.org/10.1108/JKM-05-2020-0334).
- Chindasombatcharoen, P., Chatjuthamard, P., Jiraporn, P. and Treepongkaruna, S. (2022), "Achieving sustainable development goals through board size and innovation", *Sustainable Development*, Vol. 30 No. 4, pp. 664-677, doi: [10.1002/sd.2264](https://doi.org/10.1002/sd.2264).
- Ciliberti, S., Carraresi, L. and Bröring, S. (2016), "Drivers of innovation in Italy: food versus pharmaceutical industry", *British Food Journal*, Vol. 118 No. 6, pp. 1292-1316, doi: [10.1108/BFJ-10-2015-0405](https://doi.org/10.1108/BFJ-10-2015-0405).
- Clausen, T.H., Korneliusen, T. and Madsen, E.L. (2013), "Modes of innovation, resources and their influence on product innovation: empirical evidence from R&D active firms in Norway", *Technovation*, Vol. 33 Nos 6-7, pp. 225-233, doi: [10.1016/j.technovation.2013.02.002](https://doi.org/10.1016/j.technovation.2013.02.002).
- Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 128, doi: [10.2307/2393553](https://doi.org/10.2307/2393553).
- Corrocher, N., Cusmano, L. and Morrison, A. (2009), "Modes of innovation in knowledge-intensive business services evidence from Lombardy", *Journal of Evolutionary Economics*, Vol. 19 No. 2, pp. 173-196. doi: [10.1007/s00191-008-0128-2](https://doi.org/10.1007/s00191-008-0128-2).
- Crupi, A., Del Sarto, N., Di Minin, A., Gregori, G.L., Lepore, D., Marinelli, L. and Spigarelli, F. (2020), "The digital transformation of SMEs – a new knowledge broker called the digital innovation hub", *Journal of Knowledge Management*, Vol. 24 No. 6, pp. 1263-1288, doi: [10.1108/JKM-11-2019-0623](https://doi.org/10.1108/JKM-11-2019-0623).
- Demartini, P. and Paoloni, P. (2011), "Assessing human capital in knowledge intensive business services", *Measuring Business Excellence*, Vol. 15 No. 4, pp. 16-26, doi: [10.1108/13683041111184071](https://doi.org/10.1108/13683041111184071).

- Demircioglu, M.A., Audretsch, D.B. and Slaper, T.F. (2019), "Sources of innovation and innovation type: firm-level evidence from the United States", *Industrial and Corporate Change*, Vol. 28 No. 6, pp. 1365-1379, doi: [10.1093/icc/dtz010](https://doi.org/10.1093/icc/dtz010).
- Doloreux, D., Shearmur, R. and Rodriguez, M. (2018), "Internal R&D and external information in knowledge-intensive business service innovation: complements, substitutes or independent?" *Technological and Economic Development of Economy*, Vol. 24 No. 6, pp. 2255-2276, doi: [10.3846/tede.2018.5694](https://doi.org/10.3846/tede.2018.5694).
- Duan, Y., Yang, M., Liu, H. and Chin, T. (2024), "How does digital transformation affect innovation in knowledge-intensive business services firms? The moderating effect of R&D collaboration portfolio", *Journal of Knowledge Management*, Vol. 28 No. 4, pp. 994-1019, doi: [10.1108/JKM-02-2023-0161](https://doi.org/10.1108/JKM-02-2023-0161).
- Edvinsson, L. (1997), "Developing intellectual capital at Skandia", *Long Range Planning*, Vol. 30 No. 3, pp. 366-373, doi: [10.1016/S0024-6301\(97\)90248-X](https://doi.org/10.1016/S0024-6301(97)90248-X).
- Fernandes, S., Cesário, M. and Barata, J.M. (2017), "Ways to open innovation: main agents and sources in the Portuguese case", *Technology in Society*, Vol. 51, pp. 153-162, doi: [10.1016/j.techsoc.2017.09.002](https://doi.org/10.1016/j.techsoc.2017.09.002).
- Ferreira, J.J.M., Fernandes, C.I. and Veiga, P.M. (2024), "The effects of knowledge spillovers, digital capabilities, and innovation on firm performance: a moderated mediation model", *Technological Forecasting and Social Change*, Vol. 200, p. 123086, doi: [10.1016/j.techfore.2023.123086](https://doi.org/10.1016/j.techfore.2023.123086).
- Firk, S., Gehrke, Y., Hanelt, A. and Wolff, M. (2022), "Top management team characteristics and digital innovation: exploring digital knowledge and TMT interfaces", *Long Range Planning*, Vol. 55 No. 3, doi: [10.1016/j.lrp.2021.102166](https://doi.org/10.1016/j.lrp.2021.102166).
- Foss, N.J. and Saebi, T. (2017), "Fifteen years of research on business model innovation", *Journal of Management*, Vol. 43 No. 1, pp. 200-227, doi: [10.1177/0149206316675927](https://doi.org/10.1177/0149206316675927).
- Freel, M.S. (2006), "Patterns of technological innovation in knowledge-intensive business services", *Industry and Innovation*, Vol. 13 No. 3, pp. 335-358, doi: [10.1080/13662710600859157](https://doi.org/10.1080/13662710600859157).
- Galbraith, J.K. (1952), *American Capitalism: The Concept of Countervailing Power*, Routledge, Houghton Mifflin.
- Galia, F. and Legros, D. (2004), "Complementarities between obstacles to innovation: evidence from France", *Research Policy*, Vol. 33 No. 8, pp. 1185-1199, doi: [10.1016/j.respol.2004.06.004](https://doi.org/10.1016/j.respol.2004.06.004).
- Galia, F. and Zenou, E. (2012), "Board composition and forms of innovation: does diversity make a difference?" *European Journal of International Management*, Vol. 6 No. 6, pp. 630-650, doi: [10.1504/EJIM.2012.050425](https://doi.org/10.1504/EJIM.2012.050425).
- Galunic, D.C. and Anderson, E. (2000), "From Security to Mobility: Generalized Investments in Human Capital and Agent Commitment", *Organization Science*, Vol. 11 No. 1, pp. 1-20, doi: [10.1287/orsc.11.1.12565](https://doi.org/10.1287/orsc.11.1.12565).
- Gentile-Lüdecke, S., Torres de Oliveira, R. and Paul, J. (2020), "Does organizational structure facilitate inbound and outbound open innovation in SMEs?" *Small Business Economics*, Vol. 55 No. 4, pp. 1091-1112, doi: [10.1007/s11187-019-00175-4](https://doi.org/10.1007/s11187-019-00175-4).
- González, X., Miles-Touya, D. and Pazó, C. (2016), "R&D, worker training and innovation: firm-level evidence", *Industry and Innovation*, Vol. 23 No. 8, pp. 694-712, doi: [10.1080/13662716.2016.1206463](https://doi.org/10.1080/13662716.2016.1206463).
- Hamid, S.A., Bashir, H., Haridy, S. and Shamsuzzaman, M. (2022), "Factors affecting innovation in the service industry: a literature-based model", *2022 Advances in Science and Engineering Technology International Conferences (ASET)*, pp. 1-5, doi: [10.1109/ASET53988.2022.9735079](https://doi.org/10.1109/ASET53988.2022.9735079).
- Haneda, S. and Ito, K. (2018), "Organizational and human resource management and innovation: which management practices are linked to product and/or process innovation?" *Research Policy*, Vol. 47 No. 1, pp. 194-208, doi: [10.1016/j.respol.2017.10.008](https://doi.org/10.1016/j.respol.2017.10.008).
- Hsiao, Y.-C. and Wu, M.-H. (2020), "How organizational structure and strategic alignment influence new product success", *Management Decision*, Vol. 58 No. 1, pp. 182-200, doi: [10.1108/MD-06-2017-0628](https://doi.org/10.1108/MD-06-2017-0628).
- Huo, L., Shao, Y., Wang, S. and Yan, W. (2022), "Identifying the role of alignment in developing innovation ecosystem: value co-creation between the focal firm and supplier", *Management Decision*, Vol. 60 No. 7, pp. 2092-2125, doi: [10.1108/MD-03-2021-0433](https://doi.org/10.1108/MD-03-2021-0433).
- Hwang, B.-N., Lai, Y.-P. and Wang, C. (2023), "Open innovation and organizational ambidexterity", *European Journal of Innovation Management*, Vol. 26 No. 3, pp. 862-884, doi: [10.1108/EJIM-06-2021-0303](https://doi.org/10.1108/EJIM-06-2021-0303).

