# Impact of multilevel strategic alliances on innovation and firm performance

## Evidence from the yacht-building industry in Turkey

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**Abstract**

**Purpose** – The purpose of this study is to explore the configuration of network ties that would have a positive impact on performance outcomes and test the presumed impact of multilevel strategic alliances on innovation and firm performance in a specific industry.

**Design/methodology/approach** – This study comprises part of a larger project on the network relations of yacht-building firms operating in Turkey. Data of the study was collected through face-to-face interviews and questionnaires with 143 yacht-building firms operating in major yacht-building regions of the country.

**Findings** – The findings of the study indicated the presence of meaningful relationship between total number of (strong) network relations perceived as strategic alliance and overall innovation performance. The generally presumed positive relationship between innovation performance and firm performance was supported. The type of innovation performance that was found to be related to the total number of network ties perceived as strategic alliance at national and global levels was product innovation performance.

**Practical implications** – A possible contribution of this study for industry members would be the implications of the finding that indicates positive impact of strategic alliances with different actors of the industry.

**Originality/value** – This study contributes to the exploration of network configurations that have a positive impact on innovation and firm performance, by dealing with the impact of the size, strength and geographical level of network relations in one single study. The yacht-building industry as the empirical setting represents a specific category of industry that rests on customized individual or small-batch manufacturing requiring considerable interaction with customers and suppliers. Because no study exists on this topic, findings can inspire similar industries.

**Keywords** Firm performance, Innovation performance, Strategic alliances, Organizational coupling, Yacht-building industry

**Paper type** Research paper

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## 1. Introduction

Literature on collaborative relations between firms is quite broad and shows diversity (Dyer and Singh, 1998; Gulati, 1998; Doz and Hamel, 1999; Kaufman *et al.*, 2000; Culpan, 2002; Grant and Baden-Fuller, 2004; Inkpen, 2006; Ritala and Ellonen, 2010; Lavie *et al.*, 2012; Christoffersen, 2013). This field of study is known as one of the three main streams that claims to explain how firms gain competitive advantage. The first of these is the industrial organization approach promoted by Porter (1980). This approach accepts the industry as the unit of analysis and the position in an attractive industry as the main source of competitive advantage. The second stream rests on the resource-based view (RBV) which takes the firm as the unit of analysis and claims that firms gain sustained competitive advantage from the ownership of a unique bundle of resources and capabilities, which are valuable, rare, inimitable and non-substitutable (Barney, 1991). The third stream is the relational view (Dyer and Singh, 1998) which argues that firms can improve their innovation capability and hence performance by effectively managing their relationships with "suppliers, customers and other resource providers such as universities or other government agencies" (Kaufman *et al.*, 2000, p. 649). According to this third view, critical resources of the firm may extend outside the firm boundaries and be embedded in the routines and processes between firms.

Collaborative approaches represent an important shift from the traditional approaches to strategic management which assumed that firms work on their own to gain competitive advantage by developing new products and services superior to their competitors (Gulati *et al.*, 2000; Gibbs and Humphries, 2009). Changes in the domestic and international market conditions have led firms to develop alternative ways for competition, built upon the realization that more and more competencies and resources required for sustained performance lie beyond the boundaries of the firm, in the hands of other entities. This explains why strategic alliances, especially with firms that complement the value chain (i.e. suppliers or distributors) and with competitors, that enable joint creation of knowledge and innovation (Capaldo, 2007) have become so popular during the past decades (Grant and Baden-Fuller, 2004; Culpan, 2009) as an organizational form and as an important tool for strategic implementation (Inkpen, 2006). In parallel to the rapid rise in the number of strategic alliances during recent decades, they have also received increased academic attention as a new unit of analysis.

Alliances are defined as business partnerships of two or more firms or business units established with the purpose of realizing mutually beneficial strategic goals (Elmuti and Kathawala, 2001). These are voluntary arrangements comprising exchange, sharing or joint effort to develop products, technologies or services between firms on the same or different levels of the value chain (Gulati, 1998). Spekman *et al.* (1998) defined strategic alliances as close, long-term and mutually beneficial agreements between two or more business partners, to share information and capabilities to develop the competitive position of both parties. These alliances possess strategic rather than tactical importance and have a longer-term perspective compared to other kinds of partnerships (Gibbs and Humphries, 2009); resources, risks, responsibilities, returns and new product development costs are shared between partners (Dickson and Weaver, 1997; Heimeriks and Duysters, 2007). Research results show that such collaborations reduce uncertainties around the firms (Gulati, 1998), create opportunities for accessing technologies and entering new markets (Elmuti and Kathawala, 2001; Inkpen, 2006; Heimeriks and Duysters, 2007; Love and Mansury, 2007); provide access to new and critical resources, knowledge and capabilities (Rothaermel and Boeker, 2008; Gulati *et al.*, 2000); contribute to the performance of business allies; and provide them competitive advantage (Dyer and Singh, 1998; Gulati, 1999; Elmuti and Kathawala, 2001; Culpan, 2002; Tan and Thai, 2014).

The factors that lead firms to form strategic alliances have become an important field of research. Scholars attempt to explain this topic from different theoretical perspectives (Varadajaran and Cunningham, 1995). A mainstream theory is the transaction costs economics, which presumes that every transaction on earth has a cost and takes the transaction cost as the unit of analysis. According to this view, firms try to minimize transaction costs in their decisions on economic exchanges (Williamson, 1981). Strategic alliances are hybrid organizational forms that may minimize transaction costs by enabling firms to work with well-known and trusted business partners (Williamson, 1991). If a firm cannot adopt a transaction within its hierarchy because of its legal or economic costs, it may prefer to enter a strategic alliance to stand against the threats of market forces (Burgers *et al.*, 1993). In that case, generation of relational rents depends on "the establishment of an effective alliance governance structure and the evolution of inter firm routines that facilitate the sharing of knowledge and information within the boundaries of the alliance" (Lavie, 2006, p. 642).

Resource dependence theory, on the other hand, sees strategic alliance as a coordinative mechanism (Pfeffer and Salancik, 1978) claiming that firms adopt one of the buffering or bridging strategies to minimize resource dependencies (Scott, 2002). Strategic alliance is a form of bridging strategy that enables firms to take measures against losses by developing relationships with other businesses that provide critical resources. The third perspective is the resource-based theory, which asserts that interfirm relationships enable firms to access strategic resources that could provide competitive advantage. Firms can improve and renew their current capabilities through strategic alliances (Park *et al.*, 2004). The relational approach as developed by Dyer and Singh (1998) complements the RBV by introducing the concept of relational rents, jointly generated by alliance partners. As an extension of the resource-based approach, the knowledge-based view claims that the way to acquire competitive advantage is innovation based on knowledge creation and recommends knowledge sharing and creation through strategic alliances (Culpan, 2009). The institutional theory, as the fifth different perspective, proposes that firms imitate the actions of other organizations in their strategic environment (Gulati, 1995). According to this view, the reason for the increase in the number of alliances is imitation of this form by other organizations (Harrigan, 1988). As can be deduced from the aforementioned mainstream theoretical assertions, factors such as market uncertainties, resource dependencies, heterogeneity of resources and capabilities and imperfect market conditions have led firms to seek strategic alliances in their efforts to acquire competitive advantage (Varadajaran and Cunningham, 1995). Improved productivity, quality and innovation performance were cited as the main objectives behind strategic alliances (Cante *et al.*, 2004).

