sustainability

MDPI

Article

What Skills for Multi-Partner Open Innovation Projects? Open Innovation Competence Profile in a Cluster Ecosystem Context

Marita McPhillips [1,*], Tatjana Nikitina [2], Silke Tegtmeier [3] and Michał Wójcik [4]

[1] Faculty of Management and Economics, Gdansk University of Technology, 80-233 Gdańsk, Poland
[2] Business School, Riga Technical University, LV-1048 Riga, Latvia
[3] Department of Technology and Innovation, University of Southern Denmark, 5230 Odense, Denmark
[4] Faculty of Electronics, Telecommunications and Informatics, Gdansk University of Technology, 80-233 Gdańsk, Poland
* Correspondence: marita.mcphillips@pg.edu.pl

Abstract: Industry 4.0 and the turbulent environment have rendered increasing interest in open innovation that extends from the bilateral transmission of expertise to multilateral platform collaborations. Open innovation ventures are seen as intricate collaborations that require the commitment of numerous partners during the lifetime of the project. In order to examine the specific competence of open innovation teams, we set the research question as follows: What individual competencies facilitate the exchange of knowledge in open innovation projects? We explored the theoretical framework of open innovation and collected information from a nation-wide, cross-industrial set of OI projects from three high-performing clusters, facilitating a total of 102 OI projects to identify open innovation competence dimensions, thus creating a novel profile. The outcomes showed that competencies facilitate the exchange of knowledge in open innovation ventures in distinct ways. Our findings showed that open innovation competence can be captured using a profile with the dimensions of creativity, entrepreneurship, communication and networking, open-minded thinking, risk-taking, and self-efficacy in digital skills. These dimensions of the open innovation competence profile are necessary for cluster project set-up. This analysis demonstrated that components of the open innovation competence profile could be paramount in understanding the underlying factors in the success of collaborative innovation projects.

Keywords: open innovation; competencies; industry clusters

Citation: McPhillips, M.; Nikitina, T.; Tegtmeier, S.; Wójcik, M. What Skills for Multi-Partner Open Innovation Projects? Open Innovation Competence Profile in a Cluster Ecosystem Context. *Sustainability* **2022**, *14*, 13330. https://doi.org/10.3390/su142013330

Academic Editors: Rosa M. Batista-Canino and Adriana F. Chim-Miki

Received: 12 August 2022
Accepted: 11 October 2022
Published: 17 October 2022

1. Introduction

The Industry 4.0 paradigm is changing organizations' long-term goals, management attitudes, organizational culture, and work relations [1]. The way organizations manage innovation projects is formed by new trends [2], and ecosystem capabilities are gaining recognition in reaction to the dynamic and unstable environment [3]. Connectivity aligned with the ecosystem concept has increased interest in open innovation (OI) projects.

The literature argues that embracing OI can bring about a number of advantages, including better connections to external knowledge, possibilities of sharing risk with project partners, and greater awareness of consumer requirements. Many studies have determined that open innovation strengthens innovation performance [4]. Other studies, however, have found that it does not have any effect on innovation performance, even an adverse one [5]. The confusing research results create a gap in understanding the conditions in which organizations could improve their innovation capacity through OI activity. One reason given for why studies have produced mixed results is attributed to distinctions in companies' practices for managing innovation processes. This implies that networked and intermediatory practices, which occur in industrial clusters, may affect the relation between OI and innovation capability. In the OI approach, organizations search for knowledge, which needs to be forged, adjusted, and disseminated in particular circumstances. The

natural form of knowledge is tacit, restricted to a specific location. Tacit knowledge brings out the importance of spatial proximity and direct contact and hence, the relevance of clusters and place-based ecosystems.

Many studies of open innovation focused on partner-level competence [6], but very few on individual-level competence that arises from promoting the transfer of expertise between organizations [7]. Therefore, from a perspective of OI collaborations, this paper took an exploratory approach to the context of competence in relation to open innovation processes in an ecosystem context. Although earlier studies have discovered that open innovation brings benefits to engaged external actors [8], it is not enough just to bring together different specialists in one inter-organizational project to repeatedly succeed in open innovation projects. Monteiro et al. [9] point to the lack of qualified human resources which negatively influences the effect of OI on reaching innovation goals.

This paper introduced, therefore, the open innovation competence profile to capture key individual-level competences that underlie continuous innovation in the framework of open innovation. Adopting a knowledge-based view [10], we proposed that open innovation competence is manifested in an individual's skills that reconfigure the process of multi-actor collaboration. Open innovation competence enables individuals, and consequently organizations, to implement diverse practices of navigating intrinsic and extrinsic competencies. Thus, we assumed that open innovation competence could ultimately allow companies to reduce organizational ambiguity as well as exposure to failure in open innovation projects. Through this inquiry, we intended to conceptually and empirically define dimensions of OI competence as a basis for OI collaboration.

The following question was defined for the purpose of this study: What competencies facilitate the exchange of knowledge in open innovation projects? In order to answer this question, we conducted a qualitative study to examine the framework of open innovation competence through narratives from open innovation projects. We collected information from a nation-wide, cross-industrial set of OI projects from three high-performing clusters, facilitating a total of 102 OI projects. Findings from this research allowed us to clarify the dimensions of an open innovation profile. Our theoretical and qualitative findings support an open innovation competence profile as a construct that is based on six key individual dimensions: creativity, entrepreneurship, communication and networking, open mindedness, risk taking, and self-efficacy in digital skills.

Thus, the implications of our study are manifold. Firstly, we propose a new framework for OI collaboration. We demonstrate open innovation competence as an individual set of transversal skills at the employee level in organizations. Secondly, we explain why OI skills should be perceived as a critical factor for successful exchange between organizations. Lastly, this study adds to both Industry 4.0 and OI research fields, notably the personal-level perspective of knowledge exchange in OI teams.

In this study, we explored OI competencies in multi-partner projects in Poland—a CEE transition economy. The innovation system in such economies is shaped not only by the technology and economical composition, but by the organizations and ecosystem environments of companies' operations. The Global Innovation Index 2020 places Poland in 25th place among the 39 countries in Europe. Poland, which only acquired its high-income country rating in 2018, and being a middle-income country for the preceding 15 years, underachieves in innovation performance for its potential development level. Theories used to explain OI have been investigated in the context of advanced economies, where the competencies and technological advancement acquired over regional cooperation in knowledge-intensive ecosystems make companies suited to gain insight from different sources; this facilitates the incorporation of gains from external knowledge. Locations of lower innovativeness are often organizationally and institutionally deficient, missing organizations that strategically target innovations, and depend heavily on SMEs to display scattered links within the innovation ecosystem [11]. Our empirical findings offer one of the first comprehensive opportunities to examine whether their propositions are also relevant in the context of a CEE transition economy.

