CORPORATE FORESIGHT AND PERFORMANCE: A CHAIN-OF-EFFECTS MODEL

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Abstract

In this paper we develop and validate a measurement scale for corporate foresight and examine its impact on performance in a chain-of-effects model. We conceptualize corporate foresight as an organizational ability consisting of five distinct dimensions: information scope, method usage, people, formal organization, and culture. We investigate the relation of corporate foresight with three innovation performance dimensions – new product success, new product innovativeness, and financial performance. We use partial-least-squares structural equations modelling to assess our measurement mode ls and test our research hypotheses. Using a cross-industry sample of 153 innovative firms, we find that corporate foresight can be validly and reliably measured by our measurement instrument. The results of the structural model support the hypothesized positive effects of corporate foresight on all performance dimensions. Implications of our findings, and limitations and future research avenues are discussed.

Keywords:

Corporate foresight, performance, innovation performance, financial performance.

INTRODUCTION

Hamel and Prahalad (1994) argued that looking forward is a key factor for firms to stay ahead of competition. However, only recently the forward-looking behaviour of firms has received attention (Gavetti *et al.* 2012). Firms that are forward looking implies that decision making is based on images of the future by which decision makers are able to make approximate anticipations of long-term implications of alternative courses of action (Gavetti and Levinthal 2000). Decision making is still being viewed as bounded rational, but it does not prevent the creation of approximate future views together with alternative courses of action and its future consequences that in turn may drive organizational actions (Gavetti *et al.* 2012).

To purposefully gain future insights, Daft and Weick (1984) refer to organizations as systems that interpret and make sense of their environment. While distant opportunities or threats may be serendipitous detected while not purposefully sought after (Gavetti 2012), Hamel & Prahalad (1994) argued that future views may be based on deep insights into trends, technologies, demographics, and lifestyles. Similarly, Chen (2008) argues that organizations may take in trends, forecasts, technological changes, and competitor moves to create a future view. However, little research exists on possible indicators on the manifestation of corporate foresight within firms, and evidence regarding this is still largely speculative, conceptual, and anecdotal (Patvardhan 2013). We propose that corporate foresight as an organizational ability may be able to fill this gap. Corporate foresight is an ability that in that enables the company to detect possible change early, interpret the consequences for the firm, and formulate effective responses to ensure the long-term survival and success (Rohrbeck 2010).

Scholars argue regarding benefits of forward-looking through corporate foresight, that it may lead to the possibility of discovering and pursuing distant opportunities that lie outside the predominant ways of thinking (Hamel and Prahalad 1994, Gavetti 2012). Such distant opportunities are less likely to be identified and tested by competitors and thus more rewarding. Corporate foresight may also allow the identification of possible future paths to take and with that the ability to actively prepare for those futures (Brown and Eisenhardt 1997). Studies have shown that foresight in areas such as opportunities in technologies, potential competitive situations, and other potential profitable situations can lead to better investment decisions, especially in the realms of research and development (R&D) and innovation investments (Courtney 2001, Mcgrath and Nerkar 2004). Therefore, we expect that firms engaged in corporate foresight in a sophisticated manner may see performance benefits.

In our study, we develop and test a model that measures corporate foresight as a multi-dimensional concept and link it to (innovation) performance. By doing so, first, we contribute to research by developing and validating a measurement scale for corporate foresight. Second, we examine the relationship between corporate foresight and various (innovation) performance dimensions in a chain-of-effects model to test for the effects of corporate foresight on performance, and in order to create a better understanding of added value of corporate foresight. Third, we aim to contribute generalizable results by drawing on a cross-industry and cross-national dataset.

This paper is structured as follows. First, we provide a review of previous literature on corporate foresight and its influence on (innovation) performance, and conclude with hypotheses. We then discuss the research methodology and corporate foresight measurement scale development. Results are presented of our empirical study, as well as a discussion on its implications and areas for future research.

THEORY AND HYPOTHESES

Corporate foresight

The conceptualization and operationalization of corporate foresight has received limited attention. Instead, scholars have focused on specific foresight issues, such as the appropriate methodologies and techniques as part of corporate foresight (Battistella 2014). We depart from a sole focus on methodologies and examine how corporate foresight may lead a firm to be more future-oriented. For instance, Hamel & Prahalad (1994) argue that corporate foresight should not be a one-time effort, but rather an "ongoing project sustained by continuous debate within a company" (Hamel and Prahalad 1994, p. 128). It is a systematic effort for early identification of important opportunities and threats, and the facilitation of response towards those. In this study, we follow the definition of corporate foresight of

Rohrbeck (2010, p. 11): "Corporate foresight is an ability that includes any structural or cultural element that enables the company to detect discontinuous change early, interpret the consequences for the company, and formulate effective responses to ensure the long-term survival and success of the company."

Our conceptualization aims to capture the foresight that exists throughout the entire organization and pulling together the collective wisdom within a firm to allow for anticipating possible futures (Hamel and Prahalad 1994). The concept of corporate foresight presented here is an attempt to comprehensively capture the contours of corporate foresight within a firm of which scholars have attempted to define its elements (Patvardhan 2013). It draws upon relevant concepts such as environmental scanning (Daft *et al.* 1988), strategic issue management (Ansoff 1980), peripheral vision (Day and Schoemaker 2005), and sense-making (Daft and Weick 1984). Central is the concept of weak signals, and the assumption that there is 'information out there' and that it can be found by firms through searching (Day and Schoemaker 2004, 2005). These weak signals can either be interpreted to avoid strategic surprises (Ansoff 1975, 1980), or as new opportunities (Hamel and Prahalad 1994, Gavetti *et al.* 2012).