With this increased interest in strategic alliances as a superior track for building competitive advantage, we find proliferating research topics that bring new issues to scholarly discussion. One important topic rests on the social network theory (Granovetter, 1973) to investigate the effect of "strength of ties" between alliance partners on performance outcomes. There is an ongoing debate in the social network literature on the degree of organizational coupling that would improve commercial performance of innovations. Some researchers have shown that tighter organizational coupling between alliance members improves innovation performance (Hansen, 1999), while some others showed the negative effects of tight coupling on innovation performance (Kim *et al.*, 2006). To resolve these contradictory findings, various studies have investigated different contingencies that have an impact on the right degree of embeddedness or organizational coupling in alliance networks to maximize performance outcomes. One study explored the performance implications of structural and relational embeddedness in the steel and semiconductor

industries (Rowley *et al.*, 2000); another analyzed the evolution of firm networks from the emergence to early growth of the firm to propose contingencies conducive to firm performance (Hite and Hesterly, 2001); another study explored the strategic orientation and environmental uncertainty contingencies that influence the impact of interfirm network ties on innovation performance of firms (Peng *et al.*, 2008); and a more recent one analyzed the impact of different degrees of organizational coupling among the members of innovation alliance project networks on the commercial performance of collaborative innovations and learn about the moderating variables in the task environment that may have an impact on this relationship (Hofman *et al.*, 2016). This research is quite new and findings have not led to an integrated theory yet. Because of contradictory findings in this research field, the topic of appropriate organizational coupling is an attractive field of inquiry.

A more recent interest in the field pertains to research in alliance portfolios (Wassmer, 2010), dealing with topics such as portfolio size, portfolio diversity, portfolio management, etc. As observed by Lavie (2007), firms having similar portfolio sizes often end up with heterogeneous performance outcomes. Recently, it has become popular to investigate the contingencies that have an impact on the relationship between some property of alliance networks and performance outcomes. While it is common to expect increasing alliance portfolio size to positively affect innovation and financial performance, recent studies have evidenced the dampening effects of alliance portfolio after a certain size, finding inverted U-shaped impact on both innovation and financial performance, contrary to the popular belief (Lahiri and Narayanan, 2013). Another recent study found results supporting the hypothesis that the alliance capital of a firm has an inverted U-shaped effect on its technological performance (Vanhaverbeke *et al.*, 2015). A similar hypothesis was confirmed in another study that predicted an inverted U-shaped relationship between a firm's level of alliance portfolio partner diversity and its level of innovation outcomes (Oerlemans *et al.*, 2013).

This study presents the set of findings of a larger research project investigating the business networks of yacht-building firms. The aim is to build on the aforementioned theoretical and empirical background to contribute to the existing literature by investigating the effect of the network configuration operationalized as the number, strength and geographical level of network relations on innovation and business performance of firms and more specifically to test the presumed effect of multilevel strategic alliances. Previous research has not dealt with these configurations in one single study. The more specific objective here is to further the inquiry of scholars on the performance impact of organizational coupling at different geographical levels. As explained above, the debate in the literature on the effect of multilevel business network portfolios, the configurations of size, strength and geographical level on performance of firms is not settled yet, and these topics were never investigated in the yacht-building business literature. To fill this gap, this study will start with an overview of the literature providing a discussion on knowledge management and innovation implications of organizational coupling and embeddedness at different geographical levels forwarded by cluster and social network theories, to develop the hypotheses of the study. In the next section, the method and findings of the field study on 143 yacht-building firms will be reported and a discussion of the results and final conclusions will be presented.

## 2. Theoretical background and hypotheses of the study

As mentioned above, the current study is part of a larger research project based on the theoretical work dealing with innovation performance of cluster firms embedded in multilevel business networks. This topic rests on the intersection of scholarly work on

clusters, innovation and knowledge-based view of the firm. The impact of clustering on knowledge and technology transfer and innovativeness has become an important inquiry track in knowledge management research. Studies that explore knowledge transfer and technology spillovers in industrial clusters (Beijerse, 2000; Karlsen *et al.*, 2003; Bathelt *et al.*, 2004; Dahl and Pedersen, 2004; Koo, 2005; Ostergaard, 2009; Morrison and Rabellotti, 2009) and the more specific work on knowledge-based theory of the firm (Nonaka, 1994; Zander and Kogut, 1995; Grant, 1996a, 1996b; Kogut and Zander, 1996) developed the idea that the real competitive power of firms depends on their capacity to access information and create knowledge. Hence, industrial clusters attracted attention as a means of facilitating access to knowledge and information through social networks, and the concept of "social embeddedness" forwarded by Granovetter (1985) became a key construct in studying the impact of social networks on innovativeness and performance. Gulati (1998, p. 296) made reference to two types of embeddedness: relational and structural, the first of which refers to the cohesion of network ties "as a mechanism for gaining fine-grained information". In this type of embeddedness, actors are strongly tied to each other and develop a shared understanding regarding some critical issues. Some researchers have emphasized the strength of strong ties associated with strategic alliances (Nelson, 1989; Uzzi, 1997; Keister, 1999). These are seen as competitive tools that provide firms new information flow, technological innovations and operational support (Capaldo, 2007). Strong ties contribute to innovation performance by enabling transfer of tacit knowledge between firms (Peng *et al.*, 2008). This kind of knowledge, although difficult to capture without implementation, comprises important insights for innovation (Medcof, 2001). Uzzi (1996) argues that transfer of tacit knowledge between firms requires special effort and is facilitated by strong linkages that motivate firms to spend more time together and develop closer communication.

Structural embeddedness, on the other hand, posits a positional perspective that "focuses on the informational role of the position an organization occupies in the overall structure of the network" (Gulati, 1998, p. 296). Findings of the study by Uzzi (1996) that is based on the concept of "structural embeddedness" showed that the chance of survival of firms that succeed in combining embedded (strong) linkages with arm's-length (weak) linkages in their business networks was the greatest. This study indicated that embeddedness provides positive returns only up to a certain level beyond which negative returns start being generated. This finding pointed to the importance of investigating the arm's-length linkages of firms besides embedded links as also suggested by the concept of "strength of weak ties" proposed by Granovetter (1973). He contends that weak ties give actors access to "novel information" and are more likely to provide "local bridges" to distant actors who possess unique information. Relying on this proposition, Rogers (2003) defined weak ties as linkages that possess the potential of developing innovation performance and pace by providing access to fields of information that are difficult to reach. Capaldo (2007) noted that a firm could increase the diversity of its business network by adding weak ties and thus improve its performance.

Contradictory implications of this literature have also motivated the study by Rowley *et al.* (2000) to examine the relational and structural embeddedness in a contingency perspective. They found empirical evidence in two different industries about the network configurations that had positive impact on firm performance. Their empirical analysis suggests that strong ties in a highly interconnected strategic alliance network negatively affect firm performance in the semiconductor industry, and the authors argue that the influence of relational and structural embeddedness is contingent on industry context. Because a firm will likely possess a mix of strong and weak ties, the authors further propose that "it will benefit from a portfolio of ties favoring one type more than the other depending

on the conditions surrounding the firm". This study showed the importance of testing these relations in different industrial contexts.

A quite recent study dealing with the "strength of ties" in alliance networks examines the impact of different degrees of organizational coupling (loose vs tight) among members of innovation alliance project networks on the commercial performance of collaboration innovations (Hofman *et al.*, 2016). According to the authors, looser alliance networks pose a problem for acting on novel ideas, while tighter alliance networks pose a problem for generating new ideas. Obstfeld (2005) calls this as "the action problem versus the idea problem". The authors claim that the appropriate degree of organizational coupling for high innovation commercial performance could be resolved by examining contingency conditions, and, in this study, they investigate how the type of innovation, classified as modular versus architectural moderates the relationship.

