# Knitting Company Performance and Board Interlocks

## An Exploration with the Finnish Software Industry

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**Abstract.** A board of directors is a supreme organism of a modern company. Often, a single board member has a place in several companies' management teams. This is called a board interlock and its impact on a single board member, companies and the economics on the whole has been studied for decades. However, there is a lack of understanding how software companies' board of directors interlock as the field is driven by knowledge and relations more heavily than the other fields. Therefore, well-connected board members could be a vital competitive advantage for companies. This study presents a quantitative analysis of 262 Finnish software companies, their boards and performance. The results show that neither high board interlocks nor foreign board members are remarkably related on the performance of companies. The implications of the findings are discussed and future research inquiries are proposed.

**Keywords:** Board interlock · Software industry · Finland

## 1 Introduction

A worn out idiom states that no organization can survive alone in the modern hyper-connected business era [20]. Networks, ecosystems, communities, complementors *et cetera* have been argued to be a key for the survival of modern companies regardless of their sector [14]. Therefore, it is not surprising that connectivity of a company's board of directors and its impact on the firm's performance have been studied exhaustively in prior literature [6,16,25].

In extant literature, there are both empirical evidence as well as arguments for the advantages and disadvantages of board interlocks. Board interlocks have been seen as elitist [26], legally suspicious [24], serving only personal benefits [7] as well as also bringing new connections and best practices for the use of a company [19].


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Also empirical studies on the impact of board interlocking to the performance of a company have yielded contradictory results. For example, Santos et al. [25] showed that a high degree of board interlocking impacts negatively on firms' performance in Brazil, whereas Horton et al. [11] found exactly the opposite in the United Kingdom.

However, a majority of existing studies handle all industries similarly, often failing to separate different fields. That is, the variety of the results might be explained by the industrial structure—e.g. the relative importance of financial, human and social capital in different industrial sector—of the studied country rather than the phenomenon itself. For the knowledge-intensive software industry, only a little attention has been given on boards of directories and their connections. We hypothesize that connections and experiences of a board member in the software industry is linked to good performance of a software firm due to the intangibility of software and value of knowledge. Thus, in this research paper, we focus first on the following question:

RQ1 *Are board interlocks associated with the economic performance of Finnish software companies?*

In addition, business networks and ecosystems are nowadays often international. For example, first time in 2012, half of the Finnish software companies have international revenue and nearly one fifth have significant international revenue [23]. Also, due to the internationalization of software businesses, we are assuming that there are increasing number of foreigners serving in boards of directors. A foreigner in the board is expected to be better networked and have more experienced than a domestic board member. This should be also visible in performance of a company. Therefore, we are secondly focusing on the question:

RQ2 *Are Finnish software companies with board of directors including foreign members performing better than companies managed by exclusively domestic boards of directors?*

Regarding the theoretical frameworks, this study leans towards *theory of social capital* by [3]. The theory explains that there are value in informal and formal relationships. That is, well-connected board members might be able to open new venues and offer new connections that can be vital for a company. In addition, well-connected board members can be more experienced and, thus, be able to help the company better. In this study, we focus only on formal connections and study how well-connected directors help software companies perform better.

To answer the presented question, we perform a quantitative study of selected software firms. As the dataset, we use 262 Finnish software companies, their executives, board members and financial key figures. The financial information is queried from Orbis database. This study contributes mainly on the on-going discussion on the impacts of board interlocks in companies' performance and shed lights on software companies board of directories composition and board

interlocks in Finland. This study is among the first address this effect in a specific industrial domain and in software industry.

Remaining of this work is structured as follows. Section 2 presents related work and the central concepts. The following Sect. 3 clarifies the used research approach and it is followed by results in Sect. 4. The final two sections discuss the implications and limitations of the results, and conclude the study, respectively.

## 2 Background, Related Work and Motivation

*Board interlocking*, or *interlocking directorate*, refers to a practice where a member of a company's board of directors or top management serves in several boards or top management teams [24,26]. As there are for example possibilities for misuses in competition, board interlocking has received attention mainly from the view-points of antitrust and business ethics (c.f. [24]).