Implementations of corporate foresight can differ widely between organizations and seem to be contingent upon an firm's stance towards its environment and strategic aspirations (Daft and Weick 1984). Therefore, Rohrbeck (2010) introduced a maturity model of corporate foresight that identifies the most salient elements of the corporate foresight ability. The maturity model for corporate foresight consists of 5 distinct dimensions – information scope, method usage, people, formal organization, and culture. We use slightly different terms than from the original model to better cover their conceptual meaning. These dimensions are distinct in the sense that they each tap into a distinct conceptual part of corporate foresight.

Regarding the five dimensions, information scope implies the ability to probe a broad range of diverse information sources to relay back to the organization for foresight purposes. Method usage reflects the extent to which an organization uses structured ways (i.e. methods, techniques) to process acquired information on relevant trends, issues, and opportunities in order to make sense out of them in organizational useful ways. People reflects the extent to which people involved with corporate foresight have specific characteristics beneficial for foresight and networks in place to communicate foresight insights. Formal organization implies that there are formal management procedures and support mechanisms in place that supports systematic foresight within a firm, independent of where it takes place within the firm. Lastly, culture reflects whether the organizational culture is supportive of corporate foresight. Based on this maturity model we argue that for effective corporate foresight a firm needs to emphasize all five dimensions and therefore, each dimension is a manifestation of corporate foresight.

Performance

Empirical research on the relationship between corporate foresight and performance has typically been fraught with difficulties. A key factor that seems to have limited empirical research on the relationship between corporate foresight and performance is that the impacts of future-related insights are only measurable or observable in the long-term. However, this limitation is highly contingent on how corporate foresight is conceptualized. For instance, according to Brown and Eisenhardt (1997), some firms would create a single view of the future and plan for this future by creating a comprehensive strategy and product development plan. Typically, researchers in the field of corporate foresight have extensively focused on future-oriented methods such as scenarios and roadmaps, for instance to facilitate planning. Empirically quantifying the consequences of such an approach towards the future is difficult

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and would require extensive longitudinal studies. However, we focus in our study on corporate foresight as an ability that reflects a firm's forward-looking perspective to anticipate future changes, identify new opportunities, and openness to future insights that may hold novel opportunities to pursue (Spanjol *et al.* 2012), and is therefore not necessarily associated with only the longer-term of the future.

Scholars typically argue for the positive effect of corporate foresight on performance. Slaughter (1998, p. 382) argues that through corporate foresight, a firm is able to "[…] explore new markets, products and services". This departs from the view of corporate foresight merely taking on the role of preventing strategic surprises or threats (Ansoff 1975) which we will not focus on in this study. Rather, research on corporate foresight has increasingly highlighted its ability to detect new opportunities for innovation that may be beneficial for a firm in pursuit of superior performance (Patvardhan 2013). Therefore, innovation performance of a firm is a suitable performance indicator, which refers to the degree of success attained by firms in achieving goals related to new products or services (Montoya-Weiss and Calantone 1994). While innovation performance can be defined and measured on a wide range of dimensions, we focus on a specific sub-set of three innovation performance dimensions that are suitable for our research on corporate foresight – new product success, new product innovativeness, and financial performance. New product success is a dimension of performance that involves the firm's ability to adapt to changing conditions and opportunities in the environment (Walker and Ruekert 1987, Baker and Sinkula 1999), new product innovativeness refers to the level of novelty of the resulting innovations (Salomo *et al.* 2008), and financial performance refers to the financial success of innovations in terms of profitability and return on investment (Im and Workman Jr. 2004).

Hypotheses

Gavetti *et al.* (2012) argue that corporate foresight may lead a firm to see new opportunities that were at first distant, unthinkable, and undiscovered. These opportunities would allow a firm to depart from dominant ways of thinking in its own business environment and consequently become more innovative and successful than its competitors. Firms that excel at detecting these distant opportunities are rewarded more than those who do not, as such opportunities are not readily seen by competitors and thus more rewarding (Hamel and Prahalad 1994, Gavetti 2012).

Similarly, firms may be more successful and innovative by pre-emptive capture or definition of a new market. Hamel and Prahalad (1994) argue that learning about trends and patterns before competitors do is key to achieve this. Similarly, Brown and Eisenhardt (1997) underscore that firms engaged with the future allowed them to create their own future in some instances. The empirical study of Brown and Eisenhardt (1997) underscores the importance of looking into the future to create and sustain successful and innovative product portfolios. They found that successful firms, in terms of product innovation success, were more focused towards and engaged with the future. These firms owed their innovation successes by identifying multiple possible futures to drive their innovation projects, which would lead to quicker development and deployment of innovations. Less performing firms were found to be negligent towards the future which left them behind the competition. Other studies similarly argue that foresight in areas such as opportunities in technologies, potential competitive situations, and other potential profitable situations can lead to better investment decisions, especially in the realms of research and development (R&D) and innovation investments (Courtney 2001, Mcgrath and Nerkar 2004).

The line of reasoning suggests that corporate foresight leads to greater awareness and anticipation of new opportunities, and the ability to more quickly develop and deploy innovations (Han *et al.* 1998, Yadav *et al.* 2007). This lead us to propose that corporate

foresight is able to positively influence 1) new product innovativeness by being able to spot new, distant, and previously unthinkable opportunities, 2) new product success by an increased likelihood of quicker innovation development and pre-empt competition in those areas. This leads to our first two hypotheses:

> *Hypothesis 1. Corporate foresight positively impacts new product innovativeness*
>
> *Hypothesis 2. Corporate foresight positively impacts new product success*

In our study, we also suggest an indirect effect of corporate foresight on financial performance through new product success and new product innovativeness as a chain-of-effects model. New product success may be regarded as a performance dimension that emphasizes "the business' success in responding over time to changing conditions and opportunities in the environment" (Walker and Ruekert 1987, p. 19). Scholars generally argue that new product success has a positive impact on financial performance (Montoya-Weiss and Calantone 1994, Langerak *et al.* 2004). New product success is increasingly emphasized for its positive relation to financial performance by the ability to confront increased levels of competition, rapidly changing market environments, higher rates of technical obsolescence, and shorter product life cycles with new products (Griffin 1997, Langerak *et al.* 2004). For instance, Griffin (1997) found that best-practice firms achieve the majority of their sales from their recently successfully developed and launched products.