As can be deduced from the aforementioned theoretical work, the appropriate configuration of organizational coupling is still being explored from different perspectives; contradictory results of different research have not been integrated into a single theory yet. Moreover, different industrial settings have not been covered yet in empirical studies. To contribute to this debate, this study set out to explore the appropriate configuration of organizational coupling that would positively impact innovation and firm performance, and to test the relationships between weak and strong ties and innovation and firm performance as posited in the aforementioned literature, the below listed hypotheses were formulated:

*H1*. There is a positive relationship between the total number of (weak/loose) ties perceived as source of information and innovation performance.

*H2*. There is a positive relationship between the total number of (strong) ties perceived as strategic alliance and innovation performance.

*H3*. There is a positive relationship between the total number of (weak + strong) network ties and firm performance.

*H4*. There is a positive relationship between the total number of (weak/loose) ties perceived as source of information and firm performance.

*H5*. There is a positive relationship between the total number of (strong) ties perceived as strategic alliance and firm performance.

*H6*. There is a positive relationship between innovation performance and firm performance

Another important topic derives from the cluster theory to investigate the impact of multilevel networks on innovation. Empirical findings from different studies showed that clusters improved efficiency, innovation and competitiveness in different ways (Singh, 2001). Research on the competitiveness of industrial clusters continues to explore the conditions that enable innovation processes. Krugman (1991), a leading scholar of the field, asserted that clusters can generate high levels of technological spillovers and innovations. A major reason proposed for this effect was physical proximity, which facilitates local transfer of information compared to transfer of distant information. The atmosphere of trust and the access to specialized suppliers have an increasing effect on the number of transactions, which in turn improve the exchange of technical know-how between cluster firms. Porter (1998) emphasized the existence of sophisticated buyers as one of the factors that lead to innovation in clusters by acting as a valuable source of information. Cluster firms enjoy a high degree of flexibility and can implement innovations at a higher pace owing to their access to a broad diversity of suppliers; they are able to experiment at low cost and can

postpone investments until the market potential of innovation is known. The high level of competition and peer pressure of equals among cluster firms act as a powerful motive for innovation. After more than 20 years of empirical work and observations on the development of various industrial regions, checking the assumptions of the early literature on externalities of clusters and emphasizing the importance of local dynamics, recent research has started to criticize this focus on internal dynamics and resources. We increasingly encounter studies investigating the consequences of global alliances and knowledge transfers between different levels of business networks and value chains. And this recent work, though confirming the importance of local linkages for knowledge spillovers, technology transfers and innovativeness, shows the remarkable significance of global linkages (Subramaniam and Venkatraman, 2001; Asheim and Isaksen, 2002; Simmie, 2003; Bathelt *et al.*, 2004; Armatlı-Köroğlu, 2005; Eraydın and Armatlı-Köroğlu, 2005; Subramaniam, 2006; Duyster and Lokshin, 2011).

To investigate the effects of different geographical levels of network ties on innovativeness of cluster firms, as indicated in the aforementioned research, the following hypotheses were formulated:

*H7*. There is a positive relationship between the total number of (weak/loose) network ties at local/national/global levels perceived as source of information and innovation performance.

*H8*. There is a positive relationship between the total number of (strong) network ties at local/national/global levels perceived as strategic alliance and innovation performance.

*H9*. There is a positive relationship between the total number of (strong) network ties at local/national/global levels perceived as strategic alliance and performance in different types of innovation (product, process, marketing and organization).

The character of supplier relations also matters for innovation performance. Relations in the form of strategic alliances are recognized as important tools for successful innovations (Teece, 1990). Including suppliers into the innovation processes helps to decrease costs, increase product quality and shorten production cycles (Ragatz *et al.*, 1997). Various studies show the positive impact of strong linkages in the form of strategic alliances with suppliers on the innovation performance of manufacturing firms (Liker *et al.*, 1995; Bidault, 1998; Sobrero and Roberts, 2002). Taking into consideration the manufacturing feature of yacht-building firms that rests on high dependence on suppliers and sub-contractors, strong ties with these third parties were presumed to have a positive relationship with innovation performance and a final hypothesis was drawn:

*H10*. There is a positive relationship between the total number of (strong) network ties with third parties that contribute to production (suppliers and sub-contractors) at local/national/global levels, perceived as strategic alliance and performance in different types of innovation (product, process, marketing and organization).

## 3. Method

### *3.1 Research setting*

The empirical setting of the research is the yacht-building industry in Turkey. The reason for choosing the yacht-/boat-building industry for the field study was that, despite the rich traditional roots in wooden boat-building crafts in Turkey, it has remained as an unrecognized, underappreciated field of business for many segments of society. During the past 20 years, this traditional wooden boat-building craft agglomerated in some

geographical regions of Turkey and transformed itself into a luxury yacht-building business activity (Uyanık and Sarı, 2008). Traditional boat and yacht-building skills combined with modern techniques and naval engineering knowledge have enabled the Turkish yacht-building industry to become an internationally recognized one since early 1990s. Yachts built in Turkey have been exported all over the world (Turkish Ship and Yacht Exporters, 2012). For the past six years, Turkey has ranked as the third country in the world receiving mega yacht orders (Global Order Book, 2011, 2012, 2013, 2014, 2015, 2016). Like the New Zealand custom boat-building industry (Glass and Hayward, 2001), the production of this industry is mostly customized boats, in the form of "individual or small batches of craft built to customers' or designers' specifications". These boats are primarily sail or motor-powered craft demanded for sports or recreational purposes. The firms in this industry rely on international suppliers for high-tech mechanical equipment and electronic appliances. In this respect, findings are generalizable only for similar industries.

*3.2 Population and sample of the study*

Preliminary data about the population of the study were obtained from several official websites. According to the industry report issued by the Turkish Ministry of Transportation in 2010, Turkey ranked as the fifth country receiving yacht orders in the world with a share of 9 per cent (UBAK, 2010). The official number indicated for registered yacht/boat builders on the website of the Chamber of Shipping was 360 (62 in İstanbul, 48 in Antalya, 48 in İzmir, 44 in Marmaris, 25 in Fethiye, 41 in Bodrum, 45 in Black Sea Region and 47 in other places) (Chamber of Shipping Izmir Branch, 2010). The authors of the study conducted a series of data searching techniques to obtain a reliable list of firms actually operating in the regions mentioned above, to achieve access to a representative sample of firms from each region. Internet sources provided various listings; member lists were requested from the regional Chambers of Trade and Chambers of Shipping and from various associations or cooperatives formed by yacht-/boat-building firms. Researchers visited the 2011 Eurasia Boat Show to pinpoint any firms that might be missing in the available lists. Before site visits, the firms in the eventual list for each specific location were called one by one. Some were already out of business, some refused to make interview. Interview appointment was requested from the top-level manager or any authorized manager of the firms that responded positively. Semi-structured interviews were conducted, and the structured questionnaires were filled by the same managers. The interviewed firms were also requested to give names of yacht-building firms that they knew, and these were included in the list. As a result of this snowball sampling method, 143 firms (39 in İstanbul/Tuzla-Pendik, 30 in Bodrum, 22 in Antalya, 16 in İzmir, 13 in Bartın and Cide and 7 in Marmaris, 5 in Fethiye, 5 around Yalova-Kocaeli, 4 in Manavgat and 2 in Bursa/Orhangazi) were interviewed. These 143 firms represent 78 per cent of the yacht/boat builders that were found to be in business as of the date of the site visits to the designated regions of the field study. Respective rates of sample representativeness are 66 per cent in İstanbul, 96 per cent in Bodrum, 91 per cent in Antalya, 76 per cent in İzmir, 65 per cent in Bartın and Cide, 87 per cent in Marmaris, 100 per cent in Fethiye, 85 per cent around Yalova-Kocaeli, 100 per cent in Manavgat and 50 per cent in Bursa. Because the regions visited comprise the major yacht-/boat-building areas all over Turkey, this study can safely boast to describe the situation in 78 per cent of the industry.

