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The Role Of Network Managers In Minimizing The Complexity Of Innovation

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ABSTRACT

Innovation nets, like organizations, need to be managed perfect. With rising numbers and actor heterogeneity in an innovation net, the potential for organizations to create, distribute and acquire knowledge more efficiently increment, but the complexity of managing the net also increment. Having someone in location to gain insight into the participating organizations' structures, and to keep track of and coordinate the available and usable resources, represents a clear advantage. While scientific research and management practice have acknowledged the significance of net managers for net efficiency, little research effort is proprietary to empirically study and validate this theoretical proposition. This article fills part of this gap by examining the penetration of the simple existence of net managers on core management functions and efficiency outcomes in low and high complexity settings. Our results confirm that employing a net manager significantly improves core net management functions and relational as well as structural net efficiency, which in turn increment goal achievement efficiency and net keeping. Furthermore, our results from interaction analyses show that the net managers' contribution is even greater in high complexity settings.

Keywords: innovation, networks, net managers

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1. INTRODUCTION

In times of globalization and the resulting increment pace of worldwide competition, the continuous development and successful launch of innovations are essential for profit-oriented organizations of any kind. While an invention can emerge at any location, an innovation requires combining a number of different aspects, such as a variety of knowledge and specific resources and capabilities. So, single organizations are often unable to provide one or the other of these prerequisites. Therefore, companies need to collaborate with their suppliers, customers or even competitors in nets to gain access to other entities' resources and capabilities in order to succeed with their innovation tasks. As a result, many recent innovation breakthroughs have not been achieved by a single actor but are the result of a broad net of people in an organization, and beyond its limits [9].

Innovation nets foster joint innovation scrambles between partners, enabling innovating organizations to share risks, grant access to complementary assets, mitigate critical mass problems, gain access to readily skilled staff and acquire scarce competencies. A net-generated innovation thus "should not be seen as the product of one actor, but as the result of interplay between several actors". So, it would be misleading to assume that mere participation in nets is a recipe for successful innovation. Just like organizations, innovation nets need to be managed perfect [6]. While a large number of members and actor heterogeneity in innovation nets are seen as prerequisites to gain access to heterogeneous knowledge, specific resources and capabilities as one source of competitive advantage, the potentially successful combination of available resources is a challenging process. As a result, having someone in location to gain insight into the participating organizations' structures, and to keep track of and coordinate the available and usable resources, will be a clear advantage.

This article intends to fill these gaps by examining the penetration of the simple existence of net managers on core management functions and efficiency outcomes in low and high complexity settings. Specifically, we compare nets with a net manager and nets without a proprietary net manager, and use structural equation modeling to evaluate the resulting direct efficacy on net management functions, relational and structural efficiency, as well as the resulting indirect efficacy on goal achievement efficiency and net keeping. We also

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study whether employing a net manager is even more beneficial in the case of high complexity compared to low complexity settings, by performing separate interaction analyses. The remainder of this article is organized as follows. The next section focuses on the thorough conceptualization of a net manager's relationship to core net management functions as well as efficiency outcomes, and serves as the conceptual foundation for our research model. then discuss our data and measures, evaluate our research model, and present our results. conclude with the implications of our empirical results and outline some directions for future research [3].

2. CONCEPTUAL FOUNDATION AND HYPOTHESES DEVELOPMENT

2.1. Efficacys on Relational Efficiency

The relationship between partners in a well-performing net is characterized by cooperation rather than competition. Conflicts are many easier to address, agreements and their allocated tasks are accepted easily. Thus, the collaboration in the net is more efficient if the involved parties collaborate in an atmosphere characterized by high levels of harmony, trust and commitment [5]. Harmony comprises an understanding of giveand-take, a preparedness to understand other parties' standpoints, and to keep rivalry very low, even if the net includes competitive organizations. Trust describes reliability, honesty, and conviction, members did not try to take advantage of each other while commitment refers to the extent to which the net organizations' personnel were involved in the net activities. Therefore, relational efficiency reflects the behavioral culture and thus the relational capital affects the relationships between the net partners. As net managers respond to neting partners' individual needs, take on a mediating and moderating role in business gatherings, and are the first to be consulted when uncertainties arise, they contribute substantially to the social interaction in an innovation net have consistently shown that interactions between neting parties can be enriched by using innovation intermediaries, such as innovation brokers. Like net managers, innovation brokers increment interaction processes and assist with linking the neting parties and ensuring that they become acquainted with one another [6]. Similarly, found that net managers' high authority, task and social competency levels positively penetration innovation nets' relational efficiency. While not every net manager achieves high levels in each of these characteristics, we still expect that the simple employment of a