Second, with regard to new product innovativeness, previous research has identified a positive effect of innovativeness on performance (e.g., Salomo *et al.* 2008). Innovative new products provide a temporary competitive advantage that allows them to generate higher sales and market share growth (Bayus *et al.* 2003). Other scholars argue that firms need to be

innovative to gain a competitive advantage in order to survive (Li and Calantone 1998). This leads to the following hypotheses:

Hypothesis 3. Corporate foresight positively impacts financial performance.

Hypothesis 3a. Corporate foresight positively impacts financial performance through new product success

Hypothesis 3b. Corporate foresight positively impacts financial performance through new product innovativeness

Figure 1 provides the conceptual model of this paper and an overview of the relationships to be tested. First, the model includes corporate foresight, comprising of its five dimensions. Second, new product success and new product innovativeness are included as innovation performance consequences of corporate foresight. Third, financial performance is included as a consequence of both corporate foresight, and new product success and new product innovativeness. Lastly, we included several control variables that have been found relevant in explaining our performance indicators.

Insert Figure 1 about here

RESEARCH METHOD

Corporate foresight scale development

We developed measures for corporate foresight due to the absence of a comprehensive measure. We built upon the maturity model of corporate foresight proposed by Rohrbeck (2010). We generated an initial pool of items of each corporate foresight dimension based on the maturity levels for the dimensions proposed by Rohrbeck (2010). Item wording went through several iterations of feedback processing to make the item wording generally

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applicable to a broad range of industries. The survey used for this study was subject to a pilot test to assess face and content validity. We selected a convenient sample of 6 participants in academic and industry positions with knowledge and experience in foresight practices. Wording and formulation of several items was slightly adjusted after this process.

The final measurement instrument for corporate foresight contains 20 items. It measures corporate foresight on 5 reflective dimensions: information scope, method usage, people, formal organization, and culture.

Measures

Other scales used in this study originate from existing studies. For measuring innovation performance aspects, we use new product innovativeness from Salomo *et al.* (2008), new product success from Baker and Sinkula (1999), and financial performance from Im and Workman Jr. (2004). The wording of items from these scales has been slightly modified where necessary to fit our survey format and research context. For instance, if an item referred to 'product' or 'service', but not both, we replaced the wording with 'product/service'.

For our control variables, we include firm size (annual revenue) as this has been argued to influence innovation performance (Shefer and Frenkel 2005). R&D intensity has been included as innovation performance is usually linked to investment in R&D (Verdu *et al.* 2012) and to control for a firm's absorptive capacity (Laursen and Salter 2014). R&D intensity is measured by dividing the R&D expenditures of 2013 by the firm's total revenues in that year. Data on R&D expenditures and a firm's total revenues is taken from the European Commission Economics of Industrial Research and Innovation R&D Scoreboard (European Commission 2013) and public financial data made available by firms themselves. Furthermore, we include market turbulence (Han *et al.* 1998) and technological turbulence

(Citrin *et al.* 2007) to control for the that market and technological turbulences may lead to opportunities for innovation to come to the attention of a firm, regardless of any effort in trying to detect them (Carter 1971). Lastly, we include competitive intensity (Auh and Menguc 2005, Zhou *et al.* 2005) because hostile environments may induce an increased perceived need to develop new opportunities (Daft and Weick 1984). The list of all items for each measurement scale is presented in Appendix A, Table 1.

Sample

We focus on firms with an emphasis on product or service innovation. We focus on these firms as corporate foresight is increasingly regarded as an approach to anticipate future opportunities, rather than a defensive approach to avert threats (Patvardhan 2013). Therefore, we used the screening criterion "having introduced three or more product/service innovations in the last five years" in our survey to filter out non-innovating firms (Cooper 1985). Furthermore, we excluded consultancy firms that provide foresight services to other firms, as we look at firms that perform corporate foresight internally and how this consequently affects their own performance.

We developed a sequential filtering process to help us find suitable firms. We randomly drew a sample of firms from top 1000 EU firms from the European Commission Economics of Industrial Research and Innovation R&D Scoreboard (European Commission 2013). We started by searching the Internet for suitable respondents within these firms that had managerial functions in areas such as innovation management, strategy and corporate development, research and development, and higher management functions, as these areas may be most knowledgeable in being on both the creating and receiving side of foresight insights. Additionally, we drew upon information provided by representatives of firms whom the authors of this study have had contact (at conference presentations, interviews, or via

social networks). Through this process we contacted 792 firms, which were contacted directly by email and/or phone and invited to participate in the survey. The initial email included a cover letter explaining the purpose of our research. After two weeks, we followed up by a reminder emails and/or telephone calls. We received 145 questionnaires through our direct approach, indicating a response rate of 18.3%. As we also drew upon social networks the authors have been participating in, we received an additional 32 responses. Of the total 177 questionnaires received, 24 had to be excluded because either the firm was a consultancy firm providing foresight related services or because the questionnaire was incomplete.

Table 1 presents the sample characteristics of the remaining 153 firms. Our sample includes mostly larger firms (>1000 employees; N=94; 61%). Major representing industries are manufacturing/production (N=47; 30.7%), R&D and engineering (N=37; 24.2%), business/consumer services provider (N=27; 17.7%), and information technology (N=28, 18.3%). Furthermore, firms with annual revenues over 1 billion Euros account for 63.3% of our sample, and revenues over 100 million Euros account for another 15.6%.