From another point-of-view, board interlocking can be seen as a positive *social capital* [3] resource for a company. Well-networked members of a board can bring valuable connections for the company's use. In addition, members who serve in multiple boards are likely more experienced, being able to better support company. Along these lines, Hao et al. [9], among others, have observed that companies with connected boards of directors are more likely to use relative performance evaluation for CEO compensation. In addition, Clarysse et al. [2] show that high-tech startups are likely to bring complementary human capital to the board of directors with outsider board members.

While the basic theoretical underpinnings are thus relatively clear, empirical studies on the impact of board interlocking have yielded contradictory results. On one hand, Santos et al. [25] find that board interlocking is a frequent phenomenon in Brazilian companies, but with a negative impact upon a company's value, especially when the degree of interlocks is high. Similarly, Loderer and Peyer [17] find that board interlocking impacts a firm's value negatively (cf. also [8]), and Fich and White [7] noted that it mainly serves board members, not the shareholders. In addition, Fich and Shivdasani [6] showed that busy board members—those with three or more directorships—have a negative impact on companies' performance.

On the other hand, for example Mol [19] points out that board interlocking might benefit all networked companies by bringing competitive advantages on giving access to resources, clients, new methods and innovations. In addition, Heracleous and Murray [10] argue that interlocking directorate should provide value for all companies in a network, but it depends on the type of the network how directors should mediate. Horton et al. [11] were among the first to show that better-connected executive or outside director is, his or her firm would achieve greater benefits in future. Similarly, Larcker et al. [16] find that best-connected boards outperform worst-connected boards in their large data set. Pombo and Gutiérrez [22] reached similar results in their study in Columbia. Stuart and Yim [27] showed that well-connected boards are more likely to be targets of private equity -backed take-private transactions. Finally, Intintoli et al. [15] argue that

overall well-connected board seems to be beneficial for protecting interests of the company's shareholders.

Despite of many general board interlock studies, only a handful has been done in the scope of software industry. Narrowing even more down to Finnish software industry, there are two recently published studies on board interlocks. Peltonen and Rönkkö [21] studied Finnish software companies' board interlocks with cluster analysis. From their dataset of 2008–2009, they identified six interlock clusters: (i) Rapidly expanding international ventures, (ii) Early-stage international ventures, (iii-iv) Private and public sector venture capitalist dyads, and (v-vi) International and non-international dyads. Their study is explorative and they did not analyze the impact of board interlock to the companies' performance.

In a more recent study, Suominen, Rilla, Oksanen, and Still [28] used social network analysis methods to study board interlocks of Finnish digital game companies. They start with the hypothesis that small, well-connected and swiftly growing industry would have a dense board interlock graph. By using data sets from the years 2013 and 2015, they find the opposite; the board interlock network was sparse and the formal board relationship does not seen to have a role in Finnish game industry. Suominen et al. [28] did not focus on performance of the game companies.

To summarize, extant literature have showed both positive and negative implications of board interlocking. Whereas the 'positive side' leans towards social and human capital theories in order to explain that well-connected and experienced directors are beneficial for a company, the 'negative side' argues that multiple directorships mainly benefits a well-connected board member by a higher compensation and better future career options. Existing literature have showed statistical support for both that interlocking directorate harms and benefits companies.

Interestingly, we find only a few studies specifically focusing on software industry. As stated by Cusumano [5], *"software is not like other businesses"*. Due to, e.g., the intangibility of software, zero reproduction costs, electronic distribution and high dependence on knowledge [1,12,13], social and human capital might be more valuable than financial or natural capital. For example, it has been shown that formal and informal network relationships are crucial for small software firms' internationalization process [4]. Therefore, the importance of well-connected and experienced boards of directors could be especially beneficial in the software industry.

The motivation for this study can be summarized with the following observations:

– Founding a software company requires a little financial capital: successful software companies have been founded in garages and building a modern software product can be done with cheap laptops and rented servers. However, due to this, competition is tight as anyone with enough skills can found a firm and replicate used business model. In this kind of market, good connections to the paying customers can be more valuable than excellent technical implementation.

Therefore, well-connected board can be a competitive advantage for a software company.
- As an intangible product, software is easy to transfer from a country of origin to all over the world. However, as all software vendors can easily transfer their products, differentiation from competitors can be hard. Thus, we hypothesize that foreign members in boards of directors could perhaps foster entry into foreign markets and this effect might be observable in performance of software companies.
- Finally, existing studies have reported contradicting results on either that board interlocking benfits [11,15,16,22] or harms [7,8,17,25] the company.