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proprietary net manager will increment relational efficiency, since this position provides a focal point within the net that should foster social interaction between the participants. We therefore hypothesize:

Hypothesis 1: The employment of a net manager increment relational efficiency.

2.2. Efficacy on Structural Efficiency

Structural efficiency refers to the net's stability, which is important, since innovation nets typically consist of loosely coupled organizations. Past research propose that stable relationships can lead to higher process and innovation knowledge exchange. So, have shown that, the lower the net's stability is, the lower the net's value creation capabilities are. Likewise, the results of a study by confirm that higher net stability can generate higher net innovation output. As a result, well-performing innovation nets are characterized by a high degree of stability, reflected in an even power distribution [4], regular net gatherings, and information transparency. Since net managers have the authority to distribute the right of co-determination, summon net gatherings, and strongly penetration information provision in the net, we expect that the employment of a proprietary net manager will increment net stability. We therefore hypothesize:

Hypothesis 2: The employment of a net manager increment structural efficiency.

2.3. Efficacy on Goal Achievement Efficiency

Besides the relational and structural efficiency measures, goal achievement efficiency refers to whether or not the net had a successful outcome and achieved its goals. While previous research consistently propose the employment of a net manager increment relational and structural efficiency, the results of both as well as propose otherwise concerning goal achievement efficiency. study critical success factors for nets as perceived by net coordinators and found no significant direct link between an intermediary, someone comparable to the net manager dand the achievement of a net's objectives. Likewise, did not find a significant direct efficacy of a net manager's ideal characteristics and goal achievement efficiency. So, previous research proposes net efficiency and especially goal achievement efficiency heavily depends on the core net management functions, and that the direct efficacy of a net manager are mediated. Therefore, there might be no direct efficacy by a net manager on goal achievement efficiency, since the former is fully mediated by the core management functions. To shed

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some light on this matter, the subsequent chapter further study core management functions' mediating role. Since a net manager can take on a significant role by selecting net members and adding resources, by helping to ensure that participants know what they must deliver and when, by co-defining the rules in the innovation net, by assessing the members' efficiency contributions, and by providing the necessary information, a net manager's actions and penetration become visible through the 4 core net management functions. Therefore expect that the 4 core management functions mediate a net manager's direct efficacy on net efficiency. Since past research has not found a direct relationship between a net manager and goal achievement efficiency, we propose this efficacy is fully mediated by core management functions. So, in the cases of relational and structural efficiency, past research provides some evidence that the direct penetration of a net manager exists. In line with this proposition, show that the efficacy of a net manager's authority, functional competences and task competencies on relational efficiency are only partially mediated by several management functions. Therefore hypothesize:

Hypothesis 3: The core management functions partially mediate the efficacy of the employment of a net manager on relational and structural efficiency, while fully mediating the efficacy on goal achievement efficiency [7].

H3a: The employment of a net manager increment core management functions.

H3b: Core management functions increment relational efficiency.

H3c: Core management functions increment structural efficiency.

H3d: Core management functions increment goal achievement efficiency.

2.4.Net Efficiency and Net Keeping

Having its origin in marketing literature, the construct of customer keeping was transferred to the context of innovation nets as net keeping, and has recently become a central construct when investigating innovation nets' efficiency. Net keeping captures an innovation net participants' overall satisfaction, and their resulting willingness to continue collaborating in a net. It represents a critical factor for successful innovation collaboration, since the erosion of net ties can lead to a significantly reduced innovation output and value-creation capabilities. Therefore propose that structural, relational and goal achievement efficiency positively penetration net keeping and, as a result, employing

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a net manager indirectly contributes to net keeping. Specifically, sustaining trust, harmony and internal commitment can strengthen social bonds and can intensify relationships between net members. The resulting higher interaction quality in nets yields learning efficacy of how to systemize an organization's own actions and how to use the variety of available resources, knowledge and capabilities, contributing to participants' overall satisfaction. Therefore, high relational efficiency levels increment the likelihood of participating in a net[8].