Insert Table 1 about here

Method

We use partial least squares (PLS) estimation techniques to test our hypotheses using SmartPLS 3 (Ringle *et al.* 2014). There are several reasons why PLS is a more suitable approach in our study. First, while we have developed and will test formal hypotheses, we pursue an exploratory goal and thus we position this study as exploratory in nature. Therefore, using PLS as a soft-modelling technique is highly suitable in such a research setting (Hair, Sarstedt, Ringle, *et al.* 2012). An additional beneficial feature is the robustness of PLS with smaller sample sizes that are not perfectly normally distributed (Hair, Sarstedt, Pieper, *et al.* 2012).

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For our second-order factors and structural model, we used a two-stage approach to estimate indicators for the second-order constructs and a path weighting scheme (Becker *et al.* 2012, Hair *et al.* 2013). This method creates latent variable scores of the first-order factors, which are subsequently used as indicators for the second-order factors. For treating missing data, we use pair-wise deletion due to only being able to gather R&D expenditure data on 103 firms in our sample. Significance of the parameter estimates was tested using a nonparametric bootstrapping technique with 5000 subsamples.

RESULTS

Measurement model

We investigate the measurement models for corporate foresight based on our own developed scales, as well as the measurement models for the other concepts used in this study from existing studies. For our reflective constructs, first, we assessed indicator reliability through factor loadings of the reflective constructs. Separate CFA analyses outside PLS-SEM to validate measurement models are not recommended due to parameter estimates depend on the specific set-up of the model (Ringle *et al.* 2012).

For the corporate foresight measurement model, table 2 shows the items of the five corporate foresight dimensions, their loadings to its respective construct, composite reliability, and average variance extracted. We employed exploratory factor analysis on our 27-item corporate foresight measurement model. Indicators are deleted when 1) the factor loading to its respective construct is below .40 as we use newly developed measurement scales (Hulland 1999, Hair, Sarstedt, Ringle, *et al.* 2012), and 2) the item does not load highest onto its intended construct (Chin 1998). Several items were deleted due to low loadings. The remaining items were found to have adequate loadings ranging from 0.57 to 0.88 for first-order indicators, and 0.71 to 0.86 for second-order indicators, indicating

adequate item reliability and exceeding well the minimum of 0.40 for exploratory studies (Hulland 1999). The second-order indicator loadings confirm that the five corporate foresight dimensions are indeed manifestations of corporate foresight, which confirms a reflective model specification. For the remaining constructs used in this study, appendix A, table 1 shows detailed results of the factor analysis with items and its respective loadings. These constructs show adequate loadings and reliability values as well.

Second, we assessed the internal consistency reliability through composite reliability (CR) scores of all reflective constructs in our structural model as this is the preferred approach over Cronbach's alpha in PLS (Hair, Sarstedt, Pieper, *et al.* 2012). Values of CR range between 0.79 to 0.92, exceeding the minimum value of 0.7 and indicating adequate reliability of our constructs (Hair, Sarstedt, Ringle, *et al.* 2012).

Third, we assessed convergent validity for the reflective constructs by examining the average variance extracted (AVE) (Fornell and Larcker 1981). We find adequate convergent validity for all our reflective constructs, with AVE ranging from 0.50 to 0.74 and thus exceeding the minimum value of 0.5 (Fornell and Larcker 1981).

Lastly, we analysed discriminant validity by using the Fornell-Larcker criterion for the reflective constructs (Fornell and Larcker 1981). Using this criterion, we find that the square root of the reflective constructs' AVE value exceed the value of the highest correlation with other constructs, and thus indicates adequate discriminant validity. Table 3 reports these findings.

Insert Table 2 about here

Insert Table 3 about here

Common method variance

The measures in our study for both dependent and independent variables are collected at a single point in time with one survey instrument from a single respondent, which leads to possible common method variance (Podsakoff *et al.* 2003). We conducted a principal components factor analysis according to Harman's one-factor test, where all variables are simultaneously entered into an exploratory factor analysis through principal components without rotation. If common method variance exists, the Harman one-factor test should produce a factor that explains at least 50% of the variance. The results of this test show that the first factor is able to explain 27.9% of the variance, which reduces the possibility of common method variance being of concern. Furthermore, the correlation matrix in table 3 shows that all correlations are below .52, suggesting common method variance is of little concern (Bagozzi *et al.* 1991).

Structural model

To test our hypotheses we assessed the path coefficients between the constructs and their significance, the model's predictive ability through R^2 values for the endogenous constructs, the f^2 effect sizes to evaluate the extent to which a predictor variable impacts an outcome variable, and the predictive relevance (Q^2) of the endogenous constructs. Chin (1998) regards R^2 values of 0.67, 0.33, and 0.19 of endogenous constructs in PLS path models as substantial, moderate, and weak, respectively. For effect sizes f^2, values of .02, .15, and .35 indicate a weak, medium, or large effect of a predictor variable on an outcome variable (Henseler *et al.* 2009). To test for mediation effects, we built two models. Model 1 tested the direct effect of corporate foresight on the three innovation performance indicators. Model 2 tested the additional direct effect of new product success and new product innovativeness on financial performance. Both models included all the control variables. Table 4 reports the results for

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the estimates. Figure 2 shows model 1 (non-mediated path model), coefficient estimates, and their significance; Figure 3 shows model 2 (mediated path-model).

First, we find adequate R^2 values in our non-mediated model (model 1) for new product success ($R^2 = .35$), new product innovativeness ($R^2 = .39$), and financial performance ($R^2 = .12$). This indicates that corporate foresight shows above moderate predictive ability for new product success, new product innovativeness, and weak predictive ability for financial performance. Furthermore, the results show medium effect sizes for corporate foresight on new product success ($f^2 = .27$), new product innovativeness ($f^2 = .16$), and weak effect size on financial performance ($f^2 = .05$).