Thus, this study pays a special attention to board interlocking and its impacts on software industry. We address whether software companies with well-connected board of directors perform better or not and whether foreign board member influence on the performance. In addition, as the full-scale studies, focusing on all companies in a given country, have yielded contradictory results, this study offers an alternative strategy by focusing on a single market domain.

## 3 Research Approach, Data and Method

This study uses Finnish software industry as a case study population. This decision is justified by existing research on the case study country (e.g. [21,28]) offering the possibility of qualitative reflections. In addition, the researchers are familiar with the selected industry and country, enabling a more in-depth analysis. Finally, the Finnish software industry is well studied: Finnish Software Industry Survey has ran eighteen times[1].

We collect, prepare and analyze data for this study in six phases. At the first phase, the aim is to create a dataset of Finnish software companies. As there is no easy way to identify all Finnish software companies through e.g., NACE REV. 2 classification, we use a proxy measure for creating a representative sample. We acquire a list of Finnish software companies from the member page[2] of *Ohjelmistoyrittäjät ry* (Finnish Software Industry and Entrepreneur Association). In total, the parsed list contained 289 companies. Naturally, this data source contains only members of the association and provides only a limited view on the Finnish software companies. A clear limitation is that we can presume member companies are more established, both in revenue and age. The data acquaintance was done in the middle of February 2016.

In the second phase, we enriched the data by querying financial and board information from the Orbis database by Bureau van Dijk. The database contains financial information of more than one hundred million companies globally. We queried the companies from the database based on company name. The search

[1] Software Industry Survey. https://www.softwareindustrysurvey.fi.
[2] Finnish Softawre Industry & Entrepreneurs Association, Members. https://ohjelmistoyrittajat.fi/en/members.

resulted in retrieval of 287 companies. The search is a fuzzy matching implemented by the data provider and the sample gathered was manually checked.

In the third phase, we created a dataset of all Finnish companies. This data is later used to search if board members or executive officers have other affiliations than the one in a software company. The data was searched from the Orbis database, limiting the search to privately-held Finnish companies. For each company, names of board members and executive officers where extracted. Orbis data does not allow us to separate board members and executive officers. However, we use the list provided from Orbis as board member data. In total, the data of 288,581 companies are included in the final dataset. The Statistics of Finland reports that at the end of 2015, there were 360,051 registered companies in Finland[3]. This leaves roughly 72,000 companies that are not accounted in Orbis. However, the extent of this dataset is argued to be substantial enough for the analysis.

In the fourth phase, we create a matching dataset of Finnish individuals using *Avoindata.fi* (literally, *open data*) service that list Finnish first names and surnames. If a board member's surname was not found in the *Väestötietojärjestelmän suomalaisten nimiaineistot* provided by *Väestörekisterikeskus*[4], we assumed that the member is foreigner. Due to privacy issues, the service publish only surnames that have more than 20 living individuals in Finland. Thus, this data sets certain limitations into the research. For example, rare surnames can be classified as foreigners.

In the fifth phase, two variables—international and network size—were created using a Python script. The Python script was used to match the surnames of software companies against the Finnish surnames to identify individuals that would not be Finnish. In practice, the script created a dichotomous variable 'international' for each company. The variable is set as true if the surname of even one of the members of the company board or its executives is not listed in the Finnish surname database. The variable 'network size' counts the sum of board members and executives directorship positions in the full set of Finnish companies. It uses the full name of individuals in the matching. That is, we calculate for all board members of software companies' the number of directorship positions they have in Finland. Finally the continuous variable is the mean of the affiliation counts of each individual associated with a company.

In the sixth phase, the data for the software companies is complemented with data on company performance. Research has pointed towards several financial data variables as good performance indicators [18]. Partly due to the fact that the majority of the companies in the sample are not publicly listed, this study uses 'Profit Margin', 'Return on Assets' (ROA), 'Current Ratio' (CR) and 'Operating Revenue' (OR) as indicators of a company's economic performance. The dependent variables are controlled for yearly variation by using a three year

[3] Tilastokeskus, Yritysten rakenne- ja tilinpäätöstilasto http://tilastokeskus.fi/tup/suoluk/suoluk_yritykset.html.