Hypothesis 4: Relational efficiency increment net keeping.

A creative and satisfying innovation net benefits from symmetric power distribution, a high level of information transparency, and a rhythm of gatherings during which participants can exchange ideas, discuss (preliminary) results, and decide on the next steps. The resulting net stability helps improve the mutual understanding of capabilities and originalities of participating organizations improves the net's value creation capabilities and also contributes to participants' satisfaction and net keeping [10].

Hypothesis 5: Structural efficiency increment net keeping.

The fulfillment of predefined goals is often referred to as an indicator of overall satisfaction. Since a high degree of goal achievement in a net indicates that the net had a successful outcome and achieved its predefined goals, we expect goal achievement efficiency to positively penetration net keeping.

Hypothesis 6: Goal achievement efficiency increment net keeping.

2.5. The Moderating Role of Net Complexity

Several studies underline the significance of interfirm collaboration to access essential knowledge and specialized capabilities held by other companies in order to stay competitive. According to the resource-based view of the firm, heterogeneity represents the very source of competitive advantage. With a rising number of actors and increment actor heterogeneity in an innovation net, the potential for organizations to create, distribute and acquire knowledge more efficiently increment. Existent research confirmed that the mix of heterogeneous parties in R&D collaborations increment the probability of developing new products and the extent of innovation novelty achieved in the net. Thus, from a resource-based perspective, it seems beneficial to establish a large innovation net with rising numbers of participants, and different organizational and cultural

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backgrounds. So, with rising actor numbers and rising actor heterogeneity, the degree of complexity for managing an innovation net also grows. For example, the presence of different organizational cultures in an innovation net can result in conflicts regarding the management of the net. Owing to the diverse backgrounds and organizational cultures of collaborating participants, innovation nets thus need to be managed even more perfect in high complexity settings if they are to be successful. A net manager entrusted with steering and coordinating the net activities represents the ultimate entity concerning the allocation, coordination and management tasks that arise in an innovation net. Having a manager in location should therefore reduce conflicts and problems in net management that arise owing to participants' diverse backgrounds and organizational cultures collaborating. Therefore, the contribution of the employment of a net manager to the core management functions as well as to net efficiency should be significantly expanded in high complexity settings [11].

Hypothesis 7: The extent of net complexity moderates the efficacy of employing a net manager.

H7a: The positive efficacy of employing a net manager on relational efficiency increment with high net complexity levels.

H7b: The positive efficacy of employing a net manager on core management functions increment with high net complexity levels.

H7c: The positive efficacy of the employment of a net manager on structural efficiency increment with high levels of net complexity. Figure1 summarizes our research model's hypothesis framework.