*3.3 Data collection tool*

The structured questionnaire of the present study comprised four parts, the first pertaining to some descriptive information about the firm; the second pertaining to innovation performance (scale adapted to the industry from the study by Varis and Littunen, 2010); the third pertaining to the local, national and global linkages in the business networks of firms

(scale developed by the authors basing on the relevant literature); and the fourth pertaining to the satisfaction of respondents with the performance of their firms (subjective performance scale adapted from the study by Venkatraman (1989). These measurement tools will be further explained below as a foundation for the descriptive statistics.

*3.4 Measurements and descriptive statistics*

The descriptive statistics regarding the dependent variables, namely, innovation performance and business performance, and the independent variables relating to certain dimensions of the business networks are summarized in Table I. The comparison of early and late respondents revealed no significant difference in any construct, so nonresponse bias was not a major concern.

*3.4.1 Innovation performance.* To operationalize the measurement of firm innovation performance, a self-reported scale based on Varis and Littunen's (2010) innovation performance survey was adapted to the Turkish yacht-building industry. As explained above, this industry has peculiar characteristics, and without making an adaptation to the terminology of boat-building, it would be difficult to collect data from the manufacturers regarding the innovations they might have performed. The project group worked in consultation with a naval engineer in adapting the original scale to the properties of the yacht-building firms (See Appendix). Twelve innovation areas were identified, and respondents were asked to rate on a five-point response scale, the degree of novelty introduced during the past three years on each of these 12 innovation areas (5 – completely new, 4 – radical improvement or change, 3 – improvement on the current, 2 – small changes and 1 – no change). And in evaluating the results, only the first two responses were accepted as an innovation, and the firm was given a score of one for each innovation type (product, process, marketing and organization) if there was at least one item checked in that category.

| Dependent variables | $\bar{X}$ | $N$ | % | SD |
|---|---|---|---|---|
| Overall innovation performance | 2.00 | 143 | | 1.34 |
| Firm performance | 2.91 | 143 | | 0.8 |
| Independent variables | | | | |
| Total number of network ties | 92.86 | 143 | 1.00 | 141.66 |
| Local | 27.34 | 143 | 0.29 | 26.76 |
| National | 40.20 | 143 | 0.44 | 63.44 |
| Global | 25.32 | 143 | 0.27 | 51.46 |
| Total number of network ties perceived as source of information (weak ties) | 55.39 | 143 | 1.00 | 86.50 |
| Local | 17.40 | 143 | 0.31 | 20.19 |
| National | 22.32 | 143 | 0.40 | 34.32 |
| Global | 15.67 | 143 | 0.28 | 31.99 |
| Total number of network ties perceived as strategic alliance (strong ties) | 8.21 | 143 | 1.00 | 21.93 |
| Local | 2.80 | 143 | 0.34 | 6.06 |
| National | 2.58 | 143 | 0.31 | 6.44 |
| Global | 2.83 | 143 | 0.34 | 9.43 |
| Total number of strong network ties providing support to production in yacht building firms | 4.15 | 143 | 1.00 | 12.24 |
| Local | 1.46 | 143 | 0.35 | 3.75 |
| National | 1.33 | 143 | 0.32 | 3.56 |
| Global | 1.36 | 143 | 0.33 | 4.93 |

**Table I.**
Descriptive statistics

The other responses were coded as "no innovation". The firms were given a score out of 4, depending on the number of accepted innovations for each category. The acceptability of the scale questions to the industry was checked by a pilot study on five firms, and after confirming its' appropriateness, it was included in the final questionnaire. This measurement is in line with the generally accepted definitions of innovation. Prior research has shown that this perception-based measure of innovation performance is reliable and correlates highly with other (objective) measures of innovation performance (Hagedoorn and Cloodt, 2003). Because the innovation scale was not an attitude scale, reliability of the data was guaranteed by cross-check questions addressed by the interviewing researchers.

The average innovation performance of firms was found as $2 \pm 1.34$ out of 4. Among 143 firms included in the sample, the highest performance was in product innovation (92 firms), followed by process innovation (80 firms), marketing (65 firms) and organization innovations (49 firms) showing relatively lower frequencies. This finding indicates a mediocre innovation performance on average; the highest frequencies were observed in product and process innovations, and the lowest in organization innovation. To understand this result, it should be taken into consideration that firms in this industry are manufacturing enterprises working on customized small batch or individual products, where meeting customer needs and expectations is a requirement for sustained competitiveness. There is a need for an ongoing quest for technological innovation in the basic features (size, speed, weight, endurance, reliability etc.) and design features (aesthetics, ergonomics, performance, etc.) of boats. And since the industry mostly comprises small-sized firms operating with few employees and relying on traditional boat-building and firm management techniques, it is easy to understand why marketing or organization innovations were used less frequently. Therefore, it is quite likely that any innovation performed by boat builders will be on the product.

*3.4.2 Firm performance.* Firm performance is a variable that can be measured by either objective or subjective indicators (Harris, 2001). The yacht-building firms in the sample were mostly small enterprises with no requirement to disclose financial information. Reluctance of the respondents to share performance data of their company led the researchers to use a subjective scale adapted from Venkatraman (1989), as proposed by various scholars (Priem *et al.*, 1995; Sapienza *et al.*, 1988) when there is difficulty in obtaining objective performance data. Several studies revealed positive correlation between objective and subjective indicators of firm performance (Dess and Robinson, 1984; Venkatraman and Ramanujam, 1986; Wall *et al.*, 2004). The project group consulted the naval engineer in the team while adapting the original scale to the yacht-building industry, and the relevance of the scale to the industry was checked by a pilot study on five firms before using in the final questionnaire. In the current study, firm performance was measured with subjective questions on a five-point Likert scale directed at the firm manager (See Appendix). To measure the internal consistency of the scaled questions, a Cronbach's alpha was used. The Cronbach's alpha results for firm performance was 0.87, indicating good reliability and internal consistency. The average perceived business performance of firms in the sample was found as $2.91 \pm 0.8$. This finding indicates a mediocre level of average perceived performance, but considering that the time of the survey coincided with the worst after-effects of the 2009 global economic crisis; this result seems to be even better than expectations.

*3.4.3 Structure of the business networks.* The number and strength of ties at local, national and global levels in the multilevel business networks of yacht-building firms were inquired by a group of questions formulated by the researchers drawing on the relevant research and the traits of the industry. The project group worked with the naval engineer in the team in

formulating the questions, and the relevance of the questionnaire to the industry was checked by a pilot study on five firms. This question group explores the number and strength of ties with 25 different actors categorized in four groups (supporters of the production process, service providers, marketing actors and other information-sharing institutions), which are likely to exist in the business networks of yacht-building firms. Answers to these questions provided data on the size of networks with different linkage strengths at four different functional areas and at three different geographical levels, and the structure of the business networks was determined with respect to size and strength. Data were collected by directly asking the total number of more or less stable business linkages at local, national and global levels with the designated 25 actors in the industry. Firms were also asked to discriminate between their weak and strong ties by answering how many of these ties they would consider just as a source of valuable information and how many they would consider as strategic alliance (more frequent and stable business ties that provide benefits to both sides). Thus, for each possible network actor, data were obtained pertaining to the size and strength of the business ties at different geographical levels (See Appendix).