[4] Väestötietojärjestelmän suomalaisten nimiaineistot. https://www.avoindata.fi/data/en/dataset/none. Licensed with Creative Commons Attribution 4.0.

mean for each variable. Companies that did not have data for three years, were excluded from the analysis. This reduced the sample to 262 companies.

Finally, the data was analyzed looking at the internationalization of the company executives and board as independent variables. The dependent variables are the four company performance indicators, and network size is used as a control variable. In addition, to evaluate the goodness of our internationalization identification strategy, we evaluated a dozen companies. Out of those, only a few had clear a false positive match caused by either a rare or compounded surname.

## 4 Results

The dataset is sufficiently small for an analytical exploration both in terms of size (262 firms) and dimensions (six variables). From the dataset, 97 firms were classified as 'internationals' and 165 as 'domestic'. Thus, the results are presented with four simple plots. In each plot, a $y$-axis represents a given economic performance measure, while the average number of board intelocks is always given on the $x$-axis. These simple scatter plots provide a tentative answer for RQ1. For answering to the question about international board members (RQ2), the scatter plots are further conditioned according to whether or not a board is exclusively domestic, only comprised of members with Finnish surnames.

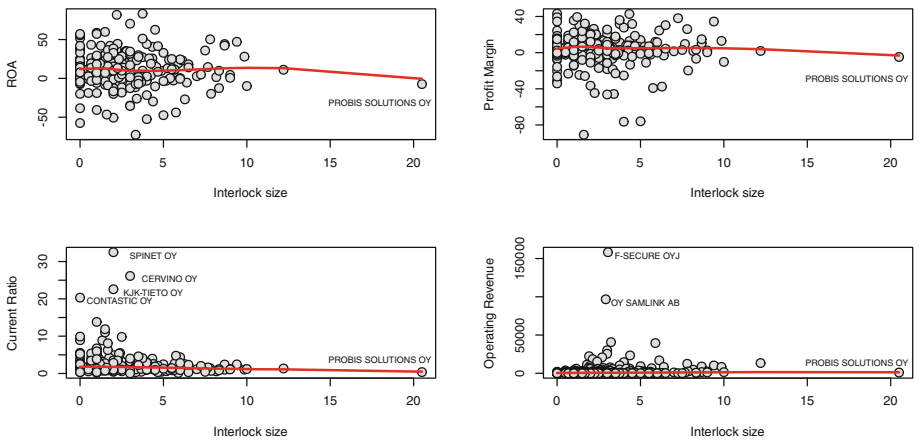


**Fig. 1.** ROAs, current ratios, profitmargins, and operating revenues for all companies (three-years average)

Given these preliminary notes, the results for RQ1 are shown in Fig. 1 and for RQ2, the results are summarized in Figs. 2, 3, 4, and 5 for the ROAs, current ratios, profit margins, and operating revenues, respectively. The following points can be used for disseminating the figures.

