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Customer Orientation and Green Product Innovation – The Mediating Role of Entrepreneurial Orientation

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Abstract

Research has shown that many external factors drive green innovation. Yet, internal cultures and capabilities within a company that impact the development of green products remain less well understood. Additionally, it has often been taken for granted that various environments lead to new product innovation per se, while the mediating role of capabilities has widely been ignored. Hence, this study focuses on a customer-oriented company culture and the three main entrepreneurial orientation dimensions – innovativeness, proactiveness, and risk-taking – of top management teams. Findings indicate that a top management team's innovativeness and risk-taking are positively mediating the effect of a customer-oriented culture on green product innovation. The study shows that this culture fosters the dynamic capabilities innovativeness and risk-taking to respond to customer expectations. Drawing on the upper echelon theory, these capabilities, in turn, have a direct impact on the development of green products. In contrast, customer orientation has a negative effect on a proactive mindset, indicating that a culture with a strong customer focus hinders top managers to be proactive and ahead of competitors with breakthrough products. These results are based on a multiple regression analysis with an underlying sample of 684 observations of publicly listed companies within the construction industry. All data points are gathered through the analysis of letters to shareholders within annual reports and the Thomson Reuters' ASSET4 database.

Keywords: entrepreneurial orientation; innovativeness; proactiveness; risk-taking; top management team; customer orientation; green product innovation

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1. Introduction

Environmental preservation has emerged as one of the most critical issues in the 21st century. The United Nations' Sustainable Development Goals (United Nations Development Programme, 2015), the Paris Agreement (United Nations Climate Change, n.d.), and movements of a whole generation increase the awareness of climate change as a societal challenge. Esty and Winston (2009) highlighted that nowadays, no company, operating globally or locally, can afford to ignore any environmental problem their operations or products cause. The nature of business has changed from the second-generation 'industrial' corporation towards the third-generation 'sustainable' corporation (Hart, 2011). Accordingly, green innovations became a mean to achieve economic development while taking environmental responsibility (Papagiannakis, Voudouris, Lioukas, & Kassinis, 2019). Specifically, companies within the construction industry contribute over 39% of the global CO_2 emissions among economic activities (World Building Council, 2019). These companies have a high potential to combat climate change, enhancing the importance of green product innovation.

As a consequence, green innovations have rapidly increased in the last decades, and the driving forces have been diverse. Many researchers found that growing regulations and norms, including regulated resource use and CO_2 emissions, drive green innovation (Chang, 2016; Berrone, Fosfuri, Gelabert, & Gomez-Mejia, 2013; Kesidou & Demirel, 2012). Other scholars focused on the increasing pressure of stakeholders, such as shareholder or supplier pressure (Doran & Ryan, 2016; Provasnek, Sentic, & Schmid, 2017; Yu, Lo, & Li, 2017). Additionally, customer demands for green products have been found to drive green product innovation (Christmann & Taylor, 2001; Perkins & Neumayer, 2009). Although some scholars already found evidence that a company's market orientation is one of the driving forces (Kesidou & Demirel, 2012; Liao, 2018), internal antecedents of green innovation within the organization

have not received much attention (Liao, 2018). In fact, market orientation consists of different dimensions, and the influence of one still lacks examination. Considering societal concerns and the resulting demands for green products, one can assume that particularly customer orientation influences the development of green products. This orientation enables companies to respond to customer needs and to satisfy their expectations (Narver & Slater, 1990).

Nevertheless, a customer-oriented company might uncover customer needs but does not necessarily have the capabilities to conduct innovations. Instead, this culture, consisting of the ambition to satisfy customers, may encourage strategic and entrepreneurial behaviors, which, in turn, lead to innovative solutions (Slater & Narver, 2000). Indeed, a customer-oriented culture stimulates capabilities that enable the exploration and exploitation of change and opportunities (Hurley & Hult, 1998). To explore and exploit, companies need to have an entrepreneurial orientation (EO) (Lumpkin & Dess, 1996). EO refers to the willingness to experiment and create new solutions, to be proactive and ahead of competitors, as well as to take risks by discovering new and unknown marketplaces (Wiklund & Shepherd, 2005).