This article is structured as follows. After the introduction, we critically analyze the literature, define the concept of OI competence, and propose a framework for analysis. Then, we employ qualitative study techniques and use the inductive approach to discuss the conceptual dimensions of an open innovation competence profile. We end the paper with conclusions, contributions to theory and practice, limitations, and lines of possible future research.

1.1. Theoretical Framework

1.1.1. Open Innovation and Inter-Organizational Cooperation

Open innovation is defined as the adoption of purposeful intra-organizational flows of knowledge to advance internal innovation and extend the external use of innovation [12]. It entails several entities cooperatively operating in a combined endeavor to create innovations by coupling diverse categories of solutions and competences [13]. Open innovation incorporates an extensive set of innovation practices [4]. Organizations are engaged in outbound innovation (by transferring knowledge from the inside of the organization) or inbound innovation (by transferring knowledge from the outside) [14], or in both (by blending extrinsic innovation resources and intrinsic research practices) [15]. A principal conceptual construct for examining the capabilities aspect of OI practices is exploration/exploitation dualism, which signifies that the personal capabilities connected to two mechanisms are pivotal for attaining successful outcomes in OI [16].

In our study, we used the framework of the knowledge-based view (KBV), which could help reveal how individual-based competence functions in the OI approach, as called upon by Chesbrough [8]. The knowledge-based approach is strongly connected to the resource-based view (RBV), and addresses the issue of knowledge development and protection in a professional relationship structure, when collaborators are engaged in innovation cooperation and competition at the same time [17]. Bacon et al. [18] linked the knowledge-based view and OI in the context of collaborative ecosystems, pointing to knowledge-transfer configurations and emphasizing the need for companies to adjust knowledge-transfer activity to the specific competition-related circumstances of each partner agreement.

Recent synthesis of the OI literature by Ogink [19] points to an array of factors that facilitate OI practices, including boundary-spanning mechanisms. The three mechanisms identified by Ogink [19] as boundary spanning are the following: absorptive capacity, substantial knowledge structure, and cooperative trust, which are interconnected to OI practices and effects. Absorptive capacity alongside cooperative trust facilitate the management of OI practices, which on the other hand, strengthen both absorptive capacity and cooperative trust in OI multi-partner projects.

Researchers have investigated OI as inside-out and outside-in knowledge that flow from many perspectives and levels (organization, platform, ecosystem) [20,21]. An open innovation research community, across various research approaches, underlines its significance by relying on the capacity to contend collaborative multi-actor innovation projects [22]. The fundamental concern in the OI research area connects to an organization's ability to perform knowledge exchange in project teams that are composed of members from different organizations, with different backgrounds, expert fields, and experiences. Inter-organizational perspective does not imply industrial relations only. OI interplays with intra-organizational collaboration and digital transformation, which influence how employees share expertise with external partners in innovation ecosystems and platforms [23,24]. Costa and Matias [25] point to the significant actors in the performance of a sustainable innovation ecosystem as the fundamental base for digital transformation. Special importance is given to academia and the user community. Universities are the middle points of innovation systems through their education of future employees, supporting and encouraging their entrepreneurial attitude, advancing competences, and aiding with necessary tools for successful integration in firms. The user community is gaining importance in creating environment-supporting knowledge transfers, which retro-feed innovation processes [25].

Although the stream of OI research concentrates around the organizational level of analysis, Bogers et al. [20] points to the need of exploring OI with a micro lens, in order to gain more comprehension of fundamental ascendants of OI processes in organizations. Therefore, the individual employee level is distinctly intriguing, for it considers micro-dynamics, and could provide some insight into how knowledge is governed in multi-actor OI projects [26].

The openness of innovation projects has been difficult to define. Dahlander and Gann [14] explain it as a spectrum that oscillates from closed innovation, when all the processes are kept in-house, to maximally open innovation, when a large number of diverse actors cooperate together in the direction of a new superior product. Research shows that managing open innovation projects is a complex process [27]. Obstacles to successful cooperation in OI projects put additional pressure on project members and their competencies. Open innovation involves voluntary cooperation and, thus, it is often wrongly perceived as self-organizing [26]. Intra-organizational projects include the cooperation of various actors: companies, municipalities, research institutions, and consumers. Partners have distinct aims, and sometimes specific interdependencies, which hinder communication [28]. Many problems come to light when a team's members are assembled, without regard to the diversity of its individuals [26].

Dahlander and Gann [14] describe that openness might be as well perceived through differences in competences, multitude in partners, and their adaptability. Bogers, Foss, and Lyngsie [7] indicate that the greater the extent of competences between partners, the more preeminent the openness of the project. Furthermore, the authors suggest that there is a lack of research pertaining to competence in facilitating OI. In order to address this literature gap, we aimed at conceptualizing the open innovation competence profile, which could provide a basis for further research.

1.1.2. Competence and Competence Framework

The European Council defines competence as a blend of knowledge, skills, and attitudes, setting out eight key competences in their recommendations for lifelong learning [29]. All eight indicated competences are considered equally important, and may be adjusted to different contexts and combinations. Some skills are perceived as transversal, e.g., critical thinking, teamwork, analytical competences, problem solving, creativity, communication and negotiation competences, and intercultural competences. These can be enclosed in key competences. For the purpose of this study, we defined competency based on Bartram et al. [30], "the repertoire of capabilities, activities, processes and responses that enable a range of work demands to be met more effectively by some people than by others." A competency (singular to the competencies) is a component of competence, which is the individuals' collection of specific proficiencies, acumen, skills, and behaviors that employees use to tackle the challenges and commitments of their responsibilities [31].

The fundamental unit of analysis in this study were competencies, being examined as the elements of competences. We did not differentiate between skills and abilities in the research review, nor in following conceptualization of the profile. We aimed to concentrate on the employees as a cornerstone in a successful open innovation model, by considering a wide array of competencies in both capacity and behavior.

Competence models consist of desired competencies for a particular job, and sometimes also contain a specific measure of results. Such models present various levels of specification, and sometimes show correlations among skills and behaviors. There are many competency models in usage in research and practice, e.g., Erpenbeck and Rosenstiel [16]. Their model allocates competencies into groups: personal, interpersonal, action-related, and domain-related. Carayannis and Campbell [32] present a model where competencies are grouped as follows: meta, domain, method, and social.

In our study, the goal was not to create a model of competencies that are required for a particular job, nor to address specific technological or industry-related knowledge, but to present an outline of the transversal and intersecting competencies that are cru-

cial for individuals to effectively share knowledge and collaborate in an ongoing digital transformation context.

For our profile, we took fundament in the European skills, competencies, qualifications, and occupations (ESCO) classification framework [33]. The ESCO framework is the official classification in the EU, accessible in most European languages. The ESCO hierarchy framework is easily searchable and may be used in electronic systems and platforms through API, facilitating matches between employees and employers. In this study we used the ESCO framework because it offers an up-to-date and comprehensive hierarchy for competency profiling. The ESCO framework is widely used by both researchers and managers in creating competency profiles; therefore, it presents the opportunity to confront the profile with the research literature and management contributions.