- laquinto, A.L. and Fredrickson, J.W. (1997), "Top management team agreement about the strategic decision process: a test of some of its determinants and consequences", *Strategic Management Journal*, Vol. 18 No. 1, pp. 63-75, doi: [10.1002/\(sici\)1097-0266\(199701\)18:1<63::aid-smj835>3.0.co;2-n](https://doi.org/10.1002/(sici)1097-0266(199701)18:1<63::aid-smj835>3.0.co;2-n).
- Jansen, J.J.P., Van Den Bosch, F.A.J. and Volberda, H.W. (2006), "Exploratory innovation, exploitative innovation, and performance: effects of organizational antecedents and environmental moderators", *Management Science*, Vol. 52 No. 11, pp. 1661-1674, doi: [10.1287/mnsc.1060.0576](https://doi.org/10.1287/mnsc.1060.0576).
- Jotabá, M.N., Fernandes, C.I., Gunkel, M. and Kraus, S. (2022), "Innovation and human resource management: a systematic literature review", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 1-18, doi: [10.1108/EJIM-07-2021-0330](https://doi.org/10.1108/EJIM-07-2021-0330).
- Kastl, J., Martimort, D. and Piccolo, S. (2013), "Delegation, ownership concentration and R&D spending: evidence from Italy", *The Journal of Industrial Economics*, Vol. 61 No. 1, pp. 84-107, doi: [10.1111/joie.12012](https://doi.org/10.1111/joie.12012).
- Koch, A. and Strotmann, H. (2008), "Absorptive capacity and innovation in the knowledge intensive business service sector", *Economics of Innovation and New Technology*, Vol. 17 No. 6, pp. 511-531, doi: [10.1080/10438590701222987](https://doi.org/10.1080/10438590701222987).
- Kratzer, J., Meissner, D. and Roud, V. (2017), "Open innovation and company culture: internal openness makes the difference", *Technological Forecasting and Social Change*, Vol. 119, pp. 128-138, doi: [10.1016/j.techfore.2017.03.022](https://doi.org/10.1016/j.techfore.2017.03.022).
- Krippendorff, K. and Garcia C. (2023), "Is organizational hierarchy getting in the way of innovation?" *Harvard Business Review*.
- Laursen, K. and Salter, A. (2006), "Open for innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms", *Strategic Management Journal*, Vol. 27 No. 2, pp. 131-150, doi: [10.1002/smj.507](https://doi.org/10.1002/smj.507).
- Le, P.B. (2024), "Applying knowledge-based human resource management to drive innovation: the roles of knowledge sharing and competitive intensity", *Management Research Review*, Vol. 47 No. 4, pp. 602-621, doi: [10.1108/MRR-02-2023-0154](https://doi.org/10.1108/MRR-02-2023-0154).
- Leary, M.T. and Roberts, M.R. (2014), "Do peer firms affect corporate financial policy?" *The Journal of Finance*, Vol. 69 No. 1, pp. 139-178, doi: [10.1111/jofi.12094](https://doi.org/10.1111/jofi.12094).
- Lin, Y. and Wu, L.-Y. (2014), "Exploring the role of dynamic capabilities in firm performance under the resource-based view framework", *Journal of Business Research*, Vol. 67 No. 3, pp. 407-413, doi: [10.1016/j.jbusres.2012.12.019](https://doi.org/10.1016/j.jbusres.2012.12.019).
- Liu, M., Shan, Y. and Li, Y. (2023), "Heterogeneous Partners, R&D cooperation and corporate innovation capability: evidence from Chinese manufacturing firms", *Technology in Society*, Vol. 72, pp. 102183. doi: [10.1016/j.techsoc.2022.102183](https://doi.org/10.1016/j.techsoc.2022.102183).
- Llopis, O. and D'Este, P. (2022), "Brokerage that works: balanced triads and the brokerage roles that matter for innovation", *Journal of Product Innovation Management*, Vol. 39 No. 4, pp. 492-514, doi: [10.1111/jpim.12618](https://doi.org/10.1111/jpim.12618).
- Lütjen, H., Schultz, C., Tietze, F. and Urmetzer, F. (2019), "Managing ecosystems for service innovation: a dynamic capability view", *Journal of Business Research*, Vol. 104, pp. 506-519, doi: [10.1016/j.jbusres.2019.06.001](https://doi.org/10.1016/j.jbusres.2019.06.001).
- Machokoto, M., Gyimah, D. and Ntim, C.G. (2021), "Do peer firms influence innovation?" *The British Accounting Review*, Vol. 53 No. 5, pp. 100988. doi: [10.1016/j.bar.2021.100988](https://doi.org/10.1016/j.bar.2021.100988).
- Marques, H., Ávila, E., Pereira, R. and Zambalde, A. (2022), "Open innovation and implementation of different types of innovation: an analysis based on panel data", *Brazilian Business Review*, Vol. 19 No. 1, pp. 39-58, doi: [10.15728/bbr.2022.19.1.3](https://doi.org/10.15728/bbr.2022.19.1.3).
- Mason, G., Rincon-Aznar, A. and Venturini, F. (2020), "Which skills contribute most to absorptive capacity, innovation and productivity performance? Evidence from the US and Western Europe", *Economics of Innovation and New Technology*, Vol. 29 No. 3, pp. 223-241, doi: [10.1080/10438599.2019.1610547](https://doi.org/10.1080/10438599.2019.1610547).
- Mention, A.-L. (2011), "Co-operation and co-opetition as open innovation practices in the service sector: which influence on innovation novelty?" *Technovation*, Vol. 31 No. 1, pp. 44-53, doi: [10.1016/j.technovation.2010.08.002](https://doi.org/10.1016/j.technovation.2010.08.002).
- Miles, I., Belousova, V. and Chichkanov, N. (2017), "Innovation configurations in knowledge-intensive business services", *Foresight and STI Governance*, Vol. 11 No. 3, pp. 94-102, doi: [10.17323/2500-2597.2017.3.94.102](https://doi.org/10.17323/2500-2597.2017.3.94.102).