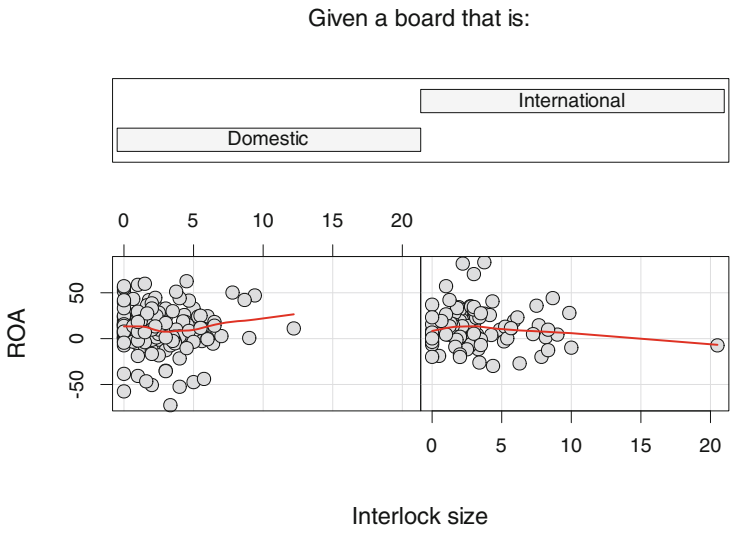


**Fig. 2.** ROAs, Interlocks, and International Board Members

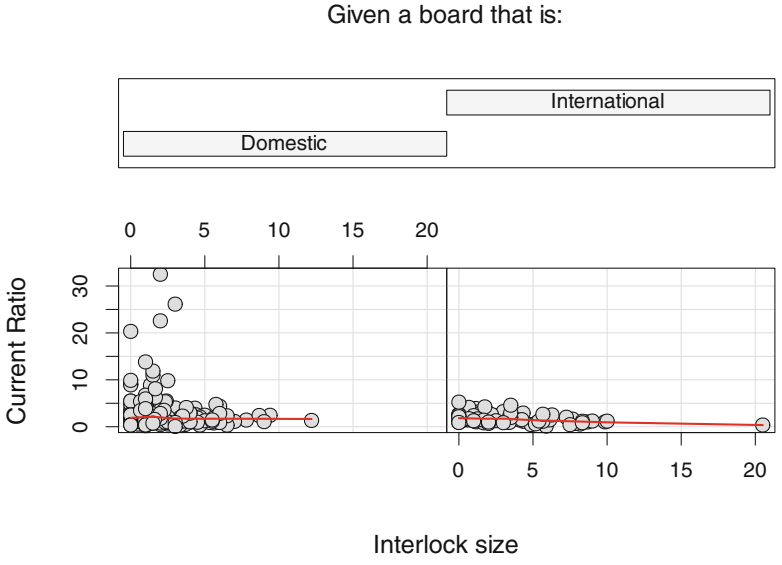


**Fig. 3.** Current Ratios, Interlocks, and International Board Members

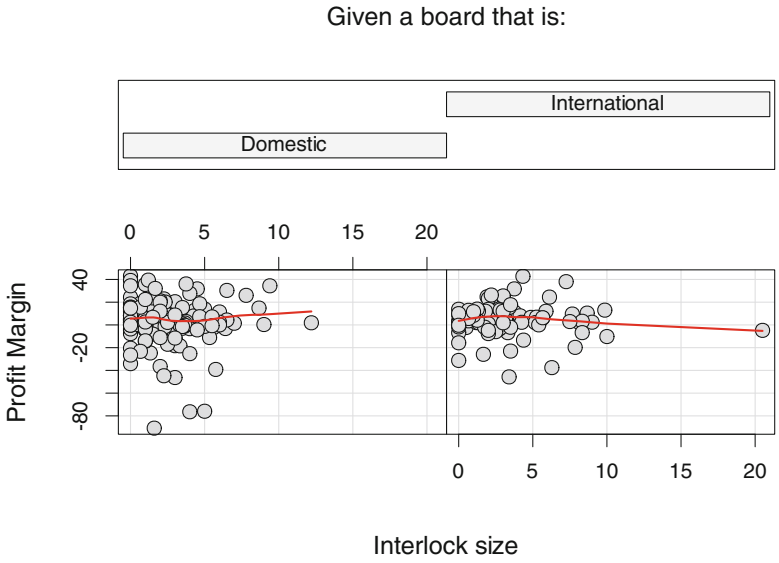


**Fig. 4.** Profit Margins, Interlocks, and International Board Members

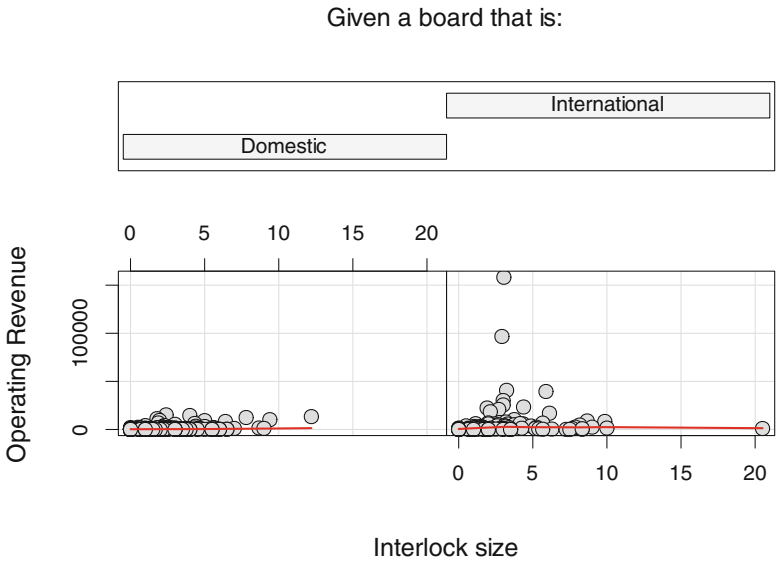


**Fig. 5.** Operating Revenues, Interlocks, and International Board Members

- The foremost observation is clear: the interlock sizes are not statistically associated with any of the four economic performance measures (Fig. 1). Even when polynomial regression lines are used for accounting potential non-linearities, the resulting lines are flat. Thus, it seems reasonable to conclude that nationwide board interlocks are not generally associated with economic performance of the sampled Finnish software companies.
- When focusing on the conditioning upon whether the boards are exclusively domestic, it becomes evident that there are no notable differences in terms of ROAs and profit margins, as can concluded by comparing the $y$-axes of the two scatter plots in Figs. 2 and 4. In contrast, the current ratios of a few companies with fully national boards are notably higher when compared to boards staffed also with international members. An analogous but reverse conclusion applies to the operating revenues shown in the $y$-axes of Fig. 5. This observation also warrants a further point.
- All figures indicate the presence of outliers. These outlying companies also distort the results regarding international boards, although removing the outliers does not strengthen the negligible statistical association between the four economic performance measures and the interlock sizes. In particular, the operating revenues in Fig. 5 are substantially higher for two outlying companies that both have also international board members. These outliers correspond with F-Secure and Samlink. The former company operates in the domain of cyber security, while the latter provides business-to-business service for banking, insurance, and related sectors.

To summarize, on one hand, the amount of nationwide board interlocks provides no noteworthy statistical power for explaining the economic performance of the sampled Finnish software companies. On the other hand, the economic variables vary to some extent according to whether the boards contain also international members. The latter observation is particularly noteworthy with respect to a few outlying companies.

## 5 Discussion

This study seek answers to the two questions: Whether well-connected boards of software companies are performing better or worse than the rest (RQ1), and whether or not foreigners in the board of directors is associated with better performance of companies (RQ2)?

