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Dialogic and Dialectic Cooperation for Knowledge Creation in IS-Mediated Open Innovation

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Abstract: Cooperation is an important aspect of open innovation (OI) facilitated by information and communication technology (ICT). Cooperation may have two distinct forms, namely dialectic or dialogic, and it has already been argued that dialogic cooperation is more appropriate for knowledge creation and innovation. In this paper, we test the hypothesis that the choice of the form of cooperation by an organisation, and its implementation in an OI-enabling Information System, are contingent to the organisation's strategic orientation and competitive and innovation strategies, and it is mediated by the past experience of its OI initiative managers. We also examined, for the first time, which are the antecedents of the adoption of dialogic (and indirectly, dialectic) cooperation in OI initiatives. The empirical research carried out in a sample of senior managers of different sectors in Greece suggests that companies that have extrospective strategic orientations and that adopt differentiation/innovation strategies are more likely to implement dialogic cooperation in their OI endeavors, thus increasing their knowledge creation potential. This choice is further supported by managers who have participated in other organisations' OI initiatives in the past.

Keywords: open innovation; dialogic cooperation; dialectic cooperation; competitive strategy; strategic orientation; initiative leadership

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1. Introduction

In the current business environment of network economies, the increasing complexity of the innovation process is responsible for maintaining the momentum of Open Innovation (OI) towards being established as a prevailing model of innovation [1]. Rather than just acquiring knowledge, OI adopters distribute the effort and responsibility of the development and processing of novel ideas and knowledge creation along a wide range of partners in the value chain, including end customers [2]. In this line, a number of different OI strategies [3] and implementation models/tools, with corresponding typologies [4], have been presented in the literature of OI. OI strategies comprise market-based strategies, network-based strategies, crowd-based strategies and cooperative strategies [3] while implementation models include innovation markets, innovation communities, innovation contests, and OI toolkits [4].

From an organizational perspective, each of the above models specifies the content, structure and governance of transactions within the innovating company, as well as with the external parties involved in the creation, delivery and capture of value through knowledge co-creation and/or integration [2,5–7]. Moreover, in the vast majority of cases, OI is implemented through ICT platforms, or hybrid forms, which in effect mediate the interaction of the different partners involved [8]. In this way, they inscribe and indirectly impose the implementation of the form of cooperation that the organisation's OI strategy dictates (although there is a difference between "cooperation" and "collaboration"; in specific parts of the paper, the word "collaboration" and its derivatives are used in the place

of cooperation because the latter has been established de facto as the most appropriate term), that is, the choice between synchronous or asynchronous transactions and between dialectic and dialogic cooperation [9]. Given that the OI strategy is linked to the competitive strategy and strategic orientation of organisations, the principal research question that this paper deals with can be stated as: *RQ: How does the competitive strategy and strategic orientation of an organization influence the choice of the form of cooperation in OI initiatives and their implementation through ICT?*

To the best of our knowledge, this is an unexploited area of research despite its importance for the alignment of competitive strategy with the chosen OI strategy and its implementation through ICT platforms. Although there has been interest in the front-end of the innovation process and the interfacing with external partners [10–12], little attention has been paid to the alignment of interfacing/cooperation strategy (and its ICT implementation) with the competitive strategy and strategic orientation of the firm for facilitating effective knowledge creation and integration [6,13]. In addition, given the importance of top managers in the introduction and support of knowledge creation processes [14] as well as on deciding the strategic orientation and the innovation strategy of an organization [14,15], in this paper, we investigate how the past involvement of top managers in OI initiatives of other organisations is linked to the choice of OI cooperation forms.

To answer the above research question, we first explore the relationship of competitive strategy and strategic orientation to OI strategy and OI-centred business models as well as the relationship of the latter to the forms of cooperation. The importance of the forms of cooperation to knowledge creation and integration is then reviewed for developing specific research hypotheses, which are then tested empirically through a questionnaire addressed to executive level managers of SMEs in Greece.

The rest of the paper is structured as follows. Sections 2–5 provide the theoretical background on the concepts related to the main research question: competitive and open innovation strategies, open innovation business models, dialectic and dialogic cooperation in OI models, mediating ICT in OI implementations, and the role of managers past experience in leading or participating in open innovation initiatives. Based on this background, three research hypotheses are built and concretised into six more specific ones in Section 6. Section 7 presents the research design and the method of analysis of the results, whereas Section 8 presents the testing of the hypotheses. Section 9 comments on the results of the empirical research and draws the conclusions.

2. Open Innovation Strategies and Implementation Models

As it was already indicated, so far, a number of different OI strategies [3] and implementation models/tools [4], with corresponding typologies (e.g., Piller and Ill [16]) have been presented in the literature of OI. Saebi and Foss [3] developed a framework linking these strategies to business models used by organisations for deploying them. In this, OI strategies are positioned along the dimensions of depth and breadth as far as knowledge search and relations with external parties, respectively, are concerned.

Market-based OI strategies are associated with low depth and low breadth relationships (arms-length relationships with a few partners) and *crowd-based* strategies with high breadth and low depth (circumstantial relationships with many partners). In the former case, knowledge is acquired through the market. Knowledge has low diversity and is integrated very loosely. In the latter, diverse knowledge sources from a large number of ad hoc external partners are linked to the innovation process. *Collaborative/cooperative* strategies involve small numbers of external partners in relatively tight relationships, whereas in network-based innovation strategies, by participating in a network deeply, the company integrates external partners in knowledge creation [3]. Collaborative innovation strategies are associated with high depth and low breadth relationships, whereas *network-based* strategies are associated with high depth and high breadth [3]. Market-based strategies seek efficiency and low costs through efficiency-centric open business models, crowd-based strategies aim at building communities that provide innovative ideas in user-centric open business

models, cooperative innovation strategies involve users/suppliers/customers/competitors in the innovation process (collaborative open business model) and open platform business models implement network-based innovation strategies.