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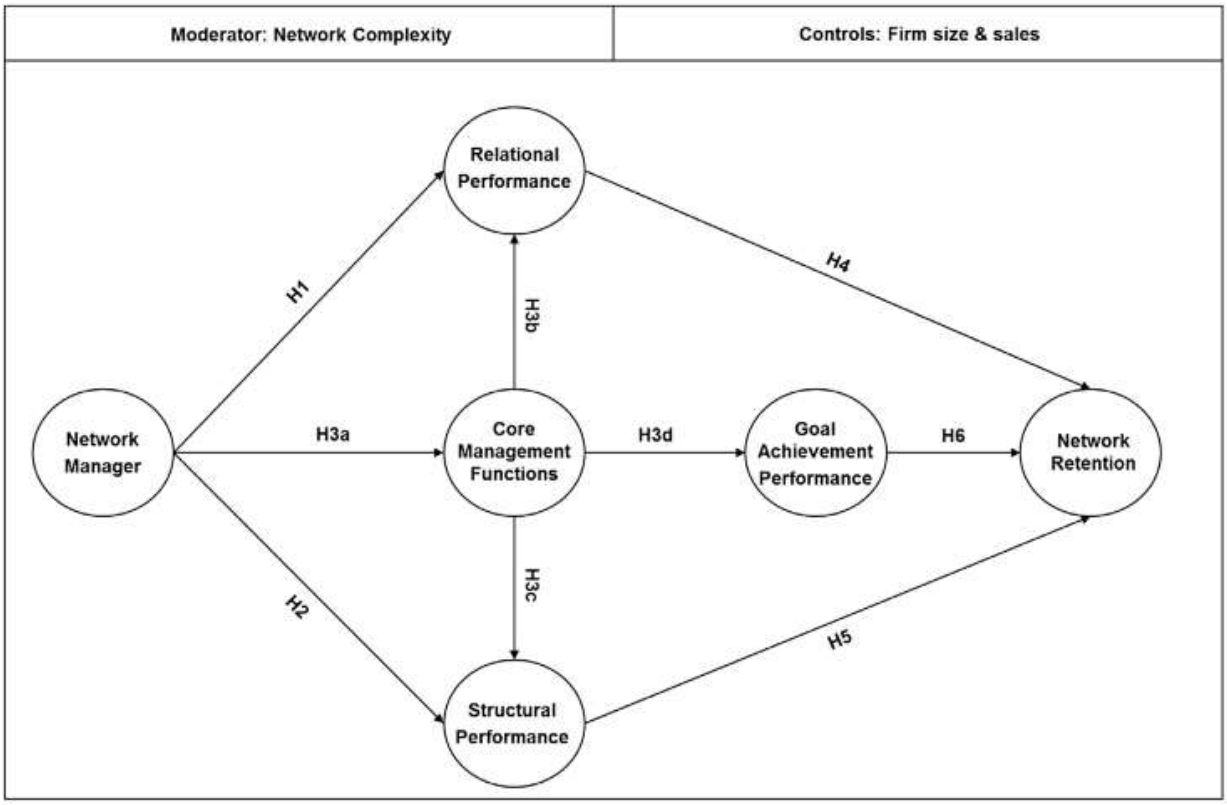

Fig1. Research model

3. RESEARCH DESIGN

3.1. Sample and Data

We chose the German mechanical engineering industry as our research context for 3 reasons. 1) it is a knowledge intensive sector in which continuous innovation is crucial in order to remain internationally competitive, since an increasing number of competitors originate from low-cost locations that can offer products of comparative quality but at a much lower price. 2) firms in this industry rely extensively on innovation-driven collaboration in order to increment technological and economic returns, and to better exploit their resources and competencies. 3) the industry landscape is shaped by hundreds of SMEs that lack resources and capabilities to innovate individually. Therefore, SMEs must inevitably collaborate with other organizations if they wish to deliver successful innovations. To really benefit from innovation nets, SMEs often require and receive support from innovation intermediaries such as innovation brokers, third parties, bridgers,

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superstru ture organizations, or intermediary firms. Net managers' roles and significance for collaboration in our study context becomes even more apparent.

Before collecting the data, we gathered information for the development of our questionnaire from 22 qualitative interviews with innovation managers and R&D heads of German manufacturing firms. The first draft of the questionnaire was then pre-tested in a pilot study to assure scale content validity, to change item wording and to remove ambiguities. After acknowledging all feedback, hints and comments, we proceeded with data collection. The questionnaire then was distributed with the support of the German Engineering Federation (VDMA), one of Europe's largest and most important industry associations, which represents more than three-thousands mainly small and medium-sized companies in mechanical engineering [8]. The questionnaire was directed at pre-identified key respondents preferably CEOs and R&D heads of the VDMA member companies [12].

4. ANALYSIS AND RESULTS

4.1. Analysis

To simultaneously assess the large number of constructs and their interrelationships in our model, we empirically examined the relationships in Figure 1 using structural equation modeling (SEM). Since type 2 higher-order constructs cannot be modeled with covariance-based structural equation modeling [1], there was no other option but to use variance based structural equation modeling for our statistical analysis (partial least squares) (PLS).