1.1.3. Competencies in Support of OI

Companies organize OI processes beyond the limits of the ecosystem, encompassing different origins of inbound and outbound knowledge [32]. Firms are dependent on a spectrum of competencies to organize different projects and manage the individual-centered drawbacks in OI teams [20]. Thus, the aim of this study was to explicate the most prevailing competencies that were discovered in empirical research that facilitate OI collaboration on the employee level.

Studies show that there is a compelling effect of the competencies of employees on the connection between OI and the performance of companies [34,35]. Mortara et al. [36] identified a set of needed skills, that were composed of the following: openness, entrepreneurial mindset, versatility, and flexibility. Du Chatenier et al. [37] proposed several dimensions that are desired for successful collaboration in OI teams: organizing inter-organizational innovation, organizing the general innovation process, and co-creating new knowledge. Hafkesbrink and Schroll [16] divided the competencies needed in OI projects into those related to the exploration and exploitation sides of the processes. In terms of exploration, personal competencies are desired to support project members in gaining new knowledge: creativity, commitment, initiative, curiosity, and flexibility. In terms of exploitation, personal competencies facilitate the use of new information; therefore, creativity levels may be lower, and the desired employees' competencies are perseverance, character strength, reliability, ambition, execution, and diligence. Accordingly, collaboration capabilities are necessary to offset the ascertained constrictions of exploration and exploitation.

Podmetina et al. [38] introduced OI types grounded in different capabilities for their attainment, particularly, technology procurement and transmission, mass innovation, and collaborative innovation. It was recommended that distinct OI competencies include an appropriate set of cultural awareness, the capabilities to work with diverse communities, the capability to create knowledge but also to disseminate and seize knowledge, the ability to work in interdisciplinary environments and multi-functional conditions, combined with communication and networking competencies. Additionally, interpersonal OI skills include collaboration in the innovation process, and innovative project management.

A survey of 473 SMEs [39] identified three competencies that represent a culture of innovation that facilitates OI: creativity and risk-taking, collaboration, and learning capabilities. Research on the OI capabilities of design firms [40] and personal OI capabilities were characterized with three competencies: creativity, organizing competence, and expressive capability. A further survey [41] denoted that the exploration phase requires creativity and cooperation competencies, and being able to listen to and engage with partners to gain insight, in order to find and seize opportunities. The exploitation phase requires entrepreneurship, cooperation, and creativity abilities to extract and implement knowledge; that is, to cooperate to create ideas, examine them, and generate prototypes.

Csath [42] pointed out that comprehension of OI and its benefits are essential for the growth of SMEs, and an educational system is required that encourages creativity, openness, self-regulation, motivation, aspiration for knowledge, and lifelong learning and cooperation. The above research showed that both a stimulating local ecosystem and a

supportive in-house climate of innovation are important for successful innovation by SMEs. Kratzer et al. [43] asserted that focusing individuals' attitudes largely on the inventive aspects of OI can be deceptive: individuals may be keen to create ideas and participate in OI teams, but they may not see the team's goal to utilize OI in various manners. It was suggested that an internal OI climate encompasses the entire innovation process, emphasizing that employees apply good solutions regardless of the source of the idea, and have the ability to support implementation. Matricano [44] argued that effective OI is rooted in competencies such as curiosity, flexibility, creativity, and diversity, as the OI process is built on openness, responsibility, trust, sustainability, and authenticity.

Oberg and Alexander [44] identified a set of significant processes that are dependent on competencies: creation, relationship, negotiation, collaboration, and interaction in product development with their partners. An important feature in the study is the ability to interpret and incorporate expertise by the individual on behalf of the company [44].

It seems that creativity, as a distinctive competence, was indicated most frequently in OI research. In addition, entrepreneurship was represented often as a competence that is required for implementing innovative ideas into practice. Cheng and Huizingh [45] found that the critical dimensions that define entrepreneurial orientation in OI were proactiveness, risk- taking attitude, creativity, and throughout assistance within the organization. The entrepreneurial attitude reinforces the results of interactions with OI partners [20]. Naturally, communication and knowledge sharing are gaining strong recognition as desired competencies in OI projects. Behanm et al. [46] pointed to four facets of communication and knowledge sharing competence: networking, competency mapping, relational, and desorptive capabilities. Social skills, such as communication and cooperation skills, are rooted in practice in various environments.

Furthermore, risk-taking attitude is taking a prominent place in the competency framework of OI, i.e., Aquilani et al. [47] argued that risk-taking attitudes, openness, and trust for multi-partner projects should be perceived as important personal features to combat barriers against OI. Concerning the risk-taking attitude, studies underline the not-invented- here (NIH) syndrome, i.e., the negative attitude towards in-bound sourcing of expertise. When there is a high level of NIH syndrome in an organization, there is a low probability of successful engagement of employees in OI projects; however, research shows that specialized training seems to counterbalance this relationship [48]. The researcher underlined that the competencies of individuals, such as leadership and risk taking, along with their knowledge and collaboration, are crucial to the adoption of OI in small and medium enterprises. A risk-taking attitude is necessary in OI projects, mainly because of the unpredictability they entail. Thus, Hosseini et al. [49] pointed to the risk-taking attitude as a necessary competency to secure successful outcomes linked to OI. Open-minded thinking is a competence that allows OI projects to thrive, despite diverse social backgrounds [43], even though adjusting individual expertise to a specific environment and context is a complicated, lengthy but crucial process; thus, this adjustment must be implemented throughout an OI project. Fostering an open-minded attitude between functional and social diversity of project partners led to better outcomes for innovation projects. Marion and Fixson [50] and Madrid-Guijarro [51] proposed openness and learning orientation as a core competence in OI, further underlining flexibility and the sharing of expertise. Our study referred to the ability to share knowledge in OI projects in dynamic environments. Furthermore, our research question framed OI competencies in the context of Industry 4.0 conditions. The concept of Industry 4.0 has an extensive effect on how individuals and organizations innovate collectively. It is notably visible in the inbound and outbound knowledge sourcing that are characteristic for open innovation processes [52]. In the implementation of the Industry 4.0 concept, the competitive advantages of firms are rooted not only in the capability to continuously adapt to new technologies, but also in the efforts of firms to align strategies with the skill sets of their current employees [53].

Organizations utilize digitalization in OI, both at the firm and at the industry level, to foster networks and ecosystems [52]. Digital technologies support OI through gener-

ating, exchanging, retrieving, and storing knowledge, and these technologies affect how companies build their external partnerships [20].