Regarding implementation models, in general, there are four operations models associated with inbound OI [4]. In *innovation markets*, organizations and individuals act as seekers of innovative solutions and innovation problem solvers coordinated by intermediaries. In the model of firm-sponsored *innovation communities*, agents of different size and complexity develop ideas, discuss concepts and promote explorative innovation. In *innovation contests*, a firm gets ideas for products, services, solution or even business models from different sources (customers, suppliers, etc.), which are also involved, in association with panels of experts, in their evaluation and selection.

Crowdsourcing is a particular application form under the umbrella of the last two models. When *innovation toolkits* are used, users develop solutions in prescribed steps using company-supplied tools, sometimes using standard components and modules in a predefined solution space and interacting with the company to get feedback. The latter two approaches are based on a dyadic (1:1), whereas the former two in a network collaboration model (1:*n*/*n*:*n*) [16]. Innovation markets and the related social product development forums as well as the ideas contests and the innovation and co-design toolkits provide processes and solution spaces with a restricted number of degrees of freedom, whereas innovation communities, through multidirectional relationships and constancy, provide an explorative and creative environment.

3. Open Innovation and Forms of Cooperation

The adoption of OI implies that an organisation's innovation management process becomes porous, and problems, solutions, ideas, concepts, designs, artefacts, products, services, etc. supplied by a variety of human and non-human actors flow in and out of its boundaries [13]. Informational and knowledge items of different forms are being transformed in many different ways so that they become of value for the parties involved. In complex organizations, this transformation is accomplished through a complex web of social processes of cooperation [17], in which agents with different views, interests, cultures and power status [18], usually situated geographically and contextually at a distance, are engaged. This means that, in both *inbound* and *outbound* open innovation, the interface of the innovation process becomes a milieu of cooperation and synergetic knowledge creation in both directions [13].

Managers and employees can engage in cooperation with internal and external stakeholders/partners in two different forms: *dialectic* and *dialogic* [9]. As it was indicated above, in our technological globalized world, these encounters are supported or mediated by information systems that influence and are influenced by the inscribed mode of cooperation. Consequently, the volume and type of knowledge being created through deliberation and cooperation depends on the form of cooperation (dialectic or dialogic) chosen to be coded in the system. The dialectic and/or dialogic characteristic of conversations and deliberations in a cooperation context have been employed in OI-related areas, such as the analysis of corporate strategic communications [19], communication with customers [20], co-creation and co-design [21,22], project communications and entrepreneurship [23], and conversations on social media [20,24]. Attempts to combine dialectic with dialogic conversations in learning were also reported [25].

There is controversy over the distinction of these two forms [26], but in general, unlike a dialectic process, which usually involves two parties, a dialogic one involves more than two parties and often "does not lead to closure and the issue remain unresolved" [23]. Thus, the dialogic process is more suitable when cooperation and real synthesis of ideas, perspectives, etc. is sought to (co)create knowledge (a winner or a winning argument is not sought through a competitive logic) [27] under empowering leadership [28]. Dialogic complex systems (of participants' logics and perspectives) are at once complementary, competitive and antagonistic with respect to one another [19,29]. In dialogic systems,

different logics co-exist, and no logic can gain supremacy and suppress or delete competing views and logics. On the other hand, dialectic cooperations are more esoteric, involve a smaller number of (known) participants and are more competitive, aiming at reaching a conclusion as fast as possible [9,21]. Participants engaged in dialectic cooperation are more interested in affirming their views and knowledge rather than commenting and elaborating on other participants' proposals [24].

In summarizing, dialogic engagement in deliberations and/or cooperation and related activities implies two-way relationships of give-and-take, competition, cooperation among many participants and inclusive conflict resolution. When ICT is used to mediate dialogic conversations/cooperation, terms of engagement similar to those found in social media seem more appropriate [24,30].

4. Computer-Supported Cooperation/Collaboration in Open Innovation

Open innovation is enabled and constrained by the technological infrastructure that mediates communication and/or cooperation. The use of ICT in OI implementations has been studied from different perspectives (e.g., [24,31–36], and a number of ICT-enabled OI platforms are now operating for various industries and ecosystems [8,37–39].

As knowledge creation is largely associated with interaction and socialisation [5], technology's main contribution is towards developing social capital rather than on storing, transforming and distributing codified knowledge [40–42]. The objective of flexible cooperative learning as strategic capability suggests a personalization rather than a codification knowledge management meta-strategy [43], paying particular attention to identifying *learning* gaps rather than *knowledge* ones. In turn, collaborative learning requires the cultivation of the appropriate knowledge integration mechanisms, which include IS-supported group-based problem solving and decision making [42,44,45].

In operational terms, the technical characteristics of the Information System employed in OI initiatives, and the way it is embedded in organizational processes needs to be aligned with the specific model of OI adopted [12]. For instance, an IS to support the innovation market model should have functionalities for defining requests (demand) and responses to demand and for matching them, whereas one for innovation communities may support an open forum where multi-role participants offer solutions, ask for solutions or just discuss/comment on solutions. Clearly, in all cases what is required by the mediating IS is to actively support the production of knowledge rather than to provide a platform to record a palette of ideas and information in raw form.