In PLS, the modeling of type 2 higher-order constructs can be easily implemented. We integrated core management functions as well as relational and structural efficiency as second-order constructs by employing the 2 stage approach in our estimation process. In the 2-stage approach, the latent variable scores are initially estimated without the presence of the second-order construct. Thereafter, the latent variable scores are used as indicators in a separate higher-order structural model analysis.

We employed Smart PLS 2.0 for the estimation of the outer and inner model parameters. We also used nonparametric bootstrapping with 500 replications and individual-level changes preprocessing to obtain the standard errors. Owing to its use of variance analytic calculation instead of reproducing an empirical covariance matrix, PLS does not provide

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interference statistical criteria to assess the holistic structural model's goodness. therefore, followed the PLS specific evaluation process: First, we evaluated the hierarchical and global measurement model, and then interpreted the path coefficients and assessed the significances by bootstrapping at the structural model level. To test net complexity's moderating role, we also implemented 3 separate interaction analyses.

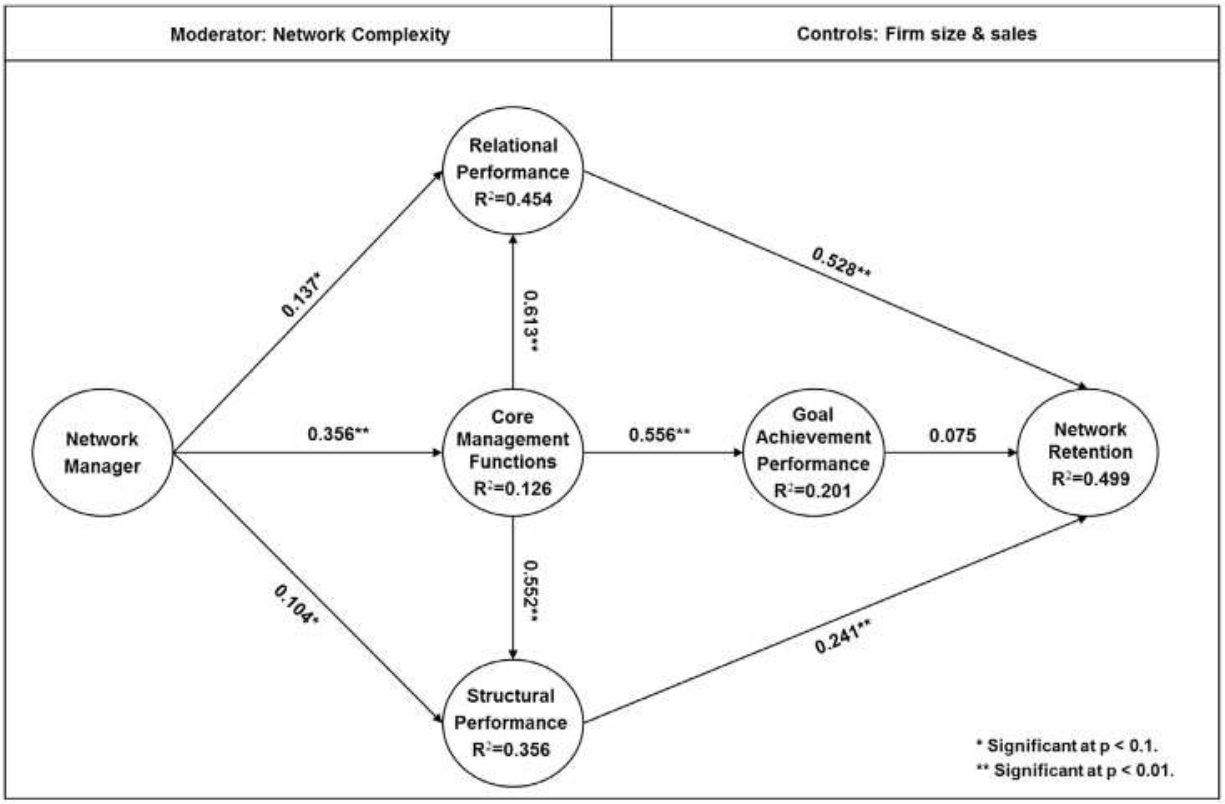

Fig2. Structural model results

4.2. Structural Model Results

To test our structural model and hypotheses, we evaluated the path coefficients and their significance levels, using an efficacy sample size of 103 observations. All results are depicted in Figure 2. Overall, the estimations fit the data well, as the R2 for each of our endogenous construct ranges between 0.13 and 0.49 (see Figure2). We also calculated the model's predictive power by applying a blindfolding approach. This procedure results in Q2 values for all the endogenous reflective constructs significantly different from 0, confirming the model's predictive power. We also assessed multi collinearity at the

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structural model level by calculating the VIF e 3.311, which conclusively demonstrates that no multi collinearity should be present at the structural model level.