- Moya-Fernández, P.J. and Seclen-Luna, J.P. (2023), "Evaluating the effects of information sources on innovation outcomes: are there differences between kibs and manufacturing firms from a Latin America country?" *Journal of the Knowledge Economy*, doi: [10.1007/s13132-023-01305-w](https://doi.org/10.1007/s13132-023-01305-w).
- Nguyen, T.N., Shen, C.H. and Le, P.B. (2022), "Influence of transformational leadership and knowledge management on radical and incremental innovation: the moderating role of collaborative culture", *Kybernetes*, Vol. 51 No. 7, pp. 2240-2258, doi: [10.1108/K-12-2020-0905](https://doi.org/10.1108/K-12-2020-0905).
- Nieves, J., Quintana, A. and Osorio, J. (2016), "Organizational knowledge and collaborative human resource practices as determinants of innovation", *Knowledge Management Research and Practice*, Vol. 14 No. 3, pp. 237-245, doi: [10.1057/kmrp.2014.26](https://doi.org/10.1057/kmrp.2014.26).
- OECD, E. (2018), "Oslo Manual 2018: Guidelines for Collecting", *Reporting and Using Data on Innovation*.
- Olson, E.M., Slater, S.F. and Hult, G.T.M. (2005), "The performance implications of fit among business strategy, marketing organization structure, and strategic behavior", *Journal of Marketing*, Vol. 69 No. 3, pp. 49-65, doi: [10.1509/jmkg.69.3.49.66362](https://doi.org/10.1509/jmkg.69.3.49.66362).
- Pace, L.A. and Miles, I. (2020), "The influence of KIBS-client interactions on absorptive capacity-building for environmental innovation", *European Journal of Innovation Management*, Vol. 23 No. 4, pp. 553-580, doi: [10.1108/EJIM-01-2019-0026](https://doi.org/10.1108/EJIM-01-2019-0026).
- Palacios-Marques, D., Gil-Pechuán, I. and Lim, S. (2011), "Improving human capital through knowledge management practices in knowledge-intensive business services", *Service Business*, Vol. 5 No. 2, pp. 99-112, doi: [10.1007/s11628-011-0104-z](https://doi.org/10.1007/s11628-011-0104-z).
- Pertusa-Ortega, E.M., Zaragoza-Sáez, P. and Claver-Cortés, E. (2010), "Can formalization, complexity, and centralization influence knowledge performance?" *Journal of Business Research*, Vol. 63 No. 3, pp. 310-320, doi: [10.1016/j.jbusres.2009.03.015](https://doi.org/10.1016/j.jbusres.2009.03.015).
- Primario, S., Rippa, P. and Secundo, G. (2024), "Peer innovation as an open innovation strategy for balancing competition and collaboration among technology start-ups in an innovation ecosystem", *Journal of Innovation and Knowledge*, Vol. 9 No. 2, doi: [10.1016/j.jik.2024.100473](https://doi.org/10.1016/j.jik.2024.100473).
- Radicic, D., Pugh, G. and Douglas, D. (2020), "Promoting cooperation in innovation ecosystems: evidence from European traditional manufacturing SMEs", *Small Business Economics*, Vol. 54 No. 1, pp. 257-283, doi: [10.1007/s11187-018-0088-3](https://doi.org/10.1007/s11187-018-0088-3).
- Rastogi, P.N. (2000), "Knowledge management and intellectual capital – the new virtuous reality of competitiveness", *Human Systems Management*, Vol. 19 No. 1, pp. 39-48, doi: [10.3233/HSM-2000-19105](https://doi.org/10.3233/HSM-2000-19105).
- Rodriguez, M., Doloreux, D. and Shearmur, R. (2017), "Variety in external knowledge sourcing and innovation novelty: evidence from the KIBS sector in Spain", *Technovation*, Vol. 68, pp. 35-43, doi: [10.1016/j.technovation.2017.06.003](https://doi.org/10.1016/j.technovation.2017.06.003).
- Roth, S., Leydesdorff, L., Kaivo-Oja, J. and Sales, A. (2019), "Open coopetition: when multiple players and rivals team up", *Journal of Business Strategy*, Vol. 41 No. 6, pp. 31-38, doi: [10.1108/JBS-11-2018-0192](https://doi.org/10.1108/JBS-11-2018-0192).
- Ruzzier, M., Antoncic, B., Hisrich, R.D. and Konecnik, M. (2007), "Human capital and SME internationalization: a structural equation modeling study", *Canadian Journal of Administrative Sciences/Revue Canadienne Des Sciences de l'Administration*, Vol. 24 No. 1, pp. 15-29, doi: [10.1002/cjas.3](https://doi.org/10.1002/cjas.3).
- Sareen, A. and Pandey, S. (2022), "Organizational Innovation in Knowledge Intensive Business Services: The role of Networks, Culture and Resources for Innovation", *FIIB Business Review*, Vol. 11 No. 1, pp. 107-118, doi: [10.1177/23197145211020737](https://doi.org/10.1177/23197145211020737).
- Sarpong, D., Meissner, D., Moraes, G.H.S.M.d and Vismara, S. (2025), "The impact of university-industry engagement and the rise of competency transfer partnerships", *The Journal of Technology Transfer*. [10.1007/s10961-025-10251-5](https://doi.org/10.1007/s10961-025-10251-5).
- Savic, M., Lawton Smith, H. and Bournakis, I. (2020), "Innovation and external knowledge sources in knowledge intensive business services (KIBS): evidence from de-industrialized UK regions", *Entrepreneurship & Regional Development*, Vol. 32 Nos 9-10, pp. 805-826, doi: [10.1080/08985626.2020.1789751](https://doi.org/10.1080/08985626.2020.1789751).
- Schildt, H. (2022), *The Institutional Logic of Digitalization*, pp. 235-251, doi: [10.1108/S0733-558X20220000083010](https://doi.org/10.1108/S0733-558X20220000083010).
- Schultz, T.W. (1961), "Investment in Human Capital", *The American Economic Review*, Vol. 51 No. 1, pp. 1-17.

Schumpeter, J.A. (1942), *Capitalism, Socialism and Democracy*. Harper & Brothers.

Sierra-Morán, J., Cabeza-García, L., González-Álvarez, N. and Botella, J. (2024), "The board of directors and firm innovation: a meta-analytical review", *BRQ Business Research Quarterly*, Vol. 27 No. 2, pp. 182-207, doi: [10.1177/23409444211039856](https://doi.org/10.1177/23409444211039856).

Silva, L.E.N., de Vasconcelos Gomes, L.A., de Faria, A.M. and Borini, F.M. (2024), "Innovation processes in ecosystem settings: an integrative framework and future directions", *Technovation*, Vol. 132, [10.1016/j.technovation.2024.102984](https://doi.org/10.1016/j.technovation.2024.102984).

Simsek, Z., Veiga, J.F., Lubatkin, M.H. and Dino, R.N. (2005), "Modeling the multilevel determinants of top management team behavioral integration", In *Source: The Academy of Management Journal*, Vol. 48 No. 1.