In general, ICT can be considered as a form of cultural and social regime that considerably shapes social practices and organisational processes [46,47]. In addition to enabling OI and its particular implementation [48], ICT, and the related online space, also acts as moderator and limiting channel, leading stakeholder interactions and collaborations to specific directions, depending on the cooperation model inscribed [49]. This is done by trade-offing objectification and rationalisation in interactions and decision making against the texture of real life, where subjectivity and flexibility prevail. Collaboration software with negotiation and argumentation features can abstract from reality and provide functionalities to express and receive opinions and knowledge items remotely, can carry out polls, produce information in (machine) usable forms, etc.; however, it is at the cost of limited richness and spontaneity compared to face-to-face direct interaction [41].

In certain cases, however, the abstraction from reality that collaboration technology provides may be beneficial for an organisation involved in complex open innovation situations. By providing objectified communication channels and by imposing rational thinking, technology may neutralise or cancel out informally developed and exercised misbehaviours and bad practices, such as abuses of power in cooperation [50] as well as other distortions induced by organisational formal and informal social and cultural regimes [41,51], such as the reluctance to use external knowledge due to Not-Invented-Here (NIH) syndrome [8].

Regarding the specific forms of cooperation (dialectic or dialogic), information systems that support dialogic cooperation have the capability of supporting multiple, parallel threats. This means that in addition to a focal company–external collaborators threat, such systems support external collaborator–external collaborator threats too, in which the focal company's actors may also intervene [24]. In addition, they support flexible closure points, allowing for variable degrees of knowledge exploration before agreements are reached and decisions are made. On the other hand, systems supporting dialectic cooperation provide facilities the means to promote individual contributions and support the permanence/storage of ideas and knowledge items with full argumentation, thus allowing incumbent actors to express and support their NIH-driven choices.

5. Institutional Isomorphism, Innovation Strategy and Forms of Cooperation

Companies are part of complex supply chains in which they usually have many different roles at the same time: supplier, customer, complementor, etc. Therefore, it is quite possible that managers in these companies have experiences from participating in, or just observing, initiatives of their supply chain partners. Obviously, these (past) experiences play a significant role when these individuals become initiators and champions of similar initiatives in their own organisation as well as on how they practice leadership with respect to the specific initiatives [1,44,52]. Managers tend to adopt similar practices, either because they see a value in them [14] or just because they think that they will legitimise them in their industry as adopters of industry's best practices [2]. In this logic, internal (organisational) and external institutional isomorphic forces influence (accelerate) the adoption of open innovation and its particular forms of implementation [53].

Clearly, managers adopt OI, value knowledge and knowledge sharing though participative knowledge creation and external knowledge integration processes [14,54]. They develop initiatives and practice empowering leadership styles to respond to the challenges that the adoption of OI imposes on individual organisation members [55], which, in the end, have positive effects on the innovation performance of their companies [56]. It has been argued that the adoption of empowering leadership styles in initiatives depends, among other factors, on the prior involvement of the leaders on other organisations' initiatives as contributors [52]. It also depends on their intention to leverage their knowledge and experience in participative initiatives in their organisation by building social capital [57]. Social capital means trust, open participation and democratic processes instead of arrogance and eagerness to prove and/or impose ideas and concepts for personal benefit [58,59], hence no eagerness for closure in decision-making [28]. In the open innovation context, this necessitates the implementation of mechanisms for and the practice of dialogic cooperation [23].

6. Development of Hypotheses

Having outlined the background of problems, concepts and tools of OI strategies; business models and mediating cooperation/collaboration technology and their relationship with competitive strategies, we now develop three specific hypotheses associated with the principal research question.

6.1. Competitive Strategies, Strategic Orientation and Innovation Strategies

It has been argued that the adoption of open innovation requires an outward looking (extrospective) focus [60,61], the corresponding strategic orientation [48] and the appropriate OI strategy from those outlined in the previous section [3]. However, the adoption of OI and its mode of implementation do not happen in a vacuum as far as the organization's strategic priorities are concerned. In both outside–in and inside–out perspectives of strategy formation, competitive advantage primarily derives either from cost leadership or from operational and/or offerings differentiation [62,63]. The two choices are associated with different strategic orientations, indicating that the strategic orientation of a company is contingent to the choice of the source(s) of competitive advantage.

Cost is an internal, firm-controlled variable, and although an outwards (extrospective) market-based comparative logic may be required for its management, in general, it is more associated with an introspective attitude towards asset exploitation. On the other hand, companies that compete in dynamic sectors and attain differentiation strategies have a more spherical and extrospective attitude towards environmental exploration, which includes the internal environment too. As a result, one can say that generic strategies of cost leadership and diversification/differentiation and the corresponding sources of competitive advantage [62] are linked, with significantly varying degrees of intensity, primarily to extrospective strategic orientations and the OI paradigm and less to introspective orientation for cost management [64–68].

As far as strategic orientation is concerned, it denotes how a company gains competitive advantage, or otherwise how it creates "the proper behaviour for continuous superior performance of the business" [66,69], after the choice of the source of competitive advantage has been made. Different strategic orientations are associated with different sources of innovative ideas and resource investments, and as such, they are an essential part of the organizational context in which (open) innovation activities are carried out. According to Cheng and Huizingh [66], entrepreneurial orientation implies the cultivation of practices to scan the environment for new opportunities [70] and a market orientation ability to understand customer needs, whereas a resource orientation, also taking into account the internal environment, has the ability to deploy a unique set of resources and to learn from past experience. Clearly, all three of these orientations are under the generic umbrella of *extrospective orientation* and are associated with innovation in general and open innovation activities in particular [64,66]. Entrepreneurial and market orientations are related to product/service innovation, whereas resource orientations are more related to internal resources and/or factor and process innovations [2].