Digital tools help to introduce novel collaboration modes, such as flash or virtual teams; these make OI projects more geographically dispersed and complex [54]. Digital competencies are used for sensing, integrating, and exploiting new knowledge; however, caution is needed to balance the digital and nondigital practices. Urbinati et al. [54] identified the capabilities that are enabled by digitalization in the OI context, which change depending on the technology and the phase in the OI project.

The European framework of DigiComp 2.0 [55] aggregates primary items of digital competence into five clusters: information and data literacy, digital content creation, communication and collaboration, safety, and problem-solving. These competencies are not connected to particular technical knowledge or programming skills. Therefore, in our study we first concentrated on self-efficacy in digital skills, i.e., being able to use digital tools to communicate, collaborate, and innovate processes and products, then on the technical skills themselves.

To sum up, the OI empirical research results indicate the aggregated competencies of creativity, entrepreneurship, communication and networking, open-minded thinking, risk- taking, and self-efficacy in digital skills are the multifaceted dimensions of individual competence that support OI activity.

2. Materials and Methods

Our study focused on competency dimensions that would be of high applicability in a digitally rich context. In our study, we did not distinguish between specific technological skills, but concentrated on transversal competencies that are utilized across technology related industries. Organizations engaged in ecosystem cooperation are often not heavily concentrated on the particular technology used to develop their market idea; rather, they aim their attention at the service that is a basis for it. Therefore, technology is only a contributing component [56].

As the goal of this study was to examine how individuals in organizations can utilize their competence for open innovation, and to probe practices that can manifest open innovation competence, conceptual sampling of open innovation projects was used to select cases where the principal aspect was visible. We analyzed a nation-wide, cross-industrial set of OI projects from three high-performing clusters, facilitating a total of 102 OI projects. The clusters were identified on the basis of the experience of the clusters in multi-partner open innovation projects. Data came from three distinct industries, and depicted a different strategic approach to OI practice. All three clusters were accredited with national key cluster titles awarded by the Polish Ministry of Economy for the best performing national networks. Clusters in our study facilitated from 45 to 121 members that operated for 11 to 14 years in ICT, biotechnology, or the maritime industry (see Table 1). Each of the clusters had more than a 3/4 share of SMEs as members, and all three developed with a bottom-up model that was established by firms and other local partners. The clusters came from different regions, and performed a wide range of open innovation activities for their members.

Table 1. Clusters and OI projects analyzed in the study.

Cluster Industry Area	Number of Members	Years of Operating	Number of OI Projects
ICT	121	13	67
Biotechnology	57	11	21
Maritime industry	45	14	14

Source: data from the study.

Industrial clusters facilitated favorable conditions to OI as a result of valuable advancements to open innovation mechanisms that were brought about by geographical proximity.

Simard and West [57] identified industrial clusters to be an excellent infrastructure to investigate open innovation, due to a number of two critical aspects: multi-partner collaboration and the flows of knowledge.

Two streams of qualitative data were used to assure insight and richness: semi-structured personal interviews (CAPI) with experts from clusters and project documentation analysis [58]. For interviews, we chose 12 professionals from 3 clusters on the basis of their extensive OI project experience in inter-organizational projects that represented different groups of OI stakeholders: six project managers, three science institutions representatives, and three SME participants. The interviews were recorded and transcribed. Each interview lasted between 60 and 80 min. A semi-structured approach was used to permit interviewees to freely depict the OI practices used in their clusters. During interviews, experts reflected on competencies and processes that contributed to the success (or failure) of all the projects facilitated by those clusters during their years of operating.

The subsequent analyses of the cases of OI project documentation contributed to the depth of exploration to address the research question. The study was focused on competencies that were identified from the narrative cases. We used the abductive approach in analyzing narratives and cases, in order to connect empirical data with theoretical bases, and to create new characteristics [59]. We looked for mentions of prevailing competencies in the cases, focusing on data that accurately depicted the specifics of competency dimensions in OI projects.

3. Results

The results were based on repeated phases of confronting the cases with conceptual and empirical research. During the empirical phase, experts reflected on competencies and processes that contributed to the performance of a total of 102 OI projects. The competencies were aggregated into six dimensions of the open innovation competence profile (see Table 2).

Table 2. Dimensions of OI competence profile in reference to the ESCO hierarchy framework [33].

Dimensions of OI Competence	ESCO Hierarchy Framework Reference [33]	Empirical Literature Reference
Creativity	generating new ideas or combining existing ones to develop innovative solutions	[16,37–45]
Communication and Networking	communicating, liaising, collaborating, and negotiating with other people, developing solutions to problems	[16,36–42,44,46,47]
Entrepreneurship	developing, organizing and managing a business venture, identifying and pursuing opportunities and mobilizing resources, keeping in mind a profitability perspective; demonstrating a proactive attitude and determination to achieve success in business	[16,36–38,41–43,45]
Open-minded thinking	being interested and open to the problems of others	[16,36–42,44,46,47,50,51]
Risk-taking attitude	accepting responsibilities for managing activities and adopting a forward-looking approach to anticipate problems, but also identifying opportunities	[16,37,39,43,45,47–49]
Self-efficacy in digital skills	using digital tools for collaboration, content creation, and problem-solving	[52–56]

The dimensions of the profile are referred to in the theoretical foundations of the ESCO hierarchy framework [33], but apply to open innovation projects. We used the ESCO framework for the reason that it offers an up-to-date and comprehensive hierarchy for

competency profiling. The framework is aligned with existing EU competency frameworks, such as DigComp, EntreComp, and LifeComp, and is widely used by both researchers and managers for competency modeling; therefore, it presents an opportunity to confront our profile with the research literature and management contributions.

The dominant competency indicated in the study by the respondents was creativity. This competence was viewed by experts to facilitate the identification of divergent solutions. The ability of a team member to delve into such solutions depended, according to the expert's OI experience, on how an individual's tasks correlated to the bigger picture. This included uncovering industry insight, the company's position in the market, user pains, technology trends, and inter-organizational relations. Flexibility in thinking and acting are necessary to work within the tight constraints of OI projects, but also to adapt to fast changing situations, such as epidemic crises or value chain disruptions.

Communicating and networking was the second most frequently mentioned competency in all cases. As an interviewee said: "No matter their other competencies, the employees in the OI project need to communicate and work in teams". It was underlined that to share knowledge successfully, team members had to work jointly in order to achieve results according to the schedule. Therefore, team members exchanged and integrated diverse fields of knowledge when dealing with real business issues. Diverse OI team members encouraged each other to look at cases from different perspectives, but aspired to go in line with the ability to communicate and take those views into account. Team members often worked in parallel and had to be in constant contact, because the outcomes of others affected their work and results. Therefore, some experts mentioned that collaborating with immediate competitors was the most challenging, because of the lack of will to openly contribute to the project knowledge base.