Second, we find in our mediated model (model 2) the R^2 value of financial performance increases to $R^2 = .27$, indicating much better predictive ability of our model for financial performance. The R^2 values for new product success and new product innovativeness remain similar ($R^2 = .35$ and $R^2 = .39$ respectively). We thus find close to moderate predictive effects of all our performance dimensions in our mediated model. Furthermore, we find that the effect size for corporate foresight on financial performance drops to $f^2 = .001$, while those for new product success and new product innovativeness remain similar to model 1 ($f^2 = .26$ and $f^2 = .16$ respectively). In addition to this model, the effect sizes of new product success and new product innovativeness on financial performance ($f^2 = .20$ and $f^2 = .01$ respectively) show that new product success is a stronger predictor of financial performance.

In assessing the predictive relevance of our model, we examined the Q^2 value of predictive relevance (Chin 1998). After running the blindfolding procedure (Chin 1998), we obtained Q^2 values in our mediated model of new product success ($Q^2 = .19$), new product innovativeness ($Q^2 = .24$), and financial performance ($Q^2 = .14$), which are well above zero and indicates the PLS path model's predictive relevance (Hair, Sarstedt, Ringle, *et al.* 2012).

Regarding our hypotheses, first, we find in our non-mediated model, that corporate foresight is able to positively directly influence new product success (b=.44, p<0.01), new product innovativeness (b=.33, p<0.01), and financial performance (b=.22, p<0.05), thereby supporting hypotheses H1, H2, and H3. Additionally, in our mediated model, we find strong support for H3a, which posits that the corporate foresight – financial performance relationship is mediated by new product success (b=.18, p<0.01). Furthermore, we find that new product innovativeness has no significant effect on financial performance in our mediated model (b=− -.10, n.s.), which leads to no support for H3b. We further find that the direct relationship of corporate foresight on financial performance becomes insignificant in our mediated model (b= .04, n.s.), which indicates that new product success fully mediates the corporate foresight – financial performance relationship (Baron and Kenny 1986).

Insert Table 4 about here

Insert Figure 2 about here

Insert Figure 3 about here

DISCUSSION

In this study, we explored whether corporate foresight can positively impact performance. Evidence regarding this specific relationship is seeing increasing interest in corporate foresight research, which is still spurred by speculative, conceptual, and anecdotal evidence (Patvardhan 2013). We contribute to the literature in several ways. We extend previous research on conceptual elements of corporate foresight and the maturity model of corporate foresight by Rohrbeck (2010) by introducing and developing a new measurement instrument

and empirically testing this. By using a dataset of 153 firms with a focus on innovation from a diverse range of industries, the measurement instrument can validly and reliably determine the extent to which a firm has a corporate foresight ability. The development of this measurement instrument further aids research on corporate foresight by allowing for more research on theory testing.

Furthermore, our findings show that corporate foresight can impact performance on all our performance indicators. We find that corporate foresight positively impacts new product success, new product innovativeness, and financial performance. This finding enhances the notion among scholars of corporate foresight "[…] to explore new markets, products and services" Slaughter (1998, p. 382) or to sense distant and novel opportunities well before competition is able (e.g. Hamel and Prahalad 1994, Gavetti *et al.* 2012), which in turn may have a positive effect on performance. Notably, we find that while corporate foresight indeed enhances the innovativeness of new products, innovativeness per se does not influence financial performance. For financial performance we find however that its impact by corporate foresight is fully mediated through new product success. We defined new product success as a dimension of performance that reflects a firm's ability to adapt to changing conditions and opportunities in the environment as such that is able to sustain a higher rate of success in introducing new products (Walker and Ruekert 1987, Baker and Sinkula 1999). The finding thus provides additional insight into the mechanisms by which corporate foresight may affect financial performance. Additionally, this finding significantly reduces the conceptual gap of how insights about the future from corporate foresight may be translated into financial performance of a firm. As such, we extent current research on corporate foresight as an ability to detect new opportunities for innovation that are more successful and innovative (e.g. Brown and Eisenhardt 1997, Mcgrath and Nerkar 2004, Spanjol *et al.* 2012), and as such may provide a firm superior performance (Patvardhan 2013),

Practical implications

With our study, we show that, first, getting a sense of the future may impact firm performance on the innovation and financial performance dimensions we use. Future insights may drive a firm to invest into distant and novel opportunities that may increase financial performance of a firm. Similarly, it may also allow a firm to spot opportunities before competitors do, allowing them to be more successful with their innovations, as it increases a firm's ability to adapt and cope with changing conditions and opportunities in the market. For firms, our findings may support managers who intend to create or invest further into their foresight practices.

Second, our study focuses on innovative firms and innovation performance dimensions. It only provides insight into the impact of corporate foresight on performance in an innovation context. Therefore, managers should only interpret our findings when they identify themselves also as being innovation oriented. Our findings are currently only applicable to those who intend to use corporate foresight as an approach that fits with their strategic aspirations of creating innovations that are innovative and successful.

Limitations and future research

This study has several limitations that may be addressed in future research. First, we find adequate support for our operationalization of corporate foresight through a validated measurement model as well as our hypothesized relationships on a single cross-industry dataset. Although data from firms in different industries were included, our measurement model of corporate foresight and the hypothesized relationships should be tested with other samples to enhance generalizability.

Second, conceptualizations of corporate foresight seem to differ widely in the literature in terms of conceptual elements included, as well as how it is operationalized in research. While our concept of corporate foresight is found to be valid and reliable, future research may look into other conceptualizations and operationalization to determine if they tap into the same conceptual space, as well as show similar results in relation to performance indicators.

Third, our study does not provide insight into the possibility of certain groups that may exist in our data, which may have substantially different parameter estimates that can bias the results. This potential to bias is not unsurprising in our study; we focus on innovation performance measures such as success and innovativeness which emphasizes corporate foresight as an opportunity-oriented approach, while research also acknowledges corporate foresight as a threat-avoidance approach. For the latter, our performance indicators may be inadequate, and may thus lead to potential heterogeneous data structures. While we aimed to account for this potential bias by only including innovation oriented firms, future research may investigate potential groupings of how firms use corporate foresight, and how this affects the links to our performance indicators. Future research may also consider introducing other performance indicators in this regard.