In summary, an extrospective strategic orientation and the incorporation of OI in a business model denote that a company creates, delivers and captures value in conjunction with its external partners, and it turns to them for innovative ideas and knowledge [3,71]. In such a context, organisational design, capabilities and management practices need to be aligned with the organisation's (open) innovation strategy in order to facilitate the sourcing of knowledge from external sources and its subsequent exploitation for innovation.

Hence, based on the above discussion and focusing on the external organisational environment, we can hypothesize:

Hypothesis 1 (H1). *The choice of generic competitive strategy and the source of competitive advantage of a firm (cost/price versus differentiation/innovation) influence its view of its external environment as source of ideas that provide competitive advantage.*

This hypothesis can be further concretized as the following two hypotheses:

Hypothesis 1A (H1A). *The consideration of cost as the main source of competitive advantage is positively correlated with the consideration of the internal environment as the main source of ideas for innovation (introspective orientation).*

Hypothesis 1B (H1B). *The consideration of differentiation by innovation as the main source of competitive advantage is positively correlated with the consideration of both the internal and external environments as sources of ideas for innovation (extrospective orientation).*

Hypothesis H1A implies that in companies that consider cost as the main source of competitive advantage, incumbent managers and employees are thought of as the creators of innovative ideas for product/services but also as the initiators of organisational renewal. On the other hand, in companies that consider innovation as source of competitive advantage and novel business models as enablers of new markets, there is a view that good innovation ideas stem from anywhere (internal and external environment).

6.2. Dialogic and Dialectic Cooperation and Open Innovation

As it was discussed above, the choice of the source of competitive advantage influences the characteristics of OI business model adopted. In practical terms, efficiency-centric business models, frequently aiming at innovations for cost reduction, are implemented as innovation markets where sellers and buyers of innovation or problem setters and problem solvers interact to obtain the best for their part. Crowd-based models underpin innovation contests seeking optimal or "best-of" solutions, whereas in innovation toolkits implementing collaborative strategies, solvers follow specific procedures and guidelines, frequently implemented in a software tool, to provide solutions to the host company [4,72]. In innovation communities that implement the open platform model, many different actors work on a variety of problem(s) provided by the members/nodes of the network. Explorative knowledge creation is the underlying *raison d'etre*.

The above business models incorporate different forms of relationships and different patterns of interaction, conversation and cooperation between the parties involved. The degree of freedom, as far as the innovation task of the parties involved is concerned, varies from narrowly defined tasks seeking optima to open creative tasks for knowledge creation. Innovation communities involve multidimensional long-term network relationships and creative, open tasks, whereas innovation markets concern specific problems/tasks addressed for obtaining the best with the minimum cost in fast transactions. In addition, as it is indicated below, transactions and forms of cooperation vary in terms of the breadth and depth of the relationships in the model [3].

In dialectic conversations and cooperation, opposites are expressed that are gradually lead or are driven through a logic of thesis and antithesis to synthesis and, hopefully, to a common understanding of the issue in hand and eventually agreement [21]. In the process, each party tries to impose its arguments on the other participants [24]. Early closure is sought by achieving satisfying objectives. This efficiency-centric mode seems suitable for strategies aiming at efficient resource use and cost management. Dialogic conversations in cooperation, on the other hand, are not bound or aimed at synthesis and/or agreement [23]. They come in small bits and are explorative in nature. In dialogics, the logic of applying minimum force to deal with resistance and counter-arguments prevails. Aggressions and confrontations are minimized. Dialogic conversations in deliberation processes aim at understanding one's own views as well as those of the others involved. It is important to note that dialogic interactions aim at creating new knowledge and innovation, each participant enriching the position of the other, while dialectic processes aim at creating consensus around extant knowledge.

In dialogic conversations, one tries to fit within the collective activity and generate an outcome that is not the sum of the individual efforts but their collective configuration. To achieve this, she may have to comment directly on the arguments of the other participants. Overall, in a firm's interactions with external stakeholders, a conversation/deliberation involving horizontal communications among many participants may be considered more dialogic that the one-to-one dialectic integration of the company with entities of its external environment, e.g., customers. Clearly, this is a mode of cooperation more suitable for expansive/explorative innovation/differentiation competitive strategies.

Given the multi-dimensionality and complexity of the business models and their implementations, including the form of cooperation supported, information and communication technologies (ICT) have a very important role to play in the development, maintenance and appropriation of the capabilities required for OI [6,13]. Of particular importance to ICT-enabled OI is how the functional characteristics of technology are aligned with the underlying OI business model and the related form of cooperation. As differentiation/diversification strategies are related to an extrospective perspective and explorative operations, where absolute or relative targets are not known, whereas cost leadership and/or choice based on the price is based on direct comparisons, negotiations and optimised exploitation of resources, we can hypothesize:

Hypothesis 2 (H2). *The choice of generic strategy and the source of competitive advantage of a firm (cost/price versus differentiation/innovation) are positively correlated with the choice of the terms of cooperation with external and/or internal stakeholders and the implementation of the associated technological infrastructure.*

This hypothesis can be further concretized as the following two hypotheses:

Hypothesis 2A (H2A). *The consideration of cost as the main source of competitive advantage is positively correlated with the engagement in dialectic cooperation with external and/or internal stakeholders supported by the associated technological infrastructure.*

Hypothesis 2B (H2B). *The consideration of differentiation/innovation as the main source of competitive advantage is positively correlated with the engagement in dialogic cooperation with external and/or internal stakeholders supported by the associated technological infrastructure.*

ICT that enables dialectic cooperation will have functionalities for promoting "winning ideas" clearly indicating ownership, whereas that for dialogic cooperation will pay particular attention to dialoguing and synthesis of ideas.