Sivam, A., Dieguez, T., Ferreira, L.P. and Silva, F.J.G. (2019), "Key settings for successful open innovation arena", *Journal of Computational Design and Engineering*, Vol. 6 No. 4, pp. 507-515, doi: [10.1016/j.jcde.2019.03.005](https://doi.org/10.1016/j.jcde.2019.03.005).

Sveiby, K.E. (1977), *The New Organizational Wealth: Managing and Measuring Knowledge-Based Assets*, Berrett-Koehler Publishers.

Svetina, A.C. and Prodan, I. (2008), "How internal and external sources of knowledge contribute to firms' innovation performance".

Teece, D.J. (2010), "Business models, business strategy and innovation", *Long Range Planning*, Vol. 43 Nos 2-3, pp. 172-194, doi: [10.1016/j.lrp.2009.07.003](https://doi.org/10.1016/j.lrp.2009.07.003).

Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-533, doi: [10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z).

Theriou, G. and Chatzoglou, P. (2009), "Exploring the best HRM practices-performance relationship: an empirical study", *Journal of Workplace Learning*, Vol. 21 No. 8, pp. 614-646, doi: [10.1108/13665620910996179](https://doi.org/10.1108/13665620910996179).

Thwaites, D. (1992), "Organizational influences on the new product development process in financial services", *Journal of Product Innovation Management*, Vol. 9 No. 4, pp. 303-313, doi: [10.1111/1540-5885.940303](https://doi.org/10.1111/1540-5885.940303).

Uzkurt, C., Kumar, R., Semih Kimzan, H. and Eminoğlu, G. (2013), "Role of innovation in the relationship between organizational culture and firm performance", *European Journal of Innovation Management*, Vol. 16 No. 1, pp. 92-117, doi: [10.1108/14601061311292878](https://doi.org/10.1108/14601061311292878).

Van Veldhoven, Z. and Vanthienen, J. (2022), "Digital transformation as an interaction-driven perspective between business, society, and technology", *Electronic Markets*, Vol. 32 No. 2, pp. 629-644, doi: [10.1007/s12525-021-00464-5](https://doi.org/10.1007/s12525-021-00464-5).

Vijande, M.L., López-Sánchez, J.Á., Pascual-Fernández, P. and Rudd, J.M. (2021), "Service innovation management in a modern economy: insights on the interplay between firms' innovative culture and project-level success factors", *Technological Forecasting and Social Change*, Vol. 165, doi: [10.1016/j.techfore.2020.120562](https://doi.org/10.1016/j.techfore.2020.120562).

Vincenzi, T.B.D and da Cunha, J.C. (2021), "Open innovation and performance in the service sector", *Innovation & Management Review*, Vol. 18 No. 4, pp. 382-399, doi: [10.1108/INMR-01-2020-0004](https://doi.org/10.1108/INMR-01-2020-0004).

Walrave, B., van de Wal, N. and Gilsing, V. (2024), "Knowledge diversity and technological innovation: The moderating role of top management teams", *Technovation*, Vol. 131, doi: [10.1016/j.technovation.2024.102954](https://doi.org/10.1016/j.technovation.2024.102954).

Wang, C., Chin, T., Chiew, Y.Y. and Capalbo, C. (2024), "How geographic diversity and collaborative breadth prevent knowledge leakage during open innovation processes", *Journal of Knowledge Management*, Vol. 28 No. 3, pp. 743-762, doi: [10.1108/JKM-04-2022-0298](https://doi.org/10.1108/JKM-04-2022-0298).

Wincent, J., Anokhin, S. and Boter, H. (2009), "Network board continuity and effectiveness of open innovation in Swedish strategic small-firm networks." *R and D Management*, Vol. 39 No. 1, pp. 55-67, doi: [10.1111/j.1467-9310.2008.00539.x](https://doi.org/10.1111/j.1467-9310.2008.00539.x).

Wright, P.M. and McMahan, G.C. (2011), "Exploring human capital: putting 'human' back into strategic human resource management", *Human Resource Management Journal*, Vol. 21 No. 2, pp. 93-104, doi: [10.1111/j.1748-8583.2010.00165.x](https://doi.org/10.1111/j.1748-8583.2010.00165.x).

Xiao, R., Ma, C.-A., Song, G.-R. and Chang, H.-Y. (2022), "Does peer influence improve firms' innovative investment? Evidence from China", *Energy Reports*, Vol. 8, pp. 1143-1150, doi: [10.1016/j.egyr.2021.12.029](https://doi.org/10.1016/j.egyr.2021.12.029).

- Zieba, M., Bolisani, E., Paiola, M. and Scarso, E. (2017), "Searching for innovation knowledge: insight into KIBS companies", *Knowledge Management Research & Practice*, Vol. 15 No. 2, pp. 282-293, doi: [10.1057/s41275-017-0050-1](https://doi.org/10.1057/s41275-017-0050-1).
- Zubielqui, G.C., Fryges, H. and Jones, J. (2019), "Social media, open innovation and HRM: implications for performance", *Technological Forecasting and Social Change*, Vol. 144, pp. 334-347, doi: [10.1016/j.techfore.2017.07.014](https://doi.org/10.1016/j.techfore.2017.07.014).

Further reading

- Alegre, J., Lapiedra, R. and Chiva, R. (2006), "A measurement scale for product innovation performance", *European Journal of Innovation Management*, Vol. 9 No. 4, pp. 333-346, doi: [10.1108/14601060610707812](https://doi.org/10.1108/14601060610707812).
- Argote, L. and Ingram, P. (2000), "Knowledge transfer: a basis for competitive advantage in firms", *Organizational Behavior and Human Decision Processes*, Vol. 82 No. 1, pp. 150-169, doi: [10.1006/obhd.2000.2893](https://doi.org/10.1006/obhd.2000.2893).
- Engelsberger, A., Bartram, T., Cavanagh, J., Halvorsen, B. and Bogers, M. (2023), "The role of collaborative human resource management in supporting open innovation: A multi-level model", *Human Resource Management Review*, Vol. 33 No. 2, doi: [10.1016/j.hrmr.2022.100942](https://doi.org/10.1016/j.hrmr.2022.100942).
- Kharub, M. and Sharma, R. (2020), "An integrated structural model of QMPs, QMS and firm's performance for competitive positioning in MSMEs", *Total Quality Management & Business Excellence*, Vol. 31 Nos 3-4, pp. 312-341, doi: [10.1080/14783363.2018.1427500](https://doi.org/10.1080/14783363.2018.1427500).
- Lee, H. and Choi, B. (2003), "Knowledge management enablers, processes, and organizational performance: an integrative view and empirical examination", *Journal of Management Information Systems*, Vol. 20 No. 1, pp. 179-228, doi: [10.1080/07421222.2003.11045756](https://doi.org/10.1080/07421222.2003.11045756).
- Levina, I. (2020), "Decentralization of firms in a country with weak institutions: evidence from Russia", *Journal of Comparative Economics*, Vol. 48 No. 4, pp. 933-950, doi: [10.1016/j.jce.2020.05.006](https://doi.org/10.1016/j.jce.2020.05.006).
- Reidenbach, E.R. (1986), "Exploring retail bank performance and new product development: a profile of industry practices", *Journal of Product Innovation Management*, Vol. 3 No. 3, pp. 187-194, doi: [10.1016/0737-6782\(86\)90051-2](https://doi.org/10.1016/0737-6782(86)90051-2).
- Tipu, S.A.A. (2011), "Academic publications on innovation management in banks" (1998–2008): A research note. *Innovation*, Vol. 13 No. 2, pp. 236-260, doi: [10.5172/impp.2011.13.2.236](https://doi.org/10.5172/impp.2011.13.2.236).