Fourth, we use a cross-sectional data set in our study. While corporate foresight is an ability that aims to enhance a firm's ability to achieve long-term performance, our data can only make inferences on this relationship at a single point in time. Although our causal inferences can only be assumed, the results of our cross-sectional study need to be confirmed by longitudinal studies, as such that future research may take on a longitudinal approach to studying corporate foresight in relation to performance.

Last, from a methodological point of view and also relevant for corporate foresight, is the usage of single informants. Previous research has emphasized that a multiple informant

method is be beneficial for our research field, as there may be a single informant bias (Rohrbeck 2010). Single informants may be overly optimistic in reporting how they perform corporate foresight, as well as how those insights are used and transformed into tangible organizational actions. Although we did not find this bias using Harman's one- factor test, future research may opt to include informants that are both on the creating-side of corporate foresight as well as on the receiving-side in order to negate this bias.

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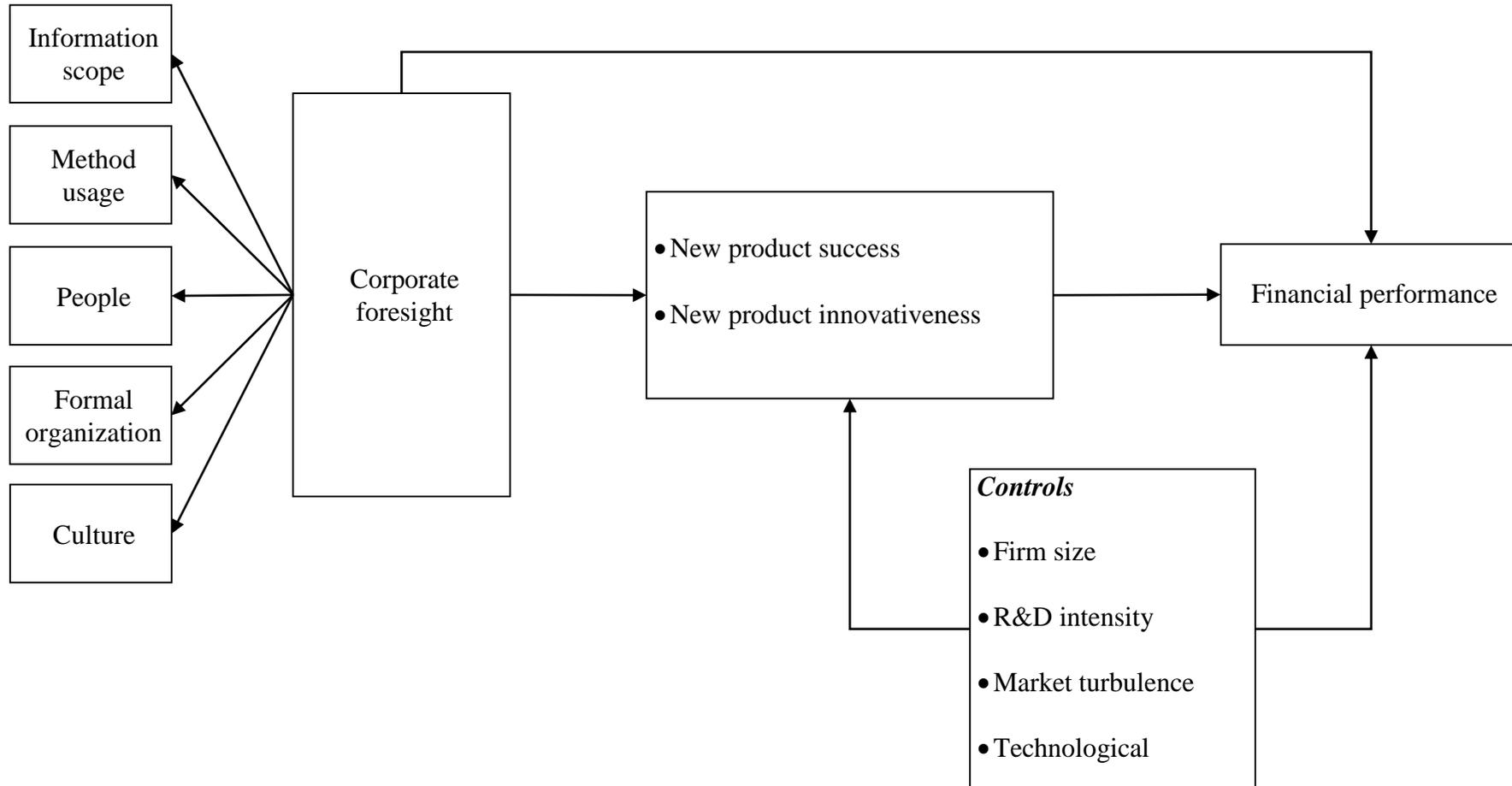
FIGURE 1

Conceptual model

TABLE 1

Sample characteristics

	No. of firms	Percentage (%)
Firm size		
<100	17	11
100-249	7	4.5
250-499	8	5.2
500-999	7	4.5
1000-1499	4	2.6
1500-2999	12	7.8
>3000	94	61
Industry		
Business/consumer service provider	27	17.7
Energy/public utilities	9	5.9
Information technology	28	18.3
Manufacturing/production	47	30.7
R&D, engineering	37	24.2
Retail/sales	5	3.3
Annual revenues ($N = 147$)		
< 10 million Euros	13	8.8
10-99 million Euros	18	12.2
100-999 million Euros	23	15.6
1-9.9 billion Euros	45	30.6
> 10 billion Euros	48	32.7