6.3. Isomorphism, Past Involvement and Forms of Cooperation

The adoption of open innovation requires a particular organisational culture for dialoguing and cooperating with internal and external parties [73–75] as well as a set of organizational capabilities [13] for absorbing external knowledge. Absorptive capacity is associated with plurality of perspectives and knowledge sources and their effective synthesis [76]. It is also a function of the richness/diversity of the pre-existing knowledge structures, personalized (tacit) and impersonalized (codified) [5,77].

Given the affinity of extrospective-oriented organisations to competitive strategies based on product/service and/or business model innovation in general and to open innovation in particular, senior management and its leadership style play a significant role on the establishment of the appropriate OI culture [18,75,78]. As it was discussed above, a participative, empowering leadership style facilitates knowledge integration from both internal and external sources [79,80]. This is because one of the most important mechanisms of knowledge integration is cooperation, in general, and cooperative problem solving, in particular [44,45]. On the other hand, a decisive antecedent of the adoption of empowering leadership style is the previous involvement in initiatives led by leaders exercising the same style, valuing the resulting trust among the participants [55]. In addition to the adoption of OI due to institutional forces [2,53], managers tend to reproduce this leadership style in the adoption of similar initiatives. In addition, as empowering leadership styles in OI imply that managers seek knowledge synthesis more than early/fast closure, it is logical to prefer OI processes based on (technology supported) dialogic cooperation. Consequently, we can hypothesize in an explorative manner:

Hypothesis 3 (H3). *Managers' past involvement in open innovation initiatives of other organisations is positively correlated to the terms of cooperation with external and/or internal stakeholders and the associated technological infrastructure.*

This hypothesis can be further concretized as the following two hypotheses:

Hypothesis 3A (H3A). *Managers' past involvement in open innovation initiatives is positively correlated to the choice of dialectic cooperation with external and/or internal stakeholders supported by the associated technological infrastructure.*

Hypothesis 3B (H3B). *Managers' past involvement in open innovation initiatives is positively correlated to the choice of dialogic cooperation with external and/or internal stakeholders supported by the associated technological infrastructure.*

The above three hypotheses can be combined in a consistent holistic narrative of the principal research question expressed in the Introduction as in Figure 1. The dotted line denotes an implicit hypothesis (the strategic orientation denotes with whom to cooperate), not stated and tested explicitly but logically derived and assumed.

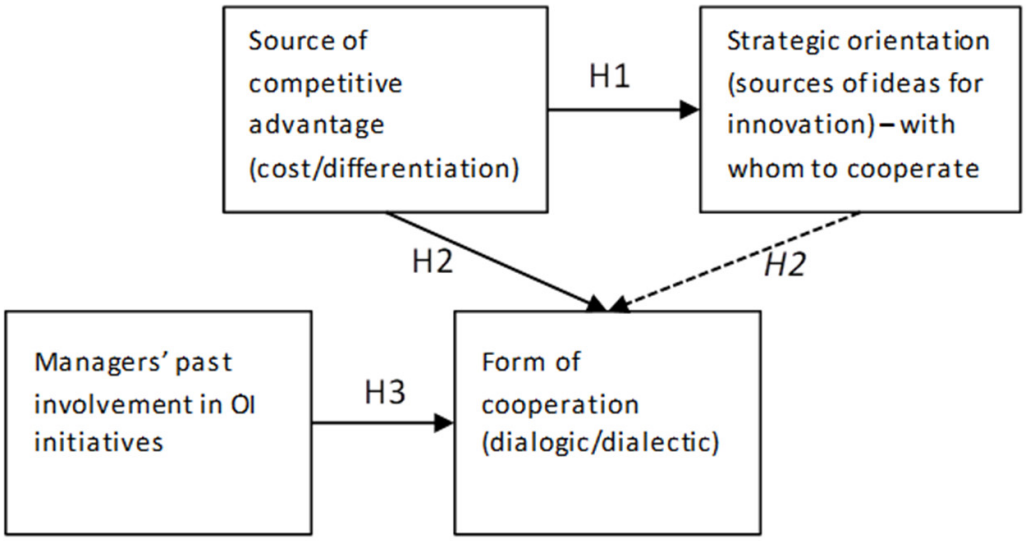

Figure 1. Hypotheses corresponding to the principal research question.

7. Research Methodology

To test the above hypotheses, a questionnaire was developed and used as a survey research instrument. Given the importance of top management in OI initiatives [14], it was intended to record the views of top management companies in Greece with respect to competitive strategy and its links to open innovation strategy and form of cooperation. The questionnaire was divided into subsections, which were conceptually independent. The questionnaire was distributed electronically through email and the Google Forms application. Responses were recorded in the same application. The survey was conducted in the period January 2021 to March 2021.

Constructs, Factors and Variables

The questionnaire comprised four sections/groups of questions; besides demographic information, there was a section regarding the source(s) of competitive advantage and the importance of innovation, a section about open innovation models and past participation in OI activities, and one to record the perceived functional specifications of OI-supporting ICT systems, including (big) data management and social networking functionalities.