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Appendix

Table A1 Descriptive statistics: numeric and categorical variables

<i>Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Age	12.70	6.95	1	28
Size	98.56	334.60	2	5485
<i>Personnel structure</i>				
Share of top management in company, %	12.20	9.98	0	100
Share of senior professionals, %	39.31	24.35	0	100
Share of mid-level professionals, %	31.98	21.85	0	93
Share of supporting staff, %	13.46	13.67	0	80
<i>Measures</i>				
Number of HRM education measures	3.23	2.31	0	10
Number of HRM work organization measures	3.01	2.11	0	11
Contribution index of firm's activities in innovation	−0.04	1.48	−3.42	3.59
Source(s): Authors' own work				

Table A2 Descriptive statistics: dummy variables

<i>Variable</i>	<i>Frequency</i>	<i>%</i>
<i>Industry</i>		
IT	160	40.10
Accounting, auditing, legal	50	12.53
Architecture, engineering, industry, design	110	21.57
Management, consulting	24	6.02
Advertising, marketing	55	13.78
<i>Innovation activity</i>		
New products/services	218	54.50
New ways to develop services	146	36.50
New ways to interact with customers in the service delivery process	190	47.50
Organizational innovation	285	71.25
Marketing innovation	201	50.25
Implementation of network forms of strategic alliances, partnerships and other types of cooperation with competitors and suppliers (building ecosystems)	221	55.25
<i>Sources of information for creation and implementation of innovation</i>		
Company's research and development	94	26.78
Marketing and customers interaction division	76	19.00
Peers (partner companies within ecosystem, competitors and other companies in industry)	100	28.49
Consumers of private sector services or services from state-owned companies and government authorities	125	31.25
Scientific organizations, universities	41	11.75
Government authorities and their databases	27	7.74
Professional and industry associations	92	25.84
Source(s): Authors' own work		

Table A3 Descriptive statistics: usage of HRM education measures

<i>Variable</i>	<i>Frequency</i>	<i>%</i>
Support programs for young staff	160	40.10
Adaptation training for new employees	185	46.37
Career development programs	123	30.83
Attracting specialists from scientific organizations and higher education institutions for mutual projects	79	19.80
Collaboration with universities	153	38.35
Corporate university	124	31.08
Corporate online courses/webinars	118	29.57
Workshops, business trainings from external experts	121	30.33
Funding business schools/universities for staff	106	26.57
Funding massive open online courses	120	30.08
Source(s): Authors' own work		

Table A4 Descriptive statistics: usage of HRM work organization measures

<i>Variable</i>	<i>Frequency</i>	<i>%</i>
Activities to identify, promote and motivate key employees and teams that drive innovation	130	32.58
Staff motivation in accordance with the company's strategic objectives	218	54.64
Concentration of innovation in a specialized research and development or innovation unit	43	10.78
Agile project management	94	23.56
Cross-functional/interdisciplinary project teams	118	29.57
Delegation of decision-making to the level of project managers and employees in the field of innovation	133	33.33
Financial and non-financial incentives for employees to initiate and innovate	113	28.32
Corporate accelerator, ideas contests, etc.	41	10.28
Remote employee work	204	51.13
Securing work time for new ideas development	44	11.03
Creating creative spaces for employees	64	16.04
Source(s): Authors' own work		

Table A5 The first component of the activities contributing to innovation in 2016–2018

<i>Variables</i>	<i>First component</i>
Research and development	0.33
Engineering	0.34
Design	0.35
Marketing	0.35
IP management	0.42
Staff training	0.34
Development and acquisition of software, IT systems	0.29
Innovation management	0.39
<i>Explained dispersion</i>	<i>0.33</i>
Source(s): Authors' own work	

Table A6 Correlation matrix of independent variables

	R&D	Marketing and customers interaction division	Peers	Consumers	Scientific organizations, government authorities	Industry associations	Share of top management	Share of senior professionals	Share of mid-level professionals	No. of HRM education measures	No. of HRM work organization measures	Contribution index of activities in innovation	Age	Size	Moscow
R&D	1														
Marketing and customers interaction division	0.0578	1													
Peers	0.0366	0.0197	1												
Consumers	0.0819**	0.0456	0.1182***	1											
Scientific organizations, government authorities	0.1526***	0.0229	0.0814**	0.0897**	1										
Industry associations	0.0103	0.0477	0.0774*	0.0492	1										
Share of top management	-0.0770*	-0.0057	0.0201	-0.0527	-0.0188	1									
Share of senior professionals	-0.0341	-0.0910**	-0.0798*	0.0043	-0.1137**	0.0144	1								
Share of mid-level professionals	0.0857**	0.1014**	0.0638	0.1193***	0.0400	-0.2766***	-0.0935*	1							
No. of HRM education measures	0.2012**	0.2257***	0.1862***	0.1121***	0.1076***	0.1397***	-0.1291***	-0.1645***	1						
No. of HRM work organization measures	0.2587***	0.2801***	0.2226***	0.1629***	0.0984**	0.1196***	-0.0931**	-0.1467***	0.0427	1					
Contribution index of activities in innovation	0.2453***	0.1675***	0.1078**	0.1335***	0.0956**	0.0419	-0.0353	0.0037	0.0427	0.2390***	1				
Age	0.0688*	-0.0080	-0.0724*	0.0217	0.0754*	0.0032	-0.1486***	-0.0482	0.0724*	0.1617***	0.0151	1			
Size	0.2384***	0.1433***	0.0830*	0.0059	0.0344	0.0542	-0.2131***	-0.2270***	0.2061***	0.4739***	0.3317***	0.1222**	1		
Moscow	0.1279***	-0.0118	0.0587	-0.0076	0.0778*	0.0437	-0.0027	-0.2049***	0.1132***	0.1118***	0.1633***	-0.1286***	0.3487***	1	
														0.2895***	1

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own work

Table A7 Estimation of the basic model with HRM education measures separately (marginal effects)