When the shares of three geographical levels in the total network of all firms were compared, those for national ties was the highest (44 per cent), and those for local (29 per cent) and global networks (27 per cent) were close to each other. Multilevel network ties perceived as a source of information revealed a distribution similar to the total network, with national ties receiving the highest share (41 per cent), followed by local ties (31 per cent) and global ties (28 per cent). Multilevel network ties perceived as strategic alliance revealed a distribution with similar shares at local (34 per cent), national (32 per cent) and global (34 per cent) levels. This represents a balanced network between different geographical levels and indicates that strategic alliances are needed and available at local, national and global levels at similar degrees.

Another variable investigated in this study was the number of strategic alliances with suppliers and sub-contractors as supporters of the production process in yacht-building firms. In this category, $4.15 \pm 12.24$ strategic alliances per firm were measured, which represent 51 per cent of strategic alliances formed by firms with overall network actors. This figure is followed by strategic alliances with actors of service providers ($1.97 \pm 7.23$), market relations ($1.22 \pm 6.13$) and information relations ($0.83 \pm 3.79$). This finding indicates the importance of network ties with suppliers and sub-contractors in this industry.

## 4. Results

One major theme investigated in this study was the relationship between the size and strength of network ties and innovation performance of firms. As measurements of the size of the network, the total number of (weak) network ties perceived as source of information and the total number of (strong) network ties perceived as strategic alliance were taken as independent variables and their relationship with overall innovation performance were tested respectively as *H1* and *H2*. The limitation with the statistical analysis here was due to the nominal nature of the dependent (innovation performance) and the independent variables (certain dimensions of business networks). Instead of multivariate design that would provide stronger testing of various aspects, fundamental chi-square testing allowed by nominal variables (Lundqvist, 2014) had to be preferred. Chi-square test is a nonparametric test, which does not require assumptions of normality (Field, 2013). To conduct chi-square analysis, data of the study on the number of firm network linkages were classified into four groups (low, medium, high and very high). The range between the lowest and the highest numbers of linkages were divided into four, to designate these groups, the sub-group that contains the lowest numbers of linkages was labeled as the "low" category, with the others

getting labels as "medium", "high" or "very high" according to the relative size of the networks in the group. In grouping the innovation performance levels, the actual number of innovation type (product, process, marketing, organization) realized by the firm was taken into consideration. Those firms who reported "no innovation" in any one type were labeled as the "no innovation" group; the ones who reported innovation in one or two types were labeled as the "low" innovation performance group; the ones who reported innovation in three types were labeled as the "medium" innovation performance group and finally, the ones who realized innovation in all four types were labeled as the "high" innovation performance group.

Results of the chi-square analysis carried out to test *H1*, which presumes a positive relationship between the total number of (weak/loose) network linkages perceived as source of information and overall innovation performance are presented in Table II. Chi-square test found Pearson chi-square value = 10.792, SD = 9 and $p = 0.290$. This finding indicated no significant relationship between the variables, and hence *H1* was rejected.

Results of the chi-square analysis carried out to test *H2*, which presumes a positive relationship between the total number of (strong) network linkages perceived as strategic alliance and overall innovation performance, are presented in Table III. For this table, Linear-by-Linear measurement value was used, as the number of cells that contain expected value of less than 5 is 4 (25 per cent). Chi-square value is 2.754, SD = 1 and $p = 0.097$, indicating a significant relationship between the total number of network ties perceived as strategic alliance and overall innovation performance. Hence, *H2* was supported.

The concept of "structural embeddedness" forwarded by Uzzi (1996) presumes that the survival chance of firms depends on the nature of their network linkages. His study indicated that the firms that succeed in combining embedded (strong) ties with arm's-length (weak) ties had the highest chance of survival. To test this finding in the current study, a correlation analysis was conducted between the total number of weak and strong network ties (perceived as source of information + strategic alliances) and firm performance. Results of

**Table II.**
The relationship between the number of network ties perceived as source of information and overall innovation performance

| Number of network ties perceived as source of information | Level of overall innovation performance: No innovation | | Low | | Medium | | High | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (*n*) | (%) | (*n*) | (%) | (*n*) | (%) | (*n*) | (%) | (*n*) | (%) |
| Low | 12 | 0.31 | 13 | 0.33 | 11 | 0.28 | 3 | 0.08 | 39 | 100 |
| Medium | 9 | 0.29 | 12 | 0.39 | 5 | 0.16 | 5 | 0.16 | 31 | 100 |
| High | 5 | 0.13 | 16 | 0.43 | 8 | 0.22 | 8 | 0.22 | 37 | 100 |
| Very high | 5 | 0.14 | 14 | 0.39 | 13 | 0.36 | 4 | 0.11 | 36 | 100 |
| Total | 31 | 0.22 | 55 | 0.38 | 37 | 0.26 | 20 | 0.14 | 143 | 100 |

**Table III.**
The relationship between the number of network ties perceived as strategic alliance and overall innovation performance

| Number of network ties perceived as strategic alliance | Level of overall innovation performance: No innovation | | Low | | Medium | | High | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (*n*) | (%) | (*n*) | (%) | (*n*) | (%) | (*n*) | (%) | (*n*) | (%) |
| Low | 16 | 0.28 | 21 | 0.37 | 9 | 0.16 | 11 | 0.19 | 57 | 100 |
| Medium | 9 | 0.20 | 20 | 0.44 | 15 | 0.33 | 1 | 0.03 | 45 | 100 |
| High | 3 | 0.19 | 6 | 0.37 | 4 | 0.25 | 3 | 0.19 | 16 | 100 |
| Very high | 3 | 0.12 | 8 | 0.32 | 9 | 0.36 | 5 | 0.20 | 25 | 100 |
| Total | 31 | 0.22 | 55 | 0.38 | 37 | 0.26 | 20 | 0.14 | 143 | 100 |

the correlation analysis testing *H3* which presumes a positive relationship between the total number of network ties (perceived as source of information + strategic alliances) and firm performance are presented in Table IV. These results indicated no significant relationship between these variables, hence *H3* was rejected.

This finding had to be further investigated by testing the relationship separately for weak and strong ties. Results of the correlation analysis carried out to test *H4*, which presumes a positive relationship between the total number of (weak/loose) network ties perceived as source of information and firm performance, are also presented in Table IV. These results indicated no significant relationship between these variables, hence *H4* was rejected. Results of the correlation analysis carried out to test *H5*, which presumes a positive relationship between the total number of network (strong) ties perceived as strategic alliance and firm performance are also presented in Table IV. No significant relationship was found between these variables, and *H5* was also rejected. Another theme found worthwhile to inquire in this study was the relationship between innovation performance and firm performance of yacht-building firms. Results of the correlation analysis carried out to test *H6*, which presumes a positive relationship between innovation performance and firm performance are presented in Table IV. A positive and significant relationship was found between these variables, hence *H6* was supported.