The importance given to cost as (main) source of competitive advantage was measured by a direct question and, hence, a single item. Innovation as a source of competitive advantage was measured by the answers in a direct and an indirect question. The former was similar to the one for cost, whereas the latter was aiming at assessing the importance given to the contribution of innovation in supporting novel aggressive strategies based on business model innovation. In the same logic but for the opposite reason, the degree of introspective strategic orientation was measured by two items: the importance of incumbent managers and employees as sources of innovative ideas as well as as initiators of change initiatives. Symmetrically, extrospective orientation (which, however, also includes an introspective dimension) was assessed by a single item, the belief that (good) innovative ideas may stem from anywhere.

The preference and the importance given by the respondents to the different forms of cooperation were determined indirectly through the preferred functional characteristics of the cooperation-enabling technology (ICT). Regarding the role and the characteristics of the mediating ICT for supporting dialogic cooperation, the flow of knowledge and

information (one way or bidirectional), the effort to cultivate an arena of competition of ideas/propositions (binary responses required), the degree of support for cooperation and synthesis of ideas of internal and external agents and the effort to integrate social media conversation in business processes were assessed. Similarly, for dialectic cooperation, the support for developing ICT weaponry for winning in the competition of ideas by means of employing systems with storage/protection (of ideas) that define a static exchange environment, appropriation/ownership indicators and extensive documentation capabilities was assessed. Finally, the past involvement of managers in OI initiatives of other organisations' change and innovation initiatives was assessed with one direct question and to find indirect to find out the degree of involvement in other open initiatives in the areas of product development as well as in process, distribution and marketing improvement initiatives, respectively.

Table 1 depicts the constructs and the items used for testing the three hypotheses.

Table 1. Variables and factors.

Factor	Description	Variable	Explanation
INTROSPECT	Introspective orientation	INTROS-1	Good innovative ideas stem from organisation's incumbent managers and employees
		INTROS-2	Organisational change initiatives stem from incumbent managers and employees
EXTROS	Extrospective orientation	EXTROS	Good innovative ideas may stem from everywhere
COMPOST	Cost as source of competitive advantage	COMPCOST	Cost is the most important determinant of competitive advantage
COMPAD-INNOV	Innovation as source of competitive advantage	COMPIN-1	Cost is the most important determinant of competitive advantage
		COMPIN-2	Innovation-supported business models create new markets
ISDIALOG	IS supporting dialogic cooperation	DIALGIS-1	IS enabling two way flow of improvement ideas, designs and solutions
		DIALGIS-2	IS supporting the "competition" of stake holders ideas and propositions
		DIALGIS-3	IS supporting cooperation of stakeholders' ideas and synthesis ideas and solutions
		DIALGIS-4	IS supporting the cooperation of external and internal organizational stakeholders
		DIALGIS-5	IS should integrate social media conversations in business processes
ISDIALEC-VAR1,2,3	IS supporting dialectic cooperation	ISDIALEC-VAR1	IS allowing the storage of stakeholders' ideas
		ISDIALEC-VAR2	IS allowing the documentation and substantiation of own ideas and suggestions
		ISDIALEC-VAR3	IS clearly indicating the "owners" of ideas and suggestions
PASTINVOI	Involvement in OI initiatives in the past	PSTINVOI-1	Involvement in other organisations' OI initiatives in the past
		PSTINVOI-2	Participation in other organisations' open new product development processes
		PSTINVOI-3	Participation in other organisations' open process improvement efforts
		PSTINVOI-4	Participation in other organisations' open distribution improvement efforts
		PSTINVOI-5	Participation in other organisations' open marketing improvement efforts

The questionnaire was administered electronically to 400 top managers, members of the Greek Senior Managers Association who have been involved in OI initiatives. An amount of 174 valid responses were received within the time frame set. Of the respondents, 81.3% were male and the rest female, 71.3% belonged to the age group 45–54 years old, and the vast majority (~91%) were holders of a degree or higher education qualification. A sample of 150 responses was formed for analysis according to the sectoral distribution depicted in Table 2.

Table 2. Survey sample information.

N = 150		
Sector	**n**	**%**
Light industry incl. food and beverages	51	34.0
Heavy industry and construction	25	16.7
Services	47	31.3
Commerce and trade	27	18.0

Before the testing of hypotheses, the items of the questionnaire were grouped into factors and tested for consistency using Principal Component Analysis (PCA). Following, the testing of hypotheses was accomplished by examining correlations between factors and between factors and individual variables.

8. Results and Hypothesis Testing

8.1. Factor Development and Testing

Initially, all possible statistically significant correlations between the groups of variables (associated with specific questions in the questionnaire) and related to the hypotheses were investigated. To facilitate it, the Principal Component Analysis (PCA) method and Cronbach's coefficient were employed. In the second stage of the analysis, the normality test was conducted for the factors that emerged from the first stage using the Kolmogorov–Smirnov test. All cases turned out to be *not* normally distributed; hence, Kruskal–Wallis non-parametric statistical tests were used to identify statistically significant correlations.

Tables 3 and 4 depict the results concerning the development of the factors. Both the Kaiser–Meyer–Olkin (KMO) measure and the Bartlett's test indicated that we can extract representative factors from the constituting items/variables for "Introspective orientation" (INTROSPECT), "Innovation as source of competitive advantage" (COMPAD-INNOV), "IS supporting dialogic cooperation" (ISDIALOG) and "Involvement in OI initiatives in the past" (PASTONVOI). In contrast, both tests indicated that we could not extract a single representative factor for "IS supporting dialectic cooperation", so the individual variables (ISDIALEC-VAR1, ISDIALEC-VAR2, ISDIALEC-VAR3) were used in the testing of the hypotheses.