Independent variables	(1) Service innovation	Standard error	(2) Innovation in developing services	Standard error	(3) Innovation customer interaction service delivery	Standard error	(4) Organizational innovation	Standard error	(5) Marketing innovation	Standard error	(6) External cooperation innovation	Standard error
<i>Information source for innovation</i>												
R&D	0.155**	(0.0675)	0.0738	(0.0674)	0.0222	(0.0661)	-0.109**	(0.0520)	-0.111*	(0.0669)	0.0314	(0.0642)
Marketing and customers interaction division	0.0115	(0.0642)	-0.0397	(0.0656)	0.196***	(0.0630)	0.138**	(0.0613)	0.191***	(0.0656)	0.231***	(0.0637)
Peers	0.0458	(0.0593)	0.0243	(0.0611)	0.0383	(0.0572)	0.0537	(0.0516)	0.0630	(0.0595)	0.164**	(0.0566)
Consumers	0.134**	(0.0556)	0.146***	(0.0554)	0.0607	(0.0550)	0.0611	(0.0469)	0.114**	(0.0567)	0.0909*	(0.0521)
Scientific organization	-0.0798	(0.0831)	-0.117	(0.0885)	-0.233***	(0.0871)	-0.100	(0.0617)	0.0116	(0.0869)	0.119	(0.0913)
Government authorities	0.0356	(0.0989)	0.0517	(0.0966)	-0.0249	(0.0901)	-0.0359	(0.0757)	0.0130	(0.0957)	0.0487	(0.0894)
Industry associations	-0.0487	(0.0597)	0.116*	(0.0618)	0.0251	(0.0591)	-0.0110	(0.0539)	-0.0145	(0.0623)	0.0942	(0.0575)
<i>Workforce structure</i>												
Share of leaders	0.00801	(0.00288)	-0.000712	(0.00336)	0.00437	(0.00291)	0.000889	(0.00210)	0.00126	(0.00292)	-0.00568**	(0.00279)
Share of top-level specialists	0.00282*	(0.00163)	0.00194	(0.00183)	-0.00183	(0.00162)	-0.000409	(0.00126)	-0.000943	(0.00172)	-0.00253	(0.00155)
Share of mid-level specialists	0.00295	(0.00183)	0.00121	(0.00200)	0.00286	(0.00178)	0.00250*	(0.00152)	0.000744	(0.00190)	-0.00162	(0.00175)
<i>HR management practices</i>												
Support programs for young staff	0.0170	(0.0561)	0.0251	(0.0602)	0.137**	(0.0552)	-0.0201	(0.0462)	0.0477	(0.0586)	0.0227	(0.0532)
Adaptation training for new employees	-0.0269	(0.0564)	-0.0206	(0.0614)	0.0721	(0.0560)	0.0776	(0.0476)	0.0157	(0.0587)	-0.00405	(0.0525)
Career development programs	-0.0934	(0.0594)	0.0298	(0.0631)	0.0169	(0.0596)	0.0405	(0.0537)	-0.104*	(0.0616)	-0.0738	(0.0552)
Attracting specialists from scientific organizations and higher education institutions for mutual projects	0.0322	(0.0684)	0.0371	(0.0705)	-0.133**	(0.0668)	-0.00322	(0.0554)	0.00557	(0.0687)	0.114*	(0.0650)
Collaboration with universities	0.0385	(0.0563)	-0.000180	(0.0591)	-0.0132	(0.0553)	0.0207	(0.0465)	-0.0642	(0.0580)	0.0948*	(0.0524)
Internal training programs, corporate universities	-0.00824	(0.0613)	0.0713	(0.0641)	-0.178***	(0.0595)	-0.0476	(0.0512)	-0.0190	(0.0634)	-0.118**	(0.0586)
Corporate online courses/webinars	0.0870	(0.0589)	0.0275	(0.0615)	0.0205	(0.0581)	-0.0273	(0.0490)	-0.00131	(0.0606)	-0.00282	(0.0567)
Workshops, business trainings from external experts	-0.0383	(0.0633)	0.00246	(0.0662)	0.104*	(0.0616)	0.152**	(0.0643)	-0.0424	(0.0648)	0.0113	(0.0583)
Funding business schools/universities for staff	-0.0405	(0.0606)	0.00718	(0.0644)	0.0225	(0.0615)	0.00255	(0.0517)	0.100	(0.0623)	0.0297	(0.0577)
Funding MOOCs	0.0267	(0.0577)	-0.0232	(0.0610)	0.0812	(0.0579)	0.00501	(0.0490)	0.0972	(0.0595)	0.0493	(0.0541)
Contribution index	0.0327*	(0.0184)	0.0416**	(0.0192)	-0.00150	(0.0184)	0.0109	(0.0146)	0.0370**	(0.0186)	0.0374**	(0.0176)
<i>Controls</i>												
Age	0.00180	(0.00398)	0.000338	(0.00429)	0.000372	(0.00400)	0.00169	(0.00333)	-0.00974**	(0.00403)	0.00296	(0.00380)
Size (natural log)	0.0577***	(0.0210)	0.00752	(0.0226)	-0.0439**	(0.0209)	-0.00494	(0.0186)	0.0596***	(0.0221)	0.0409**	(0.0205)
Moscow	0.0238	(0.0552)	0.0165	(0.0582)	-0.169**	(0.0527)	0.0768*	(0.0455)	-0.00965	(0.0569)	0.0491	(0.0526)
International	0.0735	(0.0616)	-0.0489	(0.0632)	0.0324	(0.0587)	0.0481	(0.0521)	0.0956	(0.0622)	0.108*	(0.0596)
Age												

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, MOOC = massive open online course

Source(s): Authors' own work

Table A8 Estimation of the basic model with HRM work organization measures separately (marginal effects)