Another theme inquired in this study was the relationship between the geographical levels of weak or strong network linkages and innovation performance. The relationship between the total number of (weak/loose) network linkages perceived as source of information by yacht-building firms at local/national/global levels and overall innovation performance (*H7*) was tested, and as demonstrated in Table V, this hypothesis was rejected. This result demonstrated that the number of weak ties at any geographical level by themselves did not have any positive impact on overall innovation performance.

| Variables | Firm performance |
|---|---|
| Total number of weak and strong network ties | $r = 0.085$<br>$p = 0.315$ |
| Total number of network (weak/loose) ties perceived as source of information | $r = 0.101$<br>$p = 0.231$ |
| Number of network (strong) linkages perceived as strategic alliance | $r = -0.069$<br>$p = 0.410$ |
| Innovation performance | $r = 0.166$<br>$p = 0.048$* |

**Note:** *$p < 0.05$

**Table IV.** The relationship between tested variables and firm performance

| Total number of (weak/loose) network ties at different geographical levels, perceived as source of information | Overall innovation performance |
|---|---|
| Local | $r = 0.037$<br>$p = 0.661$ |
| National | $r = 0.089$<br>$p = 0.290$ |
| Global | $r = 0.120$<br>$p = 0.153$ |

**Table V.** The relationship between the total number of (weak/loose) multi-level network ties perceived as source of information and overall innovation performance

The relationship between the total number of (strong) network linkages perceived as strategic alliance by yacht-building firms at local/national/global levels and overall innovation performance (*H8*) was also tested, and as can be observed in Table VI, *H8* was also rejected. This result indicated that at no geographical level strong ties had a significant impact on overall innovation performance.

The aforementioned findings (*H7* and *H8*) led to the presumption that yacht-building firms may not be giving equal importance and thus using all four types of innovation (product, process, marketing, organization); thus, use of a variable containing an average of these four different types of innovation might be misleading. From this point of view, the aforementioned relationship was tested for each type of innovation. Results of the correlation analysis carried out to test *H9* which presumes a positive relationship between the total number of multilevel (strong) network linkages perceived as strategic alliance and performance in different innovation types (product, process, marketing and organization innovation) are presented in Table VII.

The results demonstrated in Table VII indicate a positive and significant relationship between the total number of network ties perceived as strategic alliance at national ($p < 0.10$) and global ($p < 0.05$) levels and performance in product innovation. Another positive and significant relationship was found between the total number of network ties perceived as strategic alliance at the global level ($p < 0.10$) and performance in organization innovation. No significant relationship was indicated between the same variable and the other types of innovation performance, and *H9* was supported partially.

Another theme investigated in this study was the relationship between total number of multilevel (strong) network linkages at local/national/global levels perceived as strategic alliance with supporters of the production process (i.e. suppliers and sub-contractors) and performance in different innovation types (product, process, marketing and organization)

**Table VI.**
The relationship between the total number of (strong) multi-level network linkages perceived as strategic alliance and overall innovation performance

| Total number of (strong) network ties at different geographical levels, perceived as strategic alliance | Overall innovation performance |
|---|---|
| Local | $r = 0.106$<br>$p = 0.210$ |
| National | $r = 0.123$<br>$p = 0.144$ |
| Global | $r = 0.089$<br>$p = 0.290$ |

**Table VII.**
The relationship between the total number of multi-level (strong) network linkages perceived as strategic alliance and performance in different innovation types

| | Innovation type | | | |
|---|---|---|---|---|
| Total number of (strong) network ties at different geographical levels, perceived as strategic alliance | Performance in product innovation | Performance in process innovation | Performance in marketing innovation | Performance in organization innovation |
| Local | $r = 0.116$<br>$p = 0.143$ | $r = 0.075$<br>$p = 0.377$ | $r = 0.050$<br>$p = 0.557$ | $r = 0.033$<br>$p = 0.696$ |
| National | r = 0.165*<br>p = 0.050 | $r = 0.133$<br>$p = 0.114$ | $r = -0.047$<br>$p = 0.581$ | $r = 0.109$<br>$p = 0.195$ |
| Global | r = 0.187**<br>p = 0.026 | $r = 0.031$<br>$p = 0.717$ | $r = -0.106$<br>$p = 0.209$ | $r = 0.154$*<br>$p = 0.066$ |

**Notes:** $^{**}p < 0.05$; $^{*}p < 0.1$

(*H10*). Results of the correlation analysis carried out to test *H10* which presumes a positive relationship between the total number of multilevel (strong) network ties perceived as strategic alliance with supporters of the production process (suppliers and contractors) and performance in different innovation types (product, process, marketing and organization innovation) are presented in Table VIII.

At local level, positive and significant relationship was found between the total number of network ties perceived as strategic alliance with supporters of the production process (suppliers and contractors) and overall innovation performance, and also performance in product innovation ($p < 0.05$) and performance in marketing innovation ($p < 0.10$).

At the national level, positive and significant relationship was found between the total number of network ties perceived as strategic alliance with supporters of the production process (suppliers and contractors) and performance in product innovation ($p < 0.05$) and overall innovation performance ($p < 0.10$). And at global level, a positive relationship was found between the total number of network ties perceived as strategic alliance with supporters of the production process (suppliers and contractors) and performance in product innovation. No significant relationship was found between the same variable and the other types of innovation performance, and *H10* was also supported partially.

## 5. Discussion and conclusions

This study provided valuable information regarding the business network structure of yacht-building industry whose field survey data were obtained from 143 firms scattered all around the coastal regions of Turkey (except for the two firms located in Bursa-Orhangazi). A survey was conducted in 2011, at a time when the industry companies were experiencing the worst after-effects of the 2009 global economic crisis. The sample interviewed represented the survivors of the crisis, who had performed comparatively better than their competitors. Regarding this disadvantaged business period, it was not surprising to find a mediocre level of average innovation performance accompanied by a mediocre level of average firm performance in the sample.

In this study, we assessed the size and strength of multilevel business networks of yacht-building firms and tried to determine the configuration of network ties that would have positive impact on innovation and firm performance. Respondents were asked to discriminate between their network ties that they perceived as source of information from the ones that they perceived as strategic alliance at local, national and global levels. These data made it possible to determine the structure of business networks with four different groups of actors (supporters of the production process, service providers, marketing actors and other

**Table VIII.** The relationship between the total number of multi-level (strong) network ties perceived as strategic alliance with supporters of the production process (suppliers and contractors) and performance in different innovation types

| Total number of (strong) network ties at different geographical levels, perceived as strategic alliance with supporters of the production process | Innovation types | | | | |
|---|---|---|---|---|---|
| | Overall innovation performance | Performance in product innovation | Performance in process innovation | Performance in marketing innovation | Performance in organization innovation |
| Local | $r = 0.187^{**}$<br>$p = 0.025$ | $r = 0.188^{**}$<br>$p = 0.024$ | $r = 0.076$<br>$p = 0.365$ | $r = 0.157^{*}$<br>$p = 0.061$ | $r = 0.100$<br>$p = 0.234$ |
| National | $r = 0.157^{*}$<br>$p = 0.061$ | $r = 0.187^{**}$<br>$p = 0.025$ | $r = 0.106$<br>$p = 0.207$ | $r = -0.077$<br>$p = 0.362$ | $r = 0.084$<br>$p = 0.320$ |
| Global | $r = 0.005$<br>$p = 0.952$ | $r = 0.147^{*}$<br>$p = 0.080$ | $r = -0.079$<br>$p = 0.351$ | $r = -0.53$<br>$p = 0.531$ | $r = 0.030$<br>$p = 0.726$ |

**Notes:** $^{**}p < 0.05$; $^{*}p < 0.1$

information-sharing institutions) at corresponding geographical levels. These data revealed that national ties received the highest share (44 per cent), with local (29 per cent) and global (27 per cent) ties remaining relatively small. Data on the size of networks perceived as strategic alliance demonstrated that local (34 per cent), national (32 per cent) and global (34 per cent) levels received almost equal shares. This finding implies that this industry has developed a balanced structure of multilevel strategic alliances, making use of embedded ties with supporters of the production process, service providers, marketing actors and other information-sharing institutions, according to the specific conditions of their industry environment.