Showing entrepreneurial spirit was a transversal competency that was indicated by respondents. The cases of OI projects showed that OI team members were often very motivated to perform well in the project. A good level of self-management, determination, and long-term effectiveness often returned high-level results. Conjointly, proper planning was perceived to be crucial. Interviewees observed that 'some team members followed the plan and performed quite well, but others required a perpetual reminder of their assignments, and some members were quite oblivious to any reminders.' Since cluster members in multi-partner OI projects came from different organizations, different 'jurisdictions' applied, and typical managerial oversight was problematic. The respondents emphasized that the OI project load could not be left to a few active team members, but that all project partners needed a high level of entrepreneurial attitude and self-organization.

Another crucial competency, open-minded thinking, means a demonstrated willingness to learn from others. The diversity of backgrounds, views, contexts, and domains is intrinsically embedded in OI projects. Diversity is stimulating to both creativity and innovation, and can be a fundament of a company's position in the market [60]. The respondents directly pointed to diversity as being an organizational advantage that upgrades the results of OI teams, by broadening the knowledge pool of the projects. Neglecting to consider the diversity of team members resulted in extensive difficulties. Respondents added that in OI settings, diversity additionally needed to be associated with diverse organizational cultures of team members that came from various organizations. Furthermore, open innovation team members often came from distinct functional and educational backgrounds. Personal and organizational circumstances seemed to affect OI teams greatly. Experts pointed to inviting organizations who had previously worked together in an OI team, but not to reject participants who had different types of expertise or experience. According to the respondents, different types of knowledge were needed in the OI team and therefore, having a diverse pool of members was beneficial for their expert contribution. Communication and collaboration were determined also by the social, cultural, and ethnic backgrounds of team members, which affected interactions. Thus, openness was needed to critically analyze partners' experiences, in order to generate new knowledge that pertained to the particular situation.

Risk taking was a transversal skill and self-management competence that was mentioned by respondents, in connection to taking a proactive approach. In an OI project, experts pointed to a risk-taking attitude as being "the extent to which team members are comfortable with making bold decisions—that is, those that might come at a costly loss". However, it was also the extent to which the OI projects partners had a tendency to engage only in projects that guaranteed expected outcomes. As respondents said, "OI projects have risk built in them, and we need not be afraid to step out of the comfort zone".

Another competency that was underlined by respondents was self-efficacy in digital skills, which is an interdisciplinary competency that is playing a new role in OI collaboration: team members have to feel confident in using technological advancements, and easily adapt to the interconnected environment that they face. As one of the managers noted: "Team members do not necessarily have to master the technological end of the process, but definitely have to be able to collaborate and integrate the technological aspects into the projects." Therefore, it is more about self-efficacy, an individual's confidence in their capability to carry out tasks and present behaviors, that is essential in producing appointed performance goals [61]. In this case, it was the ability of individuals to use the digital tools required by their organization and OI team. In addition, ICT safety is becoming a prominent competency in the digitalized environment, including data protection, identity protection, and security measures.

To sum up, through a qualitative process, we were able to distinguish six dimensions representing sets of competencies for individuals to organize and manage OI projects in multi-partner settings. Even though we described the six competencies individually, the empirical data based on experiences from 102 OI projects showed that they are not separate, but should be considered collectively. The results also showed that the OI competency profile could provide insight into knowledge sharing in OI teams, and that the dimensions varied in importance. Even though we did not find significant differences between clusters on the basis of the demographics of the interviewees or the selection of clusters, the prominence of each competency dimension was distinct for the different OI teams within each cluster; this calls for further research. The outcomes also manifested that collaboration in OI teams was often perceived and referred to as demanding. Companies that engage in OI may experience an unwillingness of employees to undertake inter-organizational knowledge projects, which may have negative impacts on the adoption of inbound and outbound OI [48]; thus, a careful choice of OI team members and specific competence-related training may be crucial to a project's success.

4. Discussion and Conclusions

Industry 4.0 and inherent digital transformation are key driving forces of the open innovation collaboration that frames the exchange of knowledge in multi-actor networks [62]. The findings of our study provide empirical evidence that successful multi-partner collaboration is intertwined with individual competencies. In answering the research question, we explicated the most prevailing competencies that were discovered in cluster OI projects as facilitating multi-actor collaboration at the employee level. Creativity, as a distinctive competence, has been indicated most frequently in OI research, e.g., [16,37,38]. In addition, entrepreneurship is represented often as a competency that is required for implementing innovative ideas into practice, e.g., [38,41,42]. The results of our extensive qualitative study among OI project managers reflecting on 102 projects conceded the prominence of those competencies, although communication and networking, were also critical in the proliferation of OI strategies. This competency facilitates the efforts of OI team members in many ways: as a social skill to mediate practices that support personal OI capability [37], and as an approach that enhances OI activities in SMEs [63].

Multi-partner OI projects are challenging and complex ventures [64], but possessing specific OI competencies can ensure that firms have enough capability to absorb the knowledge sourced from their partners, and utilize it in the organization's own processes and structures [65]. Therefore, on the basis of empirical findings, in order to pinpoint the

competencies that facilitate the external exchange of knowledge in OI teams, we developed the OI competence profile. We defined a set of key competencies to organize and advance the exchange of knowledge: creativity, entrepreneurship, communication and networking, open-minded thinking, risk-taking attitude, and self-efficacy in digital skills. The competencies aggregated in the OI competence profile are fundamental for organizations to engage in the boundary-spanning mechanisms identified by Ogink [19]. Boundary-spanning activities enhance trust in multi-partner projects, notably in innovation processes that are carried out across industry lines [66]; these activities also elevate the number of informal connections that facilitate the collaboration effort [67]. The cases that were analyzed in our study provided evidence, along with Ter Wal [68], that employee engagement that integrates external exploration and integration within the organization positively influences knowledge transfer from external sources, and multiplies OI outcomes. Our evidence is also in line with the research of Enkel et al. [69], who linked the collaboration in an OI project with increased absorptive capacity at the employee level in terms of sourcing profitable knowledge from outside, integrating it in the company's practice, and promoting the usage of external knowledge across the company. This is especially important for SMEs, who experience both a reduced ability for absorption and limited resources as being critical obstacles to innovation in general, and not explicitly to OI [70].

Our study provides a unique insight into how individual competencies are embedded in the practices of OI projects, especially from the perspective of place-based ecosystems and industries. Moreover, our results underline that successful multi-actor collaboration calls for organizations and their employees to alter their skills and practices [62]. Our profile allows companies to single out desired OI competencies, and support the development of those that are still not sufficient. Thus, it facilitates the advancement of the digital transformation process, and empowers companies to successfully adjust to the new dynamic environment of Industry 4.0, which is defined by continuous change. Organizations will have a difficult task to ascertain and acquire these competencies in new employees. Therefore, the future of innovation processes depends on the coordination of individuals and organizations across different structures and bounds, inclusive of educational and regulatory institutions [71]. Although these competencies, as such, may not be treated as a full competency description of an OI team member, they assist in the exchange of knowledge in OI projects. Independently, each of the competencies would constitute an advantage for any individual who is engaged in the innovation process. Yet, as an aggregated profile, competencies incorporate essential elements in the encompassing competence that facilitates collaboration in OI teams.