To answer RQ1, we did not find any evidence that the interlock sizes would be statistically associated with any of the four economic performance measures used. That is, we did not find that interlocking would have either positive or negative impacts on the firms' performance.

To answer RQ2, we showed that the performance measures vary to some extent according to whether the boards contain international member or not. This observation is mainly related to current ratios and operating revenues; however, the effects are opposite – international boards have higher operating

revenues whereas national boards have higher current ratios. Nevertheless, the outliers remain interesting cases for further studies.

The results have certain implications for on-going academic discussions. First, this study contributes to a long-running debate on whether high board interlocking impacts positively or negatively to the company's performance. Prior studies have showed support for both relations. In this study, we did not found any robust statistical associations—that is, high board interlocking sizes seem not to have major impacts on the performance of Finnish software companies. This can be associated some aspect of the software industry, which was not uncovered in the scope of this study, but warrants further analysis.

Looking to explain prior positive associations between board interlocks and company performance, we might question the temporal aspects of the data gathered. For example, it can be that well-connected directors are lured to well-performing or promising companies, which then creates a virtuous cycle. Further qualitative and quantitative work are needed to fully understand the impacts and limitations of interlocking directorate. In addition, in our data gathering process, Orbis data limits the study by providing no historical information on board members, although financial data is provided up to the 10 last years.

We were expecting that either well-performing stable companies would have foreigners in their board of directors or quickly growing companies would have acquired foreigner investors and board members. However, when outliers are excluded, we find only a little, if any, statistical association. A further research could be targeted to investigate these outliers if they can suggest some indication on the direction of relationship between foreign member and firm performance. While companies with international board or executive members were performing a little better than companies with fully domestic directors in current ratios whereas an opposite result was found in operating revenues. Nevertheless, the differences remain small. When the few notable outliers are taken into account, there is a substantial difference in operating revenue and these companies seem to support our starting expectation.