Based on the upper echelon theory, which argues that characteristics of a top management team (TMT) affect the entire organization (Hambrick & Mason, 1984), entrepreneurial TMTs influence organizational outcomes. Without EO, a company would remain stiff and unable to adapt to customer needs (Sharma, Chrisman, & Chua, 1997; Zahra, 2005). Therefore, EO is seen as a dynamic capability that enables a TMT to respond to recognized demands and deploy emerging opportunities, leading to increased developments of demanded green products (Zahra, Sapienza, & Davidsson, 2006).

Thus, this thesis discovers whether EO is the missing link between customer orientation and green product innovation, leading to the following research question:

Does a customer orientation drive TMTs to be innovative, proactive, and risk-taking in order to foster green product innovation?

Next to extending the existing literature by exploring the driving force of customer orientation on green product innovation, the study will make multiple contributions to gaps in the EO literature. First, despite the considerable attention on the EO–performance relationship, the antecedents of EO are often being ignored. Hence, few researchers focused on a mediating role of EO towards specific firm outcomes. As EO is widely acknowledged as a driver for superior performance (Do Couto Soares & Perin, 2019), it is essential to understand the factors and cultures stimulating it. While Rosenbusch, Rauch, and Bausch (2013) found a significant effect of environmental munificence and dynamism on EO, it can be assumed that a customer-oriented culture, which enables the firm to recognize opportunities and changes in demand could show a similar effect. Second, existing research on the impact of EO on product innovation led to inconclusive results. For instance, Lassen, Gertsen, and Riis (2006) found that each EO dimension has a varying effect. On the other side, no significant relationship was found within a sample of firms in Scandinavia and the United States (Renko, Carsrud, & Brännback, 2009). Additionally, even fewer scholars focused on the relationship between the widely known EO construct and particularly green product innovation. For instance, researchers changed the scale of EO towards green entrepreneurial orientation (Jiang, Chai, Shao, & Feng, 2018) or environmental knowledge (Roxas, Ashill, & Chadee, 2017). Third, the thesis complements existing research on EO by looking at a multidimensional construct. It is considered that each of the three dimensions could have a stronger, weaker, or even contradicting effect on a corresponding variable. Fourth, making use of analyzing EO on the basis of previously written words, results are proposed to be less biased and better accessible compared to the commonly used questionnaires to measure EO (Baruch, 1999; Krippendorff, 2004). Last, existing research in EO, green product innovation, and customer orientation is extended with an international

sample of large companies within the construction industry. Particularly EO has mainly been assessed on small companies where the use of questionnaires is more feasible compared to large multinationals (Rauch, Wiklund, Lumpkin, & Frese, 2009).

To extend the existing literature and investigate the research question, the thesis is organized as follows: First, prior empirical evidence and theoretical arguments will create the basis for the hypothesis creation. Second, the chosen industry context, the data generation, and variable measurements, as well as the analytical approach for a multiple mediation study based on a multidimensional EO construct, will be outlined in the methodology section. Next, the results of the defined hypotheses will be presented and discussed. Last, the implications of this study and recommendations for future research will be outlined.

2. Theoretical Background and Hypotheses Development

This section presents a theoretical understanding of the concepts of green product innovation, companies' customer orientation, and TMTs' EO. First, a common understanding of green product innovation and the vital role of customers in this context will be addressed. Second, drawing on the theory of customer orientation, the relationship between a customer-oriented firm and green innovation will be hypothesized. Third, EO will be explained to gain insights into the meaning of the construct and its dimensionality. Last, the mediating role of EO as a dynamic capability will be described. Based on this, multiple hypotheses will be derived and the conceptual model presented.

2.1 Green Product Innovation

Fussler and James (1996) were one of the first scholars to describe green innovation as the development and creation of new products, services, or processes that provide value for customers and businesses while significantly reducing environmental impacts. The authors underline the need for companies to find the balance between achieving financial and

environmental goals to create a win-win situation (Pereira & Vence, 2012). Ottman, Stafford, and Hartman (2006, p.24) stated that "although no consumer product has a zero impact on the environment, […] the terms 'green product' or 'environmental product' are used commonly to describe those that strive to protect or enhance the natural environment by conserving energy and/or resources and reducing or eliminating