This article contributes to the literature in many ways. The literature on OI has centered around the benefits and challenges to organizations that participate in this mode of cooperation. Open innovation competence has been studied to a lesser extent. In a framework of a knowledge-based view, we conceptualized the open innovation competence profile, by which organizations can manage collective multi-actor teams to carry out inbound and outbound innovation. Therefore, we discussed its six dimensions, and enhanced the OI research field by probing the performance of collaborative OI activities of firms [72]. Therefore, this study supplements the OI literature from the knowledge-based perspective.

Furthermore, other research on OI is predominantly fragmented, and based on a specific industry context. To some degree, this could be connected to a lack of overarching conceptualization regarding OI competence. In this study, we considered open innovation competence in relation to case narratives from different industries in an place-based ecosystem context. Our study, therefore, constitutes a substantial basis for further studies on OI practices.

Many organizations refer to open innovation as an unnecessary complication of a once easy-to-grasp in-house linear innovation model. The open innovation competence profile can help firms to design a hiring, up-skilling, and managerial practice that continuously improves their organizational capability during the multi-actor innovation process, which

could ease managerial constraints, elevate the efficiency of teams, and raise the chances of radical innovation in the volatile, crisis-plagued, and digitalized environment. Our study facilitates organizations in recognizing the intricacy of OI collaboration; thus, it can help in managing future OI teams to achieve additional resilience to deal with the unexpected. By doing so, this article adds to the discussion on micro-foundations of organizational capabilities for OI [73]. Moreover, the results point to the need to incorporate relevant OI competency building elements into the policy programs that are targeted at universities and vocational education and training (VET) institutions. The findings also provide an individual-level view of the problems and related competencies that are inherent in open innovation for policy makers, to formulate interventions to facilitate multi-partner projects, thus stimulating science-industry collaboration.

Our empirical findings offer one of the first comprehensive opportunities to examine whether OI competence framework propositions are also relevant in the context of a CEE transition economy. From the path dependence outlook, transformation is a shift that aggregates constructive and destructive impacts, and it has devised distinct patterns of behavior regarding the implemented institutional structures that are applied in the economy and in social behaviors which should not be neglected. Therefore, future studies might involve the explanation for these disparities between OI practices in transition and advanced economies, in order to design appropriate systems for project members, and stimulate their inclination to OI collaboration.

Our study is not without limitations. The exploratory perspective of our qualitative research does not cover all of the issues that are related to OI competence. It is somewhat an outset study that ascertained the multi-faced phenomenon of OI collaboration and desired competencies. The complex character of OI research calls for a mixed-method approach to OI competencies that include various contexts, in order to augment the validity of the results, which might be also an interesting direction for future studies. Furthermore, our study did not take into consideration advanced technological capabilities that are embedded in the Industry 4.0 context, which could provide better insight into the technological aspects of the profile. Furthermore, future research on the OI competence readiness of the future workforce (i.e., university students) would be welcomed.

Author Contributions: Conceptualization, M.M.; methodology, M.M.; investigation, M.M.; writing—original draft preparation, M.M.; writing—review and editing, M.M., T.N., S.T., and M.W.; project administration, M.M.; funding acquisition, M.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Gdansk University of Technology, grant number DEC-4/2021/IDUB/II.2/Sc under the Excellence Initiative—Research University Programme.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Excellence Initiative Committee of Gdansk University of Technology (Ref. DEC-4/2021/IDUB/II.2/Sc, 03.11.2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Verhoef, P.C.; Broekhuizen, T.; Bart, Y.; Bhattacharya, A.; Qi Dong, J.; Fabian, N.; Haenlein, M. Digital transformation: A multidisciplinary reflection and research agenda. *J. Bus. Res.* **2021**, *122*, 889–901. [CrossRef]
2. Skare, M.; Soriano, D.R. How globalization is changing digital technology adoption: An international perspective. *J. Innov. Knowl.* **2021**, *6*, 22–223. [CrossRef]
3. Zhen, Z.; Yousaf, Z.; Radulescu, M.; Yasir, M. Nexus of digital organizational culture, capabilities, organizational readiness, and innovation: Investigation of SMEs operating in the digital economy. *Sustainability* **2021**, *13*, 720. [CrossRef]
4. Laursen, K.; Salter, A. Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strat. Manag. J.* **2006**, *27*, 131–150. [CrossRef]