For practitioners, this study gives some suggestions. Statistically it seems that there are no differences whether the board members are highly or lowly interlocked. This might seem to be counter-intuitive as one would easily assume that highly interlocked board members would have higher social and human capital, and thus be able to support company better than ones with lower social capital. Board interlocks is expected to improve social capital by, e.g., offering a connection to other board professionals who are well-connected, which might open new opportunities for both the person and the company. Highly connected board members' social capital is increased by, e.g., increasing experiences faster with more directorships. Therefore, well-connected board members should bring some benefits for also company. However, we did not found strong and clear statistical correlation to show that the number of board interlocking would be associated with performance.

In addition, of course board members can be motivated by other reasons than helping the company. There are existing studying suggesting that 'busy'

board members do not help companies as well as the others. A busy member is defined as one who have three or more directorships at the same time. However, at least our analysis did not show that having more interlocking directorships would harm companies. Nevertheless, the basic underpinning is clear: having too many positions mean that one cannot concentrate well on every task at hand and, therefore, some of those tasks might not be handled with enough attention. Another further research theme would thus be the quality of board work. There may exist differences in the level and activity of board work and this might be a stronger explaining factor to firm performance.

Naturally, there are some limitations to our research that should be taken into account. First, our strategy to select software companies based on the membership and existence of a profile page in a local advocacy group limits our attention to active, well-performing companies.

Second, we used an open data service to identify foreigners in boards of directors. The used approach has limitations as, e.g., rare surnames are not listed which might have generated some 'false positives'. We noted in the evaluation, for example, that double-barrelled surnames (e.g., when two surnames are joined with a hyphen after a marriage) cause false positives in our matching strategy. However, our identification approach is usable for a large-scale quantitative study and some small error margin, thus, can be accepted.

Third, Finland remains a small, isolated Nordic country with a language spoken by only few and that resembles only little the other languages spoken in the area. Thus, it can be that there are smaller numbers of foreigners available to serve in boards of directors and therefore there could be a higher number of highly interconnected board members. Further work is needed to replicate the analysis in other countries and with other industries. Fourth, Orbis data limits our capabilities to extract only board members and to get historical data for the individuals associated with the company. This makes showing the impact of a new board member challenging, as we can not attribute a specific performance gain to a person. We should also note, that our study looks at top management as a whole whereas prior research has focused on board interlocks either purely in board of directors or executives.

Nevertheless, this study opens new avenues for future inquiries. For example, a majority of existing work focus only on formal, observable, ties between board members and companies. Social capital theory identifies also informal ties, which can be even more stronger and meaningful for performance of a company than formal ones. Further work should study the importance of informal connections such as those created in clubs and software industry associations.

In addition, most of the interlocking directorate studies are based on a single snapshot of a time. There are only a handful of studies (e.g. [8]) presenting longitudinal analysis on the impacts of board interlocking. Further studies should pay attention to model long time implications of having board interlocks. Finally, our dataset have outliers that differ remarkably from the remaining set. Whereas we did not focus on analysing those in this study, a qualitative analysis of outliers could reveal interesting alternative approaches and working patterns.

Finally, this study tried to focus on a smaller segment of Finnish industry in order to avoid the possible pitfalls of previous studies. However, it might be that there are small clusters inside our set of data – thus, in further work, we should cluster the companies and study the impact of board interlocking inside these clusters. For example, companies, that are seeking to growth quickly, could benefit more from well-connected board members than already established companies. In addition, in further studies the meaningfulness of the performance indicators should be analyzed with care.

## 6 Conclusions

This study addressed the impacts of board interlocks to the performance of software companies. We used a set of 262 Finnish companies, their directors and financial indicators in a quantitative analysis. First, the results show that board interlocks do not seem have either positive or negative correlation on the companies' performance. Second, we showed that having a foreign board member correlates with a better performance of a company only when the performance is evaluated with operating revenues. An opposite effect was found with current ratios. However, there are remarkable outliers in the dataset. Nevertheless, these are contradicting results when compared to the extant literature. However, there are certain limitations in restricting the study population to a single country and therefore future work is needed to replicate the results with a larger dataset. Nevertheless, this study might help scholars to better understand the impacts of board interlocks in software industry and provide some suggestions for the practitioners.

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