TABLE 2

Final measurement items for corporate foresight dimensions

Construct	Loading [a]	t-value [a]
Corporate foresight (CR = .89, AVE = .62)		
Information scope (CR = .84, AVE = .57)	**.85**	**27.29**
Our organization performs environmental scanning also outside our current business	.81	22.62
Our organization performs environmental scanning proactively in both time horizons, long and short term	.74	10.85
Our organization performs environmental scanning by using a large variety of information sources.	.83	20.77
Our organization performs environmental scanning by using also restricted or exclusive sources (such as personal contacts and specialized databases)	.60	7.06
Method usage (CR = .92, AVE = .74)	**.77**	**17.90**
Our organization uses structured ways to integrate future-related market and technology information	.88	28.64
Our organization uses structured ways to integrate future-related information from different time horizons.	.87	25.90
For processing future-related information our organization uses structured ways that fit a specific objective or business issue.	.83	19.08
For processing future-related information our organization uses structured ways that fit the specific context of our firm (e.g. volatility of the environment).	.85	23.85
People (CR = .85, AVE = .59)	**.76**	**16.54**
People in our organization that engage in future-related research activities have a broad knowledge reaching beyond their own domain.	.77	13.15
People in our organization that engage in future-related research activities have a strong internal network.	.84	34.84

Construct	Loading [a]	t-value [a]
People in our organization that engage in future-related research activities have a strong external (outside the organization) network	.84	23.64
People in our organization that engage in future-related research activities are good communicators	.60	5.21
Formal organization (CR = .80, AVE = .50)	**.86**	**30.59**
In our organization future-related research activities are triggered top-down (e.g. by top management).	.57	4.97
In our organization top management strongly supports future-related research	.85	18.79
In our organization future-related research is formally implemented	.71	8.52
In our organization future-related information is rapidly diffused through formal channels	.66	6.97
Culture (CR = .87, AVE = .63)	**.71**	**14.21**
In our organization most employees are receptive to signals from the external environment (outside the organization.	.79	20.31
In our organization basic assumptions are challenged explicitly and frequently.	.70	10.90
In our organization every employee is encouraged to detect weak signals (i.e. signals that announce a possible external change early).	.82	19.51
In our organization every employee is encouraged to transmit weak signals (i.e. signals that announce a possible external change early).	.86	23.18

[a] Loadings and t-values in bold indicate loadings to its higher-order construct

TABLE 3

Matrix of correlations of constructs and square root of average variance extracted

	Construct	1	2	3	4	5	6	7	8	9
1	Corporate foresight	(.79)								
2	New product success	.52	(.76)							
3	New product innovativeness	.47	.42	(.81)						
4	Financial performance	.28	.49	.19	(.81)					
5	Firm size	.12	.01	.07	.06	(1.00)				
6	R&D intensity	.05	.13	.22	.15	-.09	(1.00)			
7	Technological turbulence	.31	.31	.49	.22	.11	.11	(.81)		
8	Market turbulence	.11	.18	.25	.11	.09	-.01	.41	(.81)	
9	Competitive intensity	-.14	-.30	-.20	-.13	.11	-.22	-.05	.07	(.85)

Notes: square root of the AVE on the diagonals. Off-diagonal elements are correlations between the latent constructs.

TABLE 4

Structural model results (non-mediated and mediated models)

| Path to:	Model 1			Model 2		
	New product success	New product innovativeness	Financial performance	New product success	New product innovativeness	Financial performance
Direct effects						
Corporate foresight	.44** (5.76)	.33** (4.23)	.22* (1.98)	.44** (5.73)	.33** (4.11)	.04 (.33)
New product success	-	-	-	-	-	.48** (4.90)
New product innovativeness	-	-	-	-	-	-.10 (.97)
Indirect effects						
Corporate foresight	-	-	-	-	-	.18** (2.64)
Total effects						
Corporate foresight	-	-	-	-	-	.22** (2.10)
Controls						
Firm size	-.05 (.65)	.01 (.02)	.02 (.16)	-.04 (.59)	.01 (.06)	.05 (.32)
R&D intensity [a]	.03 (.45)	.14 (1.37)	.11 (1.12)	.04 (.53)	.15 (1.41)	.11 (1.20)
Market turbulence	.10 (1.04)	.08 (1.07)	.03 (.25)	.10 (1.13)	.08 (1.03)	-.01 (.35)
Technological turbulence	.12 (1.29)	.34** (3.83)	.12 (1.16)	.12 (1.36)	.34** (3.73)	.10 (1.25)
Competitive intensity	-.23* (2.37)	-.11 (1.46)	-.07 (0.68)	-.22* (2.36)	-.11 (1.36)	.03 (.69)
R^2	.35	.39	.12	.35	.39	.27

Notes: t-test values in parentheses – one-tailed for hypothesized effects and two-tailed for controls.