Table 3. Calculation of KMO measure and Bartlett's test.

Sector		**INTROSPECT**	**COMPAD-INNOV**	**ISDIALOG**	**PASTINVOI**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.630	0.650	0.807	0.814
Bartlett's Test of Sphericity	Approx. Chi-Square	23.361	32.979	173.563	303.106
	df	1.000	1.000	10.000	10.000
	Sig.	0.000	0.000	0.000	0.000

Table 4. Factor composition.

Factors/Variables	Communalities		Total Variance Explained					
			Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Initial	Extraction	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
INTROSPECT								
INTROS-1	1.000	0.691	1.383	69.136	69.136	1.383	69.136	69.136
INTROS-2	1.000	0.691	0.617	30.864	100.000			
COMPADINNOV								
COMPADIN-1	1.000	0.724	1.448	72.381	72.381	1.448	72.381	72.381
COMPADIN-2	1.000	0.724	0.552	27.619	100.000			
ISDIALOG								
DIALGIS-1	1.000	0.633	2.620	52.398	52.398	2.620	52.398	52.398
DIALGIS-2	1.000	0.526	0.765	15.298	67.695			
DIALGIS-3	1.000	0.549	0.597	11.930	79.625			
DIALGIS-4	1.000	0.477	0.569	11.388	91.013			
DIALGIS-5	1.000	0.435	0.449	8.987	100.000			
PASTINVOI								
PSTINVOI-1	1.000	0.411	3.048	60.969	60.969	3.048	60.969	60.969
PSTINVOI-2	1.000	0.573	0.755	15.104	76.073			
PSTINVOI-3	1.000	0.780	0.531	10.615	86.688			
PSTINVOI-4	1.000	0.676	0.419	8.374	95.062			
PSTINVOI-5	1.000	0.609	0.247	4.938	100.000			

8.2. Hypothesis Testing

As it is indicated in Table 5 below, based on the value of Spearman *rho* correlation coefficient, there is a small positive (0.185) and statistically significant correlation (p-value = 0.035 < 0.05) between the factor INTROSPECT (Introspective orientation) and the variable COMPCOST (Cost as source of competitive advantage). Hence, we can accept hypothesis H1A as true, which means that broadly introspective strategic orientations are associated with the consideration of cost as the source of competitive advantage.

Regarding hypothesis H1B, the results of the Kruskal–Wallis H test indicated that factor COMPADINNOV (Innovation as source of competitive advantage) is statistically significantly correlated with the variable EXTROS (Extrospective orientation) at significance level 1%. In addition, based on Spearman *rho* correlation coefficient, there is a small positive (0.247) and statistically significant correlation (p-value = 0.021 < 0.05) between COMPADINNOV and EXTROS. Therefore, we can accept hypothesis H1B too, a result which indicates that, in companies, extrospective strategic orientations are related to the adoption of differentiation/innovation competitive strategies.

For Hypothesis H2A, neither the Kruskal–Wallis H test nor the calculation of the Spearman rho correlation coefficient provided sufficient evidence that the hypothesis was valid, indicating that there are no sufficient grounds to consider that the choice of cost as a source of competitive advantage is followed by the choice of dialectic cooperation in OI and by the corresponding ICT implementation. However, as far as Hypothesis H2B is concerned, on the basis of Spearman *rho* correlation coefficient, there is a small positive (0.228) and statistically significant correlation (p-value = 0.005 < 0.05) between factor COMPADINNOV and factor ISDIALOG (IS supporting dialogic cooperation), so hypothesis H2B can be accepted. This means that, in contrast to H2A, there is evidence that the choice of innovation as a source of competitive advantage is followed by the choice of the dialogic form of cooperation and its associated ICT implementation.

Table 5. Hypotheses testing.

Test Statistics [a,b] **Hypothesis**	**H1A**	**H1B**	**H2B**	**H3A**			**H3B**
	INTROSP	EXTROS					
Kruskal–Wallis H	10.281	13.455					
df	4	4					
Asymp. Sig.	0.038	0.009					
a. Kruskal–Wallis Test							
b. Grouping Variable: COMPCOST, COMPADINNOV							
Correlations							
	COMPCOST/ INTROSP	COMPADINNOV/ EXTROS	COMPADINNOV/ ISDIALOG	PASTINVOLV/ ISDIALEC-VAR1,2,3			PASTINVOI/ ISDIALOG
Spearman's rho	0.185 *	0.247 *	0.228 *	0.100	0.102	−0.037	0.163 *
Sig. (2-tailed)	0.035	0.021	0.005	0.222	0.213	0.655	0.047
N	150						
	** Correlation is significant at the 0.05 level (2-tailed).*	** Correlation is significant at the 0.01 level (2-tailed)*	** Correlation is significant at the 0.01 level (2-tailed)*	*Correlation is significant at the 0.01 level (2-tailed)*			** Correlation is significant at the 0.05 level (2-tailed)*

Regarding hypothesis H3A, based on Spearman *rho* correlation coefficient and the corresponding *p*-values (>0.05), the factor PASTINVOLV (Involvement in OI initiatives in the past) is not related to any of the variables, indicating IS support for dialectic cooperation (ISDIALEC-VAR1, ISDIALEC-VAR2, ISDIALEC-VAR3). Therefore, there is insufficient evidence to support that hypothesis H3A is valid.