Independent variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Service innovation	Standard error	Innovation in developing services	Standard error	Innovation customer interaction service delivery	Standard error	Organizational innovation	Standard error	Marketing innovation	Standard error	External cooperation innovation	Standard error
<i>Information source for innovation</i>												
R&D	0.125*	(0.0653)	0.0715	(0.0634)	−0.0605	(0.0639)	−0.112**	(0.0493)	−0.142**	(0.0654)	0.0894	(0.0637)
Marketing and customers interaction division	0.00917	(0.0633)	−0.0780	(0.0650)	0.169***	(0.0643)	0.115*	(0.0623)	0.180***	(0.0670)	0.195***	(0.0654)
Peers	0.0277	(0.0581)	0.00766	(0.0593)	0.0611	(0.0590)	0.0323	(0.0493)	0.0516	(0.0596)	0.163***	(0.0575)
Consumers	0.103*	(0.0556)	0.130**	(0.0550)	0.0671	(0.0576)	0.0417	(0.0466)	0.0846	(0.0584)	0.0952*	(0.0543)
Scientific organizations	−0.0343	(0.0798)	−0.0711	(0.0828)	−0.295***	(0.0860)	−0.109*	(0.0559)	0.0228	(0.0851)	0.213**	(0.0888)
Government authorities	0.0564	(0.0971)	0.0425	(0.0962)	−0.0199	(0.0939)	−0.0379	(0.0749)	0.0535	(0.0989)	0.0678	(0.0908)
Industry associations	−0.0485	(0.0578)	0.133**	(0.0591)	0.0369	(0.0607)	−0.00689	(0.0505)	−0.0249	(0.0617)	0.107*	(0.0585)
<i>Workforce structure</i>												
Share of leaders	0.000369	(0.00283)	−0.00109	(0.00335)	0.00463	(0.00309)	0.000464	(0.00201)	0.00110	(0.00288)	−0.00503*	(0.00284)
Share of top-level specialists	0.00261*	(0.00157)	0.00169	(0.00174)	−0.00195	(0.00168)	−0.000957	(0.00120)	−0.000671	(0.00170)	−0.00245	(0.00155)
Share of mid-level specialists	0.00226	(0.00176)	0.00103	(0.00194)	0.00285	(0.00187)	0.00171	(0.00145)	7.82e−05	(0.00192)	−0.00189	(0.00179)
<i>Organizational measures</i>												
Activities to identify, promote and motivate key employees and teams that drive innovation	0.109*	(0.0560)	0.109*	(0.0562)	−0.0269	(0.0583)	0.0442	(0.0478)	−0.0231	(0.0589)	0.00543	(0.0549)
Staff motivation in accordance with the company's strategic objectives	−0.0652	(0.0513)	−0.0784	(0.0542)	0.0886*	(0.0531)	0.0733*	(0.0407)	−0.0291	(0.0538)	−0.00644	(0.0503)
Concentration of innovation in a specialized R&D unit	0.228**	(0.112)	−0.0668	(0.0843)	0.108	(0.0877)	−0.00636	(0.0754)	0.0507	(0.0891)	−0.00264	(0.0872)
Agile project management	0.172**	(0.0675)	0.112*	(0.0640)	−0.0403	(0.0659)	0.0448	(0.0621)	0.136**	(0.0681)	0.0665	(0.0659)
Cross-functional/interdisciplinary project teams	0.00192	(0.0613)	0.0101	(0.0628)	0.0196	(0.0630)	0.146**	(0.0586)	0.0821	(0.0638)	0.0597	(0.0608)
Delegation of decision-making to the level of project managers and employees in the field of innovation	0.0101	(0.0557)	0.124**	(0.0556)	0.00514	(0.0575)	0.113**	(0.0488)	0.0116	(0.0577)	0.00955	(0.0540)
Financial and non-financial incentives for employees to innovate	−0.0563	(0.0565)	0.0873	(0.0588)	−0.0477	(0.0598)	0.0474	(0.0511)	0.0630	(0.0604)	−0.0166	(0.0565)
Corporate accelerators, ideas contests, etc.	0.0142	(0.101)	0.0408	(0.0943)	0.0172	(0.0960)	0.137	(0.135)	−0.0658	(0.1000)	−0.0609	(0.0953)
Remote work	−0.0243	(0.0522)	−0.0609	(0.0539)	0.0173	(0.0540)	0.0104	(0.0431)	0.00210	(0.0545)	0.0596	(0.0512)
Securing work time for new ideas development	−0.0390	(0.0852)	0.0236	(0.0835)	0.0797	(0.0907)	0.0953	(0.0844)	0.0522	(0.0867)	−0.0333	(0.0785)
Creative spaces for employees	0.0132	(0.0711)	0.0820	(0.0717)	0.0948	(0.0737)	0.0123	(0.0611)	−0.0470	(0.0746)	−0.0139	(0.0683)
Contribution index	0.0247	(0.0186)	0.0249	(0.0190)	0.00565	(0.0193)	0.00466	(0.0145)	0.0349*	(0.0192)	0.0390**	(0.0183)
<i>Controls</i>												
Age	0.00318	(0.00386)	0.000288	(0.00413)	0.00254	(0.00408)	0.00401	(0.00317)	−0.00775*	(0.00406)	0.00545	(0.00384)
Size (natural log)	0.0290	(0.0220)	0.00619	(0.0223)	−0.0313	(0.0223)	−0.0213	(0.0189)	0.0459**	(0.0228)	0.0387*	(0.0217)
Moscow	0.0397	(0.0538)	−0.0215	(0.0551)	−0.142***	(0.0528)	0.0525	(0.0440)	−0.00608	(0.0558)	0.0355	(0.0552)
International	0.0550	(0.0639)	−0.0493	(0.0641)	0.0456	(0.0636)	0.0144	(0.0527)	0.0590	(0.0657)	0.0767	(0.0630)
Observations	323		326		326		326		326		326	

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source(s): Authors' own work

Table A9 Estimation of the basic model for technical KIBS (marginal effects)

Independent variables	(1) Service innovation error	(2) Innovation in developing services error	(3) Innovation customer interaction service delivery error	(4) Organizational innovation error	(5) Marketing innovation error	(6) External cooperation innovation error
<i>Information source for Innovation</i>						
R&D	0.120*	0.00892	(0.0727)	−0.0311	(0.0678)	−0.00889
Marketing and customers interaction division	0.0368	−0.0316	(0.0849)	0.134*	(0.0794)	0.144*
Peers	0.0764	0.0590	(0.0736)	0.0644	(0.0689)	0.265***
Consumers	0.103	0.145**	(0.0666)	−0.0331	(0.0650)	0.0457
Scientific organizations	−0.0900	−0.135	(0.0984)	−0.418***	(0.104)	0.248**
Government authorities	−0.0638	0.0496	(0.121)	0.0430	(0.115)	−0.0476
Industry associations	0.00487	0.0834	(0.0800)	−0.00374	(0.0749)	0.0924
<i>Workforce structure</i>						
Share of leaders	0.00132	0.00114	(0.00384)	0.00989**	(0.00395)	−0.00293
Share of top-level specialists	0.00261	0.00193	(0.00239)	−0.000817	(0.00219)	0.000133
Share of mid-level specialists	0.00251	0.00269	(0.00260)	0.00293	(0.00244)	0.00133
<i>Human capital measures</i>						
No. of HR management practices	−0.0187	−0.000845	(0.0187)	0.0246	(0.0175)	0.00128
No. of organizational management practices	0.0387**	0.0429**	(0.0196)	0.0207	(0.0188)	0.0236
Contribution index of activities in innovation	0.0195	0.0115	(0.0247)	0.0169	(0.0238)	0.0404*
<i>Controls</i>						
Age	0.00866*	−0.00317	(0.00532)	0.00957*	(0.00494)	0.0104**
Size (natural log)	0.00670	0.00139	(0.0279)	−0.0408	(0.0263)	0.0181
Moscow	0.0317	0.0287	(0.0684)	−0.0810	(0.0634)	0.0782
International	0.00674	−0.0818	(0.0742)	0.114*	(0.0682)	0.0658
Observations	216	219	219	219	219	219

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own work

Table A10 Estimation of the extended model with interactions for Technical KIBS (marginal effects)