Analyses conducted to test the hypotheses of the study revealed that it was predominantly the total number of network ties perceived as strategic alliance (*H2*) that had a significant impact on overall innovation performance, rather than those perceived as source of information (*H1*). The findings for *H1* and *H2* are in conformance with a number of studies in literature (Grant and Baden-Fuller, 2004; Inkpen and Tsang, 2005; Heimeriks and Duysters, 2007; Walter *et al.*, 2008; Luo and Deng, 2009; Cui and O'Connor, 2012). Explanation offered for similar findings is that, arm's-length (weak/loose) relationships provide firms with explicit/codified information that is accessible in other ways, while tacit/implicit knowledge containing important insights for innovation can only be carried through strong (tight/embedded) ties that are regarded as strategic alliance (Cavusgil *et al.*, 2003; Badir and O'Connor, 2015). Such ties enable people to spend more time together and facilitate transfer of implicit knowledge through close communication (Uzzi, 1996). This finding can be better interpreted by considering the nature of the production process in custom boat building, which predominantly rests on traditional methods transferred by masters to apprentices as tacit knowledge. Because codified knowledge is less relevant in this type of production, it is not surprising to find that arm's-length relations that are perceived as sources of information do not have much impact on innovativeness in this industry. This finding implies that in similar industries, the network ties used must somehow make a difference in developing tacit knowledge and joint problem-solving which require mutual trust based on frequent on-the-job relations to have an impact on innovation.

Another research interest of this study was the configuration of the business network that would have the highest impact on firm performance. This was assessed by three hypotheses that tested the impact of the size of the total network (*H3*), only weak/arm's-length ties (perceived as source of information; *H4*) and only strong ties (perceived as strategic alliance; *H5*) on the dependent variable firm performance. Results indicated no significant impact of total, weak or strong network size on firm performance. An important empirical study by Rowley *et al.* (2000), which tested the impact of weak and strong ties on firm performance, demonstrated that strong ties in a highly interconnected strategic alliance network negatively affect firm performance. In this study, strong ties were found to be positively related to firm performance in the steel industry, whereas weak ties were positively related to firm performance in the semiconductor industry. Hence, the authors argued that the impact of relational and structural embeddedness on firm performance is contingent on industry context. This finding is also in conformance with the contention of Gulati (1998) that firm performance is under the influence of many other factors besides alliances, and it would be difficult to find a positive relationship empirically (p. 309). And still there is a study (Lahiri and Narayanan, 2013) which proposes that "at high levels of innovation of the focal firm, increasing alliance portfolio size dampens financial performance". Firm boundaries were found to be moderating the impact of alliance portfolio size on innovation and financial performance differently.

Here it would also be appropriate to mention about the negative after-effects of the 2009 global crisis on the yacht-building industry. Collection of the field data of this study in 2011 coincided with the worst period of after-effects of this crisis. When the effects of the global crisis began to be felt in 2009, the existing yacht projects of the firms helped them sustain their business position for one or two years. Eventually, in 2011, the drastic fall in demand for new yachts was accompanied by a sudden increase in second-hand yacht sales, which led to an unavoidable fall in new yacht orders all over the world. Many firms quit business, some firms tried to survive the crisis by small maintenance or renovation projects, while still some others pulled down their prices to even unsustainable levels. Under these conditions, it was quite difficult to assess the presumed relationships (*H3*, *H4*, and *H5*) between the various properties of the network and firm performance. In this industry, business performance somehow seemed to be more dependent on factors like the availability of long-term boat construction contracts at the time of the economic crisis and/or financial power of their current customers to sustain payments for the continuation of the boat construction.

Another question tested in this study was the relation between innovation performance and firm performance (*H6*). Positive relationship was confirmed between these variables. This finding is in conformance with studies which found positive relationship between innovation and firm performance (Roberts, 1999; Calantone *et al.*, 2002; Cho and Pucik, 2005; Artz *et al.*, 2010; Gunday *et al.*, 2011; Atalay *et al.*, 2013). It can be safely argued that despite the hard economic conditions, those firms who were able to show high innovativeness were also high business performers.

An important question of the present study was the performance implications of the geographical proximity of business network partners, as an extension of the arguments about the impact of externalities of clusters or the multilevel networks on innovation. As mentioned above, early cluster studies emphasized benefits of geographical proximity enjoyed by cluster firms (Krugman, 1991; Porter, 1990, 1998, 2000), while more recent studies (Asheim and Isaksen, 2002; Simmie 2003; Armatlı-Köroğlu, 2005; Eraydın and Armatlı-Köroğlu, 2005) showed the critical importance of integrating with global markets. The literature on regional innovation systems and innovation geography is exploring the interaction of many different aspects of multilevel innovation alliances for sustained commercial performance of innovations. Literature on clustering at regional or city level or impact of inter-country and inter-city alliances on innovation output of alliances (Guan *et al.*, 2015) continue looking for the contingencies or moderating factors that influence the relation.

Considering that such findings carry critical importance in designing clustering policies, especially for the yacht-building industry which is closely linked to external markets both for suppliers and customers, it was seen as a worthwhile question to find out the relationship between innovation performance and the size and strength of local, national or global networks. Therefore, it was necessary to test the relationship with the dependent variable overall innovation performance by breaking up the total number of weak and strong network ties into local, national and global levels. The tests revealed no significant relationship at any specific level between overall innovation performance and the number of ties perceived as source of information (*H7*) or as strategic alliance (*H8*). Upon these findings, the presumption that strong network ties might have an impact only on some types of innovation led the researchers to test the same relationship by breaking down the data on innovation performance into its constituent types (product, process, marketing and organization innovation). Results indicated a positive and significant relationship between the total number of network ties perceived as strategic alliance at national and global levels and performance in product innovation; another positive and significant relationship was found between the total number of network ties perceived as strategic alliance at the global level

and performance in organization innovation (*H9* supported partially). This finding is in conformance with the main findings of the study by Hofman *et al.* (2016) which demonstrated that the "impact of organizational coupling among innovation network partners on innovation commercial performance is contingent upon the type of innovation being pursued". The major difference with the present study is the classification of innovation as "modular" and "architectural" instead of the classical innovation types as product, process, marketing and organizational (OECD and Eurostat, 2005), and no geographical differentiation of alliance partners was included in the study. Our finding showed the importance of network ties perceived as strategic alliance at national and global levels on product innovation, which is the innovation type most relevant for the customized design nature of yacht building. As explained above, majority of the firms in the sample are small enterprises, mostly relying on product innovations for customer satisfaction; process, marketing or organization innovations seem to occur relatively less frequently, with a lower impact on the presumed relationship. Performance in organization innovation was found to be related only with the size of the global network perceived as strategic alliance. This finding can be explained with the fact that mostly the larger firms are capable of establishing ties with global actors, suppliers and service providers of the yacht-building industry, and organization innovations are likely to take place in larger firms.

A last theme assessed was related to the effect of the number of strong network ties with supporters of the production process (i.e. suppliers and sub-contractors) on specific types of innovation performance at different geographical levels. This group of actors is expected to make a significant impact on innovation performance of yacht-building industry because of the customized project or small batch nature of the manufacturing process. Findings again indicated the importance of network ties perceived as strategic alliance with supporters of the production process at local and national levels on both overall innovation and product innovation performance (*H10* supported partially). This finding is in conformance with the arguments of the cluster theory (Krugman, 1991; Porter, 1998, 2000), implying positive impact of proximity of suppliers and sub-contractors on different types of innovation performance. The operational location of global suppliers is important in interpreting this result. Though sub-contractors are mostly local, suppliers are generally representatives of global mechanical hardware and electronic appliances firms, situated at local or national levels. Global firms giving service to Turkish yacht builders through representatives at national level are mostly located in İstanbul. Thus, these representative suppliers were designated as "local" by yacht-building firms operating in İstanbul, and by the firms in other regions, they were designated as "national". Real global linkages in this group were relatively fewer in number and the total number of such linkages was also found in positive relationship with performance in product innovation. Only the network size of the local supporters of the production process perceived as strategic alliance was found to be positively related to performance in marketing innovation. No significant relationship was found between the same variable and the other types of innovation performance.