5. Caputo, M.; Lambert, E.; Cammarano, A.; Michelino, F. Exploring the impact of open innovation on firm performance. *Manag. Decis.* **2016**, *54*, 1788–1812. [CrossRef]
6. Radziwon, A.; Bogers, M. Open innovation in SMEs: Exploring inter-organizational relationships in an ecosystem. *Technol. Forecast. Soc. Chang.* **2019**, *146*, 573–587. [CrossRef]
7. Bogers, M.; Foss, N.J.; Lyngsie, J. The "human side" of open innovation: The role of employee diversity in firm-level openness. *Res. Policy* **2018**, *47*, 218–231. [CrossRef]
8. Chesbrough, H. The future of open innovation. In *Research Technology Management*; Taylor and Francis Inc.: Abingdon, UK, 2017; Volume 60, pp. 35–38. [CrossRef]
9. Monteiro, F.; Mol, M.; Birkinshaw, J. Ready to be open? Explaining the firm level barriers to benefiting from openness to external knowledge. *Long Range Plan.* **2017**, *50*, 282–295. [CrossRef]
10. Pereira, V.; Bamel, U. Extending the resource and knowledge based view: A critical analysis into its theoretical evolution and future research directions. *J. Bus. Res.* **2021**, *132*, 557–570. [CrossRef]
11. Huggins, R.; Prokop, D.; Thompson, P. Universities and open innovation: The determinants of network centrality. *J. Technol. Transf.* **2020**, *45*, 718–757. [CrossRef]
12. Chesbrough, H.W. *Open Innovation: The New Imperative for Creating and Profiting from Technology*; Harvard Business School Press: Boston, MA, USA, 2003.
13. Fagerberg, J. Innovation: A guide to the literature. In *Innovation: A Guide to the Literature*; Oxford University Press: Oxford, UK, 2009.
14. Dahlander, L.; Gann, D.M. How open is innovation? *Res. Policy* **2010**, *39*, 699–709. [CrossRef]
15. Chesbrough, H.; Bogers, M. Explicating open innovation. In *New Frontiers in Open Innovation*; Oxford University Press: Oxford, UK, 2014; pp. 3–28.
16. Hafkesbrink, J.; Schroll, M. Ambidextrous organizational and individual competencies in open innovation: The dawn of a new research agenda. *J. Innov. Manag.* **2014**, *2*, 9–46. [CrossRef]
17. Grant, R.M. Knowledge-based view. In *Wiley Encyclopedia of Management*; Wiley: Hoboken, NJ, USA, 2015; pp. 1–2. [CrossRef]
18. Bacon, E.; Williams, M.D.; Davies, G. Coopetition in innovation ecosystems: A comparative analysis of knowledge transfer configurations. *J. Bus. Res.* **2020**, *115*, 307–316. [CrossRef]
19. Ogink, R.H.A.J.; Goossen, M.C.; Romme, A.G.L.; Akkermans, H. Mechanisms in open innovation: A review and synthesis of the literature. *Technovation* **2022**, 102621. [CrossRef]
20. Bogers, M.; Zobel, A.-K.; Afuah, A.; Almirall, E.; Brunswicker, S.; Dahlander, L.; Frederiksen, L.; Gawer, A.; Gruber, M.; Haefliger, S.; et al. The open innovation research landscape: Established perspectives and emerging themes across different levels of analysis. *Ind. Innov.* **2017**, *24*, 8–40. [CrossRef]
21. West, J.; Bogers, M. Leveraging external sources of innovation: A review of research on open innovation. *J. Prod. Innov. Manag.* **2014**, *31*, 814–831. [CrossRef]
22. Santos, A.B.; Bogers, M.L.A.M.; Norn, M.T.; Mendonça, S. Public policy for open innovation: Opening up to a new domain for research and practice. *Technol. Forecast. Soc. Chang.* **2021**, *169*, 120821. [CrossRef]
23. Dodgson, M.; Gann, D.; Salter, A. The role of technology in the shift towards open innovation: The case of Procter & Gamble. *R&D Manag.* **2006**, *36*, 333–346. [CrossRef]
24. Dahlander, L.; O'Mahony, S.; Gann, D.M. One foot in, one foot out: How does individuals' external search breadth affect innovation outcomes? *Strat. Manag. J.* **2016**, *37*, 280–302. [CrossRef]
25. Costa, J.; Matias, J.C.O. Open innovation 4.0 as an enhancer of sustainable innovation ecosystems. *Sustainability* **2020**, *12*, 8112. [CrossRef]
26. Markovic, S.; Bagherzadeh, M.; Vanhaverbeke, W.; Bogers, M. Managing business-to-business open innovation: A project-level approach. *Ind. Mark. Manag.* **2021**, *94*, 159–163. [CrossRef]
27. Oguguo, P.C.; Bodas Freitas, I.M.; Genet, C. Multilevel institutional analyses of firm benefits from R&D collaboration. *Technol. Forecast. Soc. Chang.* **2020**, *151*, 119841. [CrossRef]
28. Vos, M. *Communication in Turbulent Times: Exploring Issue Arenas and Crisis Communication to Enhance Organisational Resilience*; Vos & Schoemaker: Jyväskylän, Finland, 2017.
29. European Council Recommendation of 22 May 2018 on Key Competences for Lifelong Learning (2018/C 189/01). Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&rid=7 (accessed on 22 May 2022).
30. Bartram, D.; Robertson, I.T.; Callinan, M. Introduction: A framework for examining organizational effectiveness. In *Organizational Effectiveness: The Role of Psychology*; Wiley: Hoboken, NJ, USA, 2008; pp. 1–10. [CrossRef]
31. Lahti, R.K. Identifying and integrating individual level and organizational level core competencies. *J. Bus. Psychol.* **1999**, *14*, 59–75. Available online: http://www.jstor.org/stable/25092664 (accessed on 22 May 2022). [CrossRef]
32. Carayannis, E.G.; Campbell, D.F.J. Open innovation diplomacy and a 21st century fractal research, education and innovation (FREIE) ecosystem: Building on the quadruple and quintuple helix innovation concepts and the "mode 3" knowledge production system. *J. Knowl. Econ.* **2011**, *2*, 327–372. [CrossRef]
33. European Skills, Competences, Qualifications, and Occupations (ESCO) Classification. Available online: https://ec.europa.eu/social/main.jsp?catId=1326&langId=en (accessed on 22 May 2022).