Independent variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Service innovation	Standard error	Innovation in developing services	Standard error	Innovation customer interaction service delivery	Standard error	Organizational innovation	Standard error	Marketing innovation	Standard error	External cooperation innovation	Standard error
<i>Information source for innovation</i>												
R&D	0.110	(0.0680)	-0.00178	(0.0712)	-0.0241	(0.0681)	-0.0821	(0.0567)	-0.147**	(0.0626)	-0.00789	(0.0623)
Marketing and customers interaction division	0.0356	(0.0807)	-0.0448	(0.0834)	0.139*	(0.0794)	0.0797	(0.0789)	0.220***	(0.0832)	0.133*	(0.0786)
Peers	0.248	(0.387)	0.870**	(0.437)	-0.199	(0.426)	0.101	(0.326)	0.175	(0.408)	0.239	(0.412)
Consumers	0.110*	(0.0641)	0.143**	(0.0657)	-0.0337	(0.0650)	0.0639	(0.0576)	0.152**	(0.0619)	0.0345	(0.0593)
Scientific organizations	-0.110	(0.0840)	-0.135	(0.0862)	-0.387***	(0.103)	-0.159**	(0.0636)	0.0125	(0.0890)	0.277***	(0.104)
Government authorities	-0.0635	(0.112)	0.0889	(0.122)	0.0610	(0.115)	0.0571	(0.118)	0.0911	(0.114)	-0.0392	(0.110)
Industry associations	-0.00597	(0.0731)	0.0614	(0.0797)	-0.00715	(0.0750)	0.0238	(0.0702)	0.0309	(0.0735)	0.0827	(0.0725)
<i>Workforce structure</i>												
Share of leaders	0.00113	(0.00458)	0.00959*	(0.00564)	0.0103*	(0.00535)	0.00492	(0.00455)	0.0103*	(0.00554)	0.00191	(0.00426)
Share of top-level specialists	0.00359	(0.00229)	0.00492*	(0.00294)	-0.00185	(0.00258)	-0.00128	(0.00201)	-0.00449*	(0.00244)	-0.000403	(0.00223)
Share of mid-level specialists	0.00198	(0.00261)	0.00465	(0.00335)	0.00261	(0.00297)	0.00181	(0.00241)	0.000560	(0.00293)	0.00129	(0.00252)
<i>Human capital measures</i>												
No. of HR management practices	-0.0184	(0.0188)	0.0148	(0.0209)	0.0320	(0.0197)	-0.0107	(0.0175)	-0.0430**	(0.0190)	0.00113	(0.0171)
No. of organizational management practices	0.0351*	(0.0210)	0.0332	(0.0225)	0.00898	(0.0216)	0.0688***	(0.0215)	0.00214	(0.0212)	0.0202	(0.0188)
Contribution index of activities in innovation	0.0162	(0.0228)	0.0144	(0.0248)	0.0200	(0.0239)	0.00870	(0.0196)	0.0545**	(0.0216)	0.0465**	(0.0218)
<i>Interactions</i>												
Peer effect x share of leaders	-0.000985	(0.00633)	-0.0187*	(0.00960)	0.000774	(0.00807)	-0.00325	(0.00576)	-0.0251**	(0.0104)	-0.00910	(0.00832)
Peer effect x share of top-level specialists	-0.00580	(0.00435)	-0.00882*	(0.00492)	0.00455	(0.00473)	0.000762	(0.00361)	0.000532	(0.00445)	0.00336	(0.00473)
Peer effect x share of mid-level specialists	0.00119	(0.00494)	-0.00426	(0.00542)	0.00133	(0.00521)	0.000225	(0.00409)	-0.00470	(0.00480)	-0.000202	(0.00491)
Peers x No. of HR management practices	0.000616	(0.0393)	-0.0607	(0.0401)	-0.0410	(0.0393)	-0.0105	(0.0330)	0.0123	(0.0357)	-0.00535	(0.0518)
Peers x No. of organizational management practices	0.00739	(0.0474)	0.0332	(0.0486)	0.0535	(0.0466)	-0.0100	(0.0454)	0.0674	(0.0437)	0.0137	(0.0583)
<i>Controls</i>												
Age	0.00836*	(0.00483)	-0.00185	(0.00528)	0.0101**	(0.00491)	0.00445	(0.00414)	-0.00507	(0.00463)	0.0115**	(0.00462)
Size (natural log)	0.00696	(0.0251)	0.00746	(0.0275)	-0.0437*	(0.0266)	-0.00403	(0.0233)	0.0492*	(0.0257)	0.0163	(0.0245)
Moscow	0.0386	(0.0614)	0.0299	(0.0684)	-0.0760	(0.0643)	0.0589	(0.0541)	-0.00365	(0.0618)	0.0756	(0.0592)
International	0.0156	(0.0685)	-0.0585	(0.0731)	0.115*	(0.0680)	0.00691	(0.0607)	0.0899	(0.0680)	0.0710	(0.0648)
Observations	216		219		219		219		219		219	

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own work

Table A11 Estimation of the basic model for professional KIBS (marginal effects)

Independent variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Service innovation	Standard error	Innovation in developing services	Standard error	Innovation customer interaction service delivery	Standard error	Organizational innovation	Standard error	Marketing innovation	Standard error	External cooperation innovation	Standard error
<i>Information source for innovation</i>												
R&D	0.319	(0.282)	0.168	(0.211)	-0.293	(0.213)	-0.224	(0)	0.656*	(0.370)	-	-
Marketing and customers interaction division	0.133	(0.144)	-0.102	(0.149)	0.251*	(0.141)	0.162	(0)	-0.0609	(0.123)	0.449***	(0.107)
Peers	0.320*	(0.183)	-0.134	(0.159)	-0.133	(0.152)	-0.165	(0)	0.234*	(0.138)	-0.00835	(0.161)
Consumers	0.104	(0.160)	-0.0435	(0.138)	0.198	(0.141)	0.111	(0)	-0.171	(0.130)	0.0577	(0.156)
Scientific organizations	-0.233	(0.212)	0.0368	(0.199)	-0.105	(0.199)			-0.0433	(0.179)	-0.0618	(0.217)
Government authorities	0.00576	(0.205)	-0.226	(0.242)	-0.287	(0.200)	0.0221	(0)	-0.286	(0.243)	0.151	(0.228)
Industry associations	-0.297**	(0.147)	0.0646	(0.155)	-0.0466	(0.134)	0.183	(0)	-0.178	(0.143)	-0.134	(0.144)
<i>Workforce structure</i>												
Share of leaders	0.00136	(0.00728)	-0.00990	(0.00864)	-0.0113*	(0.00646)	-0.0106	(0)	0.00279	(0.00695)	-0.00144	(0.00625)
Share of top-level specialists	-0.00578	(0.00428)	-0.00181	(0.00392)	-0.00917***	(0.00353)	0.00297	(0)	0.00842**	(0.00415)	-0.00297	(0.00388)
Share of mid-level specialists	0.000132	(0.00418)	-0.00688	(0.00521)	-0.000810	(0.00400)	0.00277	(0)	-0.00104	(0.00556)	-0.0144***	(0.00436)
<i>Human capital measures</i>												
No. of HR management practices	-0.0381	(0.0371)	-0.0225	(0.0325)	0.0186	(0.0313)	-0.0152	(0)	0.0314	(0.0283)	0.0616**	(0.0301)
No. of organizational management practices	0.0689	(0.0496)	0.0726*	(0.0407)	-0.0179	(0.0469)	0.0519	(0)	0.0318	(0.0486)	-0.0223	(0.0494)
Contribution index of activities in innovation	-0.00941	(0.0450)	0.0491	(0.0399)	0.0264	(0.0516)	0.0189	(0)	0.0103	(0.0584)	-0.0225	(0.0633)
<i>Controls</i>												
Age	0.00334	(0.00832)	0.00475	(0.00847)	-0.00522	(0.00874)	0.0137	(0)	-0.0206**	(0.00859)	-0.0126	(0.00966)
Size (natural log)	0.0460	(0.0533)	0.0204	(0.0603)	-0.0986*	(0.0543)	-0.0951	(0)	0.131***	(0.0512)	0.0727	(0.0597)
Moscow	-0.142	(0.173)	-0.00870	(0.171)	-0.108	(0.151)	-0.0321	(0)	-0.324*	(0.170)	-0.0327	(0.154)
International	0.322**	(0.158)	-0.181	(0.155)	-0.116	(0.149)	-0.0217	(0)	0.227*	(0.136)	0.514***	(0.162)
Observations	62		62		62		56		62		56	

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own work