Findings of this study are expected to contribute to the literature on factors affecting the innovativeness and competitiveness of yacht-building firms on one hand, and the literature on the structural properties of business networks and innovation performance on the other hand. This study more specifically fills a gap in the exploration of network configurations that have a positive impact on innovation and firm performance, by dealing with the impact of the size, strength and geographical level of networks in one single study. The yacht-building industry as the empirical setting represents a specific category of industries that rest on customized manufacturing according to customer or designer specifications,

requiring considerable interaction with customers and suppliers. Because no study exists on this topic, findings can inspire similar industries.

A possible contribution of this study for industry members would be the implications of the finding that indicates a positive impact of strategic alliances with different actors of the industry on overall innovation performance and product innovation performance. This finding suggests the benefits of establishing long-term and trust-based relationships with suppliers and sub-contractors at different geographical levels, and recommends joint action in R&D projects, product development, manufacturing design, etc. Results indicated the significance of strategic alliances at national and global levels for product innovation, and demonstrated the importance of strategic alliances at global level for organization innovation, while also showing the importance of strategic alliances with suppliers and sub-contractors at the local level for overall innovation performance, product innovation and also marketing innovation. These findings may inspire members of similar industries to work on a more fruitful network structure for maximum innovation outcomes.

The most important limitation of this study with respect to generalizability of research results concerns the empirical setting which represents an industry that is not familiar for many scholars, because of its peculiarity of production and marketing systems. As mentioned above, the yacht-building industry in Turkey is similar to that described for New Zealand (Glass and Hayward, 2001) producing mostly customized sail or motor-powered boats, in the form of "individual or small batches of craft built to customers' or designers' specifications" and relying on international suppliers for high-tech mechanical equipment and electronic appliances. In this respect, findings are generalizable only for similar industries. Another limitation of this study has been the timing of the research project, which coincided with the worst after-effects period of the 2009 global economic crisis. It was difficult to determine the network-based determinants of firm performance, which seemed to be dependent on factors probably more related with chance rather than the size and strength of network ties with different industry actors. Related with this concern, the cross-sectional nature of the data can also be noted as a limitation. It would be comforting to collect longitudinal data to see the changes in the empirical setting under better economic conditions. Another limitation of the study was the necessity to use subjective data for firm performance. As explained above, small- and medium-sized firms are not required to disclose financial information, and their managers are reluctant to give such information to the interviewers. As suggested for such situations, this study used a subjective scale proposed in previous studies (Venkatraman, 1989). The limitation with the statistical analysis was due to the nominal nature of the dependent (innovation performance) and independent variables (certain dimensions of business networks) which limited the use of multivariate analysis.

For further studies, we may suggest comparative exploration of network configurations in industries of different nature to develop propositions for theory building. Another interesting topic would be the investigation of the nature, type and operation of strategic alliances with different actors of the industry. A detailed analysis of relationships with multilevel strategic alliances would provide a deeper understanding about the performance determinants in different industrial contexts.

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## Appendix. Questionnaire items

### *A.1. Innovation performance*

In the question below, please check the relevant column to specify what kind of innovation was achieved in your firm during **last three years** in the areas indicated at each row. Please give only one answer to each row and do not skip any row.

| | Completely new | Radical improvement or change | Change on the current product | Small changes | No change |
|---|---|---|---|---|---|
| In the main specifications of the boat (i.e. size, speed, weight, durability, reliability) | | | | | |
| In the design features of the boat (i.e. aesthetics, ergonomics, performance) | | | | | |
| In the manufacturing techniques of the boat (affecting cost, quality and production time) | | | | | |
| In the equipment used in construction of the boat (affecting cost, quality and production time) | | | | | |
| In the software used in design and engineering of the boat (i.e. 3-D design software) | | | | | |
| In the software used in production and management of the firm (i.e. enterprise resource planning (ERP) software) | | | | | |
| In the marketing positioning of the boat (i.e. brand name, geographical indication) | | | | | |
| In promotion of the boat in the market (i.e. internet, fairs, magazines) | | | | | |
| In payment techniques to facilitate selling of the boats (i.e. leasing, customer partnerships) | | | | | |
| In classification (register of shipping) or quality management systems | | | | | |
| In the human organization of the firm (an important change) | | | | | |
| External cooperations, strategic alliances | | | | | |

(*continued*)

*A.2. Firm performance*

Please indicate the degree of your satisfaction with the indicated performance criteria at each row during **last three years** by checking the relevant column.

| | Not satisfied | Satisfied to a small extent | Satisfied at a medium extent | Satisfied | Satisfied at a high extent |
|---|---|---|---|---|---|
| 1.Increase in sales | 1 | 2 | 3 | 4 | 5 |
| 2. Profit margin | 1 | 2 | 3 | 4 | 5 |
| 3. Price compared to competitors | 1 | 2 | 3 | 4 | 5 |
| 4. Orders received | 1 | 2 | 3 | 4 | 5 |
| 5. Orders delivered | 1 | 2 | 3 | 4 | 5 |
| 6. Total sales revenue | 1 | 2 | 3 | 4 | 5 |
| 7. Reputation of the firm | 1 | 2 | 3 | 4 | 5 |
| 8. Customer satisfaction | 1 | 2 | 3 | 4 | 5 |
| 9. Firm performance in general | 1 | 2 | 3 | 4 | 5 |

*A.3. Network relations*

Below you will find a list of local / national and global actors that may be found in the **business relationship / information sharing** networks of yacht building firms. Consider the actor at each row to specify the number of local / national and global actors at each column that (1) your firm benefits as an **information source** and (2) your firm perceives **as a strategic alliance** contributing to innovation performance.

| | (1) Number of actors that you benefit as source of information | | | (2) Number of actors that contribute to innovation performance perceived as a strategic alliance | | |
|---|---|---|---|---|---|---|
| **Actors in the business network of your firm** | Geographical level | | | Geographical level | | |
| | Local | National | Global | Local | National | Global |
| **Those contributing to production** | | | | | | |
| Suppliers of structure and body material | | | | | | |
| Suppliers of electrical appliances | | | | | | |
| Suppliers of electronic appliances | | | | | | |
| Suppliers of mechanical equipment | | | | | | |
| Suppliers of other equipment | | | | | | |
| Subcontractors | | | | | | |
| Yacht builders that get subcontracting services from your firm | | | | | | |
| **Service providers** | | | | | | |
| Design firms | | | | | | |
| Engineering firms | | | | | | |
| Consulting firms | | | | | | |
| Universities | | | | | | |

(*continued*)

| | | | | | | |
|---|---|---|---|---|---|---|
| Banks | | | | | | |
| Insurance companies | | | | | | |
| Certification companies | | | | | | |
| Maintenance and repair companies | | | | | | |
| **Market relations** | | | | | | |
| Customers (for boats under construction) | | | | | | |
| Brokers | | | | | | |
| National and international fair organizers | | | | | | |
| National and international magazines and Publishers | | | | | | |
| Marketing and promotion companies | | | | | | |
| **Information relations** | | | | | | |
| Other yacht building firms | | | | | | |
| Friendship group based on trust | | | | | | |
| NGO's like associations, foundations and chambers | | | | | | |
| Related public institutions | | | | | | |

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