34. Zhang, S.; Yang, D.; Qiu, S.; Bao, X.; Li, J. Open innovation and firm performance: Evidence from the Chinese mechanical manufacturing industry. *J. Eng. Technol. Manag.—JET-M* **2018**, *48*, 76–86. [CrossRef]
35. Najar, T.; Dhaouadi, K.; Zammel, I.B. Intellectual capital impact on open innovation: The case of technology-based sectors in Tunisia. *J. Innov. Econ.* **2020**, *32*, 75–106. Available online: https://econpapers.repec.org/RePEc:cai:jiedbu:jie_032_0075 (accessed on 22 May 2022). [CrossRef]
36. Mortara, L.; Minshall, T. How do large multinational companies implement open innovation? *Technovation* **2011**, *31*, 586–597. [CrossRef]
37. Du Chatenier, E.; Verstegen, J.A.A.M.; Biemans, H.J.A.; Mulder, M.; Omta, O.S.W.F. Identification of competencies for professionals in open innovation teams. *R&D Manag.* **2010**, *40*, 271–280. [CrossRef]
38. Podmetina, D.; Soderquist, K.E.; Petraite, M.; Teplov, R. Developing a competency model for open innovation. *Manag. Decis.* **2018**, *56*, 1306–1335. [CrossRef]
39. Mazur, J.; Zaborek, P. Organizational culture and open innovation performance in small and medium-sized enterprises (SMEs) in Poland. *Int. J. Manag. Econ.* **2016**, *51*, 104–138. [CrossRef]
40. Hong, K.; Kim, B. Open innovation competency of design enterprises to outsourcing service. *J. Open Innov. Technol. Mark. Complex.* **2020**, *6*, 36. [CrossRef]
41. Sloane, P. *A Guide to Open Innovation and Crowdsourcing: Advice from Leading Experts in the Field*; Kogan Page Publishers: London, UK, 2011.
42. Csath, M. Encouraging innovation in small and medium sized businesses: Learning matters. *Dev. Learn. Organ.* **2012**, *26*, 9–13. [CrossRef]
43. Kratzer, J.; Meissner, D.; Roud, V. Open innovation and company culture: Internal openness makes the difference. *Technol. Forecast. Soc. Chang.* **2017**, *119*, 128–138. [CrossRef]
44. Matricano, D. The state of the art of open innovation culture. In *Exploring the Culture of Open Innovation*; Emerald Publishing Limited: Bingley, UK, 2018; pp. 139–162. [CrossRef]
45. Cheng, C.C.J.; Huizingh, E.K.R.E. When is open innovation beneficial? The role of strategic orientation. *J. Prod. Innov. Manag.* **2014**, *31*, 1235–1253. [CrossRef]
46. Behnam, S.; Cagliano, R.; Grijalvo, M. How should firms reconcile their open innovation capabilities for incorporating external actors in innovations aimed at sustainable development? *J. Clean. Prod.* **2018**, *170*, 950–965. [CrossRef]
47. Aquilani, B.; Abbate, T.; Codini, A. Overcoming cultural barriers in open innovation processes through intermediaries: A theoretical framework. *Knowl. Manag. Res. Pract.* **2017**, *15*, 447–459. [CrossRef]
48. De Araújo Burcharth, A.L.; Fosfuri, A. Not invented here: How institutionalized socialization practices affect the formation of negative attitudes toward external knowledge. *Ind. Corp. Chang.* **2015**, *24*, 281–305. [CrossRef]
49. Hosseini, A.S.; Soltani, S.; Mehdizadeh, M. Competitive advantage and its impact on new product development strategy (case study: Toos Nirro technical firm). *J. Open Innov. Technol. Mark. Complex.* **2018**, *4*, 17. [CrossRef]
50. Marion, T.J.; Fixson, S.K. The transformation of the innovation process: How digital tools are changing work, collaboration, and organizations in new product development*. *J. Prod. Innov. Manag.* **2021**, *38*, 192–215. [CrossRef]
51. Madrid-Guijarro, A.; Martin, D.P.; García-Pérez-De-Lema, D.; Martin, D.P. Capacity of open innovation activities in fostering product and process innovation in manufacturing SMEs. *Rev. Manag. Sci.* **2021**, *15*, 2137–2164. [CrossRef]
52. Enkel, E.; Bogers, M.; Chesbrough, H. Exploring open innovation in the digital age: A maturity model and future research directions. *R&D Manag.* **2020**, *50*, 161–168. [CrossRef]
53. Bresciani, S.; Ferraris, A.; Romano, M.; Santoro, G. Digital ecosystems. In *Digital Transformation Management for Agile Organizations: A Compass to Sail the Digital World*; Emerald Publishing Limited: Bingley, UK, 2021; pp. 153–165. [CrossRef]
54. Urbinati, A.; Manelli, L.; Frattini, F.; Bogers, M.L.A.M. The digital transformation of the innovation process: Orchestration mechanisms and future research directions. *Innov. Organ. Manag.* **2021**, *24*, 65–85. [CrossRef]
55. Carretero, S.; Vuorikari, R.; Punie, Y. DigComp 2.1. In *The Digital Competence Framework for Citizens. With Eight Proficiency Levels and Examples of Use*; Publications Office of the European Union: Luxembourg, Luxembourg, 2017.
56. Giones, F.; Brem, A. Digital technology entrepreneurship: A definition and research agenda. *Technol. Innov. Manag. Rev.* **2017**, *7*, 44–51. Available online: http://timreview.ca/article/1076 (accessed on 24 May 2022). [CrossRef]
57. Simard, C.; West, J. Knowledge networks and the geographic locus of innovation. In *Open Innovation: Researching a New Paradigm*; Oxford University Press: Oxford, UK, 2006; pp. 220–240.
58. Poutanen, P.; Soliman, W.; Ståhle, P. The complexity of innovation: An assessment and review of the complexity perspective. In *European Journal of Innovation Management*; Emerald Group Publishing Ltd: Bingley, UK, 2016; Volume 19, Issue 2, pp. 189–213. [CrossRef]
59. Langley, A.N.N.; Smallman, C.; Tsoukas, H.; Van De Ven, A.H. Process studies of change in organization and management: Unveiling temporality, activity, and flow. *Acad. Manag. J.* **2013**, *56*, 1–13. Available online: http://www.jstor.org/stable/23414342 (accessed on 24 May 2022). [CrossRef]
60. Bassett-Jones, N. The paradox of diversity management, creativity and innovation. *Creat. Innov. Manag.* **2005**, *14*, 169–175. [CrossRef]
61. Bandura, A. *Self-Efficacy: The Exercise of Control*; W.H. Freeman and Company: New York, NY, USA, 1997.

62. Saarikko, T.; Westergren, U.H.; Blomquist, T. Digital transformation: Five recommendations for the digitally conscious firm. *Bus. Horizons* **2020**, *63*, 825–839. [CrossRef]
63. Ahn, J.M.; Minshall, T.; Mortara, L. Understanding the human side of openness: The fit between open innovation modes and CEO characteristics. *R&D Manag.* **2017**, *47*, 727–740. [CrossRef]
64. Livieratos, A.D.; Tsekouras, G.; Vanhaverbeke, W.; Angelakis, A. Open Innovation moves in SMEs: How European SMEs place their bets? *Technovation* **2022**, *117*, 102591. [CrossRef]
65. Grama-Vigouroux, S.; Saidi, S.; Berthinier-Poncet, A.; Vanhaverbeke, W.; Madanamoothoo, A. From closed to open: A comparative stakeholder approach for developing open innovation activities in SMEs. *J. Bus. Res.* **2020**, *119*, 230–244. [CrossRef]
66. Fleming, L.; Waguespack, D.M. Brokerage, boundary spanning, and leadership in open innovation communities. *Organ. Sci.* **2007**, *18*, 165–180. [CrossRef]
67. Holmes, S.; Smart, P. Exploring open innovation practice in firm-nonprofit engagements: A corporate social responsibility perspective. *R&D Manag.* **2009**, *39*, 394–409. [CrossRef]
68. Ter Wal, A.L.J.; Criscuolo, P.; Salter, A. Making a marriage of materials: The role of gatekeepers and shepherds in the absorption of external knowledge and innovation performance. *Res. Policy* **2017**, *46*, 1039–1054. [CrossRef]
69. Enkel, E.; Heil, S.; Hengstler, M.; Wirth, H. Exploratory and exploitative innovation: To what extent do the dimensions of individual level absorptive capacity contribute? *Technovation* **2017**, *60–61*, 29–38. [CrossRef]
70. Carayannis, E.G.; Meissner, D. Glocal targeted open innovation: Challenges, opportunities and implications for theory, policy and practice. *J. Technol. Transf.* **2017**, *42*, 236–252. [CrossRef]
71. Bednar, P.M.; Welch, C. Socio-technical perspectives on smart working: Creating meaningful and sustainable systems. *Inf. Syst. Front.* **2020**, *22*, 281–298. [CrossRef]
72. Corbo, L.; Kraus, S.; Vlačić, B.; Dabić, M.; Caputo, A.; Pellegrini, M.M. Coopetition and innovation: A review and research agenda. *Technovation* **2022**, 102624. [CrossRef]
73. Bertello, A.; De Bernardi, P.; Forliano, C.; Ricciardi, F. *How Do Individuals Engage in Open Innovation? Unveiling the Microfoundations of Relational Capabilities*; Springer: Cham, Switzerland, 2022; pp. 19–28. [CrossRef]