† $p < .10$, * $p < .05$, ** $p < .01$

[a] Pairwise deletion, N=103
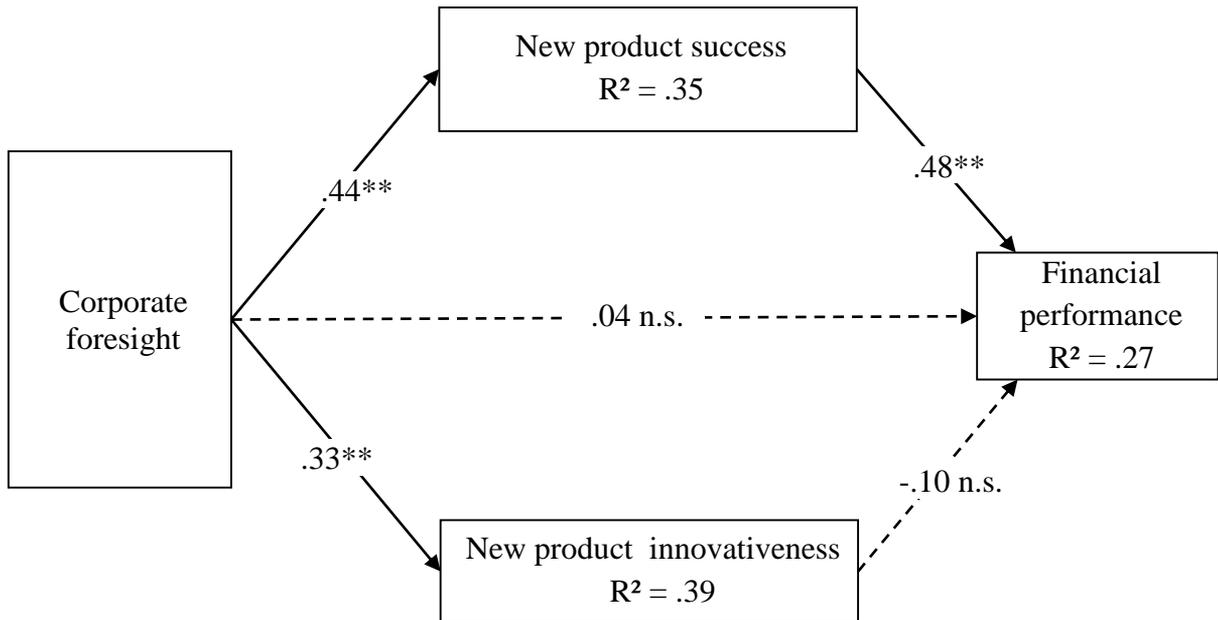
FIGURE 2

Non-mediated structural model
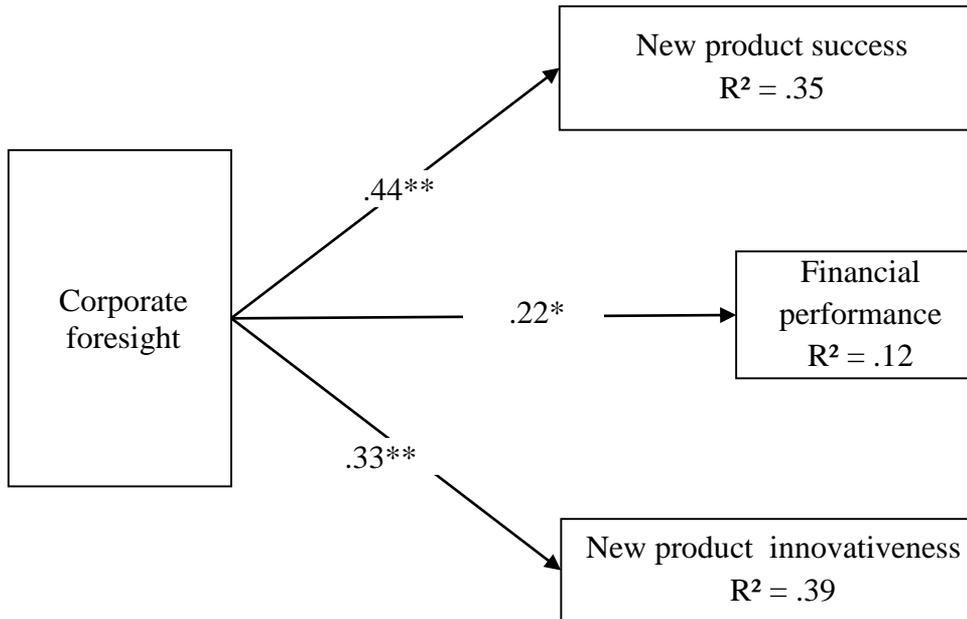
Note: control variables not shown.
† p < .10, * p < .05, ** p < .01

FIGURE 3

Mediated structural model

New product success
$R^2 = .35$

.44**

.48**

Corporate foresight

.04 n.s.

Financial performance
$R^2 = .27$

.33**

-.10 n.s.

New product innovativeness
$R^2 = .39$

Note: control variables not shown.
† $p < .10$, * $p < .05$, ** $p < .01$, n.s. not significant

Measurement items

Construct	Loading	t	AVE
New product success (CR = .90) (Baker and Sinkula 2007)			.58
Our firm performed very successfully during the last three years, with respect to:			
New product/service introduction rate relative to the largest competitor	.76	15.87	
New product/service success rate relative to the largest competitor	.77	15.00	
Degree of new product/service differentiation	.79	18.84	
First to enter the market with new applications	.78	20.06	
New product/service cycle time (time-to-market) relative to the largest competitor	.76	17.20	
Acquiring the image of an innovative supplier relative to the largest competitor	.74	15.57	
New product innovativeness (CR = .88) (Salomo *et al.* 2008)			.65
The majority of our innovations are based on substantially different core technology	.71	12.22	
The majority of our innovations involve technologies that make old technologies obsolete	.80	21.11	
The majority of our innovations use new technologies that permits quantum leaps in performance	.88	47.22	
The majority of our innovations use technologies that have an impact on or cause significant changes in the whole industry	.83	25.85	
Financial performance (CR = .89) (Im and Workman Jr. 2004)			.66
Relative to competing new products/services during the last three years, our firm's new products/services is very successful, with respect to:			

Construct	Loading	t	AVE
Return on investment	.81	15.21	
Sales	.88	29.25	
Market share	.79	12.44	
Profitability	.78	11.94	
Competitive intensity (CR = .84) (Auh and Menguc 2005, Zhou *et al.* 2005)			.72
There are too many similar products/services in the market, therefore it is very difficult to differentiate our brand.	.88	13.47	
Anything that one competitor can offer, others can match easily	.81	7.26	
Technological turbulence (CR = .85) (Citrin *et al.* 2007)			.65
Technological changes provide big opportunities in our industry	.83	19.61	
The technology in our industry is changing rapidly	.73	11.97	
A large number of new product/service ideas have been made possible through technological breakthroughs in our industry	.86	29.10	
Market turbulence (CR = .79) (Han *et al.* 1998)			.65
The extent of turbulence in the market is high	.71	3.24	
The frequency of changes in customer preferences is high	.89	5.50	