In line with Hypotheses 1 and 2, the employment of a net manager positively penetrations the relational ($\beta = 0.14$, $p < 0.1$) as well as structural efficiency ($\beta = 0.10$, $p < 0.1$) [13]. To test the mediating role of core management function proposed in Hypothesis 3, we followed the procedures proposed by Iacobucci and Duhachek, who built on Baron and Kenny's recommendations for testing mediation efficacy [2]. Supporting Hypothesis 3a, the employment of a net manager significantly increment core management functions ($\beta = 0.36$, $p < 0.01$). Furthermore, in line with Hypotheses 3b, 3c, and 3d, the core management functions significantly increment relational ($\beta = 0.61$, $p < 0.01$), structural ($\beta = 0.55$ $p < 0.01$), and goal achievement efficiency ($\beta = 0.55$, $p < 0.01$).

In addition to the evaluation of the main and mediation efficacy. We used 3 separate interaction analyses to test for moderation efficacy, with all the predictor and moderator variables standardized to counteract multi collinearity when establishing the interaction terms[9].

Finally, our results from interaction analyses also confirmed a moderation of net complexity on the relationship between net manager and structural efficiency by strengthening the positive penetration ($\beta = 0.11$, $p < 0.1$) (Figure3).

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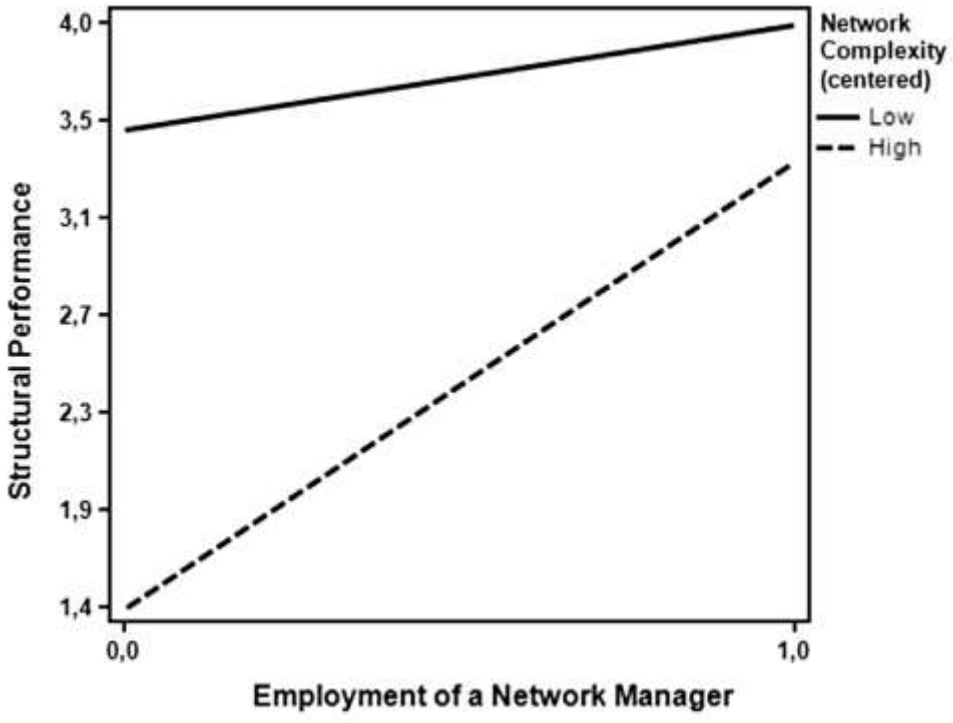

Fig3. Interaction Analyses for Structural Performance

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