Finally, as Table 5 depicts, there is a small positive (0.163) and statistically significant correlation (p-value = 0.047 < 0.05) between factors PASTINVOLV and ISDIALOG (IS supporting dialogic cooperation). Therefore, we can accept hypothesis H3B, indicating that managers' past involvement in OI initiatives is associated with their choice of dialogic cooperation and its ICT implementation.

In summary, the empirical research indicated that companies whose executives consider both the internal and external environment as sources of good innovation ideas that provide competitive advantage through innovation strategies implement Open Innovation through information systems that support dialogic cooperation. In making this choice, the past participation of the initiating managers plays a significant role in OI initiatives of different organization, even somehow having more passive roles.

9. Discussion

In this paper, we explored the relationship between competitive and innovation strategies on the one hand and the form of cooperation (dialectic or dialogic) between the parties involved in OI initiatives on the other. Cooperation is a decisive factor for OI success. As OI is implemented in different forms that correspond to different OI business models and strategies, the aforementioned endeavour initially requires a formulation of this plurality of models and strategies and their interrelationships. Published research presented in Sections 2–4 forms the basis for deriving these associations. These is almost a one-to-one correspondence between market-based, network-based, crowd-based and collaborative strategies on the one side and efficiency-seeking, open-platform (networked), user-centric and collaborative open innovation business models on the other. Similarly, we can argue that such a correspondence exists between OI business models and implementation models (innovation markets, innovation communities, innovation contests and innovation toolkits, respectively).

Of the four chains of relationships mentioned above, network-based strategies implemented as innovation communities in the context of open-platform business models assume organisations being engaged in long-term, deep relationships with other partners/network nodes, working together for knowledge creation. These organisations are more likely to adopt innovation/differentiation competitive strategies and extrospective orientations, as they are constantly open/porous and focused on the long-term related to other network participants. Hence, as we expected, the empirical research conducted through a sample of senior managers in Greek SMEs showed that extrospective orientation is a characteristic of companies seeking competitive advantage through innovation, i.e., novel knowledge creation.

More importantly, as far as the main research question is concerned, the results of the survey and their consequent analysis indicated that these companies are more likely to engage in dialogic cooperation with their OI partners. Innovative, extrospective-oriented companies in OI networks value multi-party, multi-thread dialoguing and cooperation without being anxious to arrive at a consensus fast. Of course, this is not possible without the help of ICT systems, which actively support the production of knowledge by enabling two-way information flow, "competition" and cooperation of ideas, synthesis of ideas and solutions, participation of external as well as internal stakeholders and incorporation of social media [81]. ICT systems that concentrate on the storage of participants' ideas and suggestions, their documentation and a clear indication of ownership are more likely to be employed in dialectic cooperation, where the placement of winning well-documented ideas is the main objective of participants. In dialectic conversations, opposites are expressed, which are gradually led but more frequently driven by power relationships to synthesis (each party tries to impose its arguments on the other OI participants) and, hopefully, to a common understanding of the issue in hand. It is important to note that dialogic interactions in OI aim at creating new knowledge and innovation, each participant enriching the position of the other while dialectic processes aim at creating and sometimes enforcing through technology a consensus around extant knowledge.

We have also examined in this paper the role of the OI-initiating managers' past experience with OI initiatives in other companies (primarily as external partners). The past involvement of managers in other organisations' open new product development processes, operations improvement processes and marketing and distribution efforts acts as a propelling force for adopting open innovation and, through the choice of the appropriate strategies and implementation models, the dialogic mode of cooperation. This choice can be explained by the willingness of managers to be legitimised in their industry by adopting OI and the managers who practice empowering leadership as result of, among other factors, previous involvement in other organisations' OI initiatives.

Overall, the theoretical and empirical research suggests that companies that initiate or participate in OI initiatives before developing and installing facilitating information systems need to carefully consider their competitive and OI strategies so that they are in line with their functionalities and use processes. Companies that aim at knowledge creation and innovation need to take advantage of network participation by engaging in dialogic cooperation with a multitude of participants/network nodes.

10. Conclusions

Many OI initiatives fail to provide leads for competitive advantage through really novel offerings (products/services) or innovative business models through the resolution of ill-defined problems that require knowledge creation by the integration of a previously existing one—knowledge originating from different sources. Usually participants are not driven to integrate their knowledge; they are just asked to share it as it is. In fact, knowledge integration involves a number of activities that are more consistent with the dialogic model of cooperation; initially, knowledge items are shared to create a "collage of diverse perspectives on the issue". This is followed by spotting and highlighting knowledge in arguments, which is most relevant to the issue and putting aside knowledge

items interfering to the resolution of the issue through innovative thinking. Voting takes place on proposals/solutions synthesised after dialogical cooperation—not on those placed initially, thus promoting those considered more relevant.

In this paper, for the first time, we examined ideas that are the antecedents of the adoption of dialogic (and indirectly, dialectic) cooperation in OI initiatives. The analysis and the survey conducted in a sample of senior managers of different sectors in Greece provides evidence that dialogic cooperation in OI is chosen and implemented though ICT by companies that have an extrospective strategic orientation and consider innovation as the source of competitive advantage in their industries. There is also evidence that this choice is further supported by managers–OI-initiators who had a previous involvement in other organisations' OI initiatives.

In summary, the work presented in this paper had an exploratory objective rather than a confirmatory one, and the empirical research and the method of analysis of the survey results were in that line. To fully confirm the results presented here and to dive deeper on the relationships between strategic orientation, source of competitive advantage, the OI business model and form of cooperation chosen, more extensive surveys are required and more sophisticated multi-factor analysis methods need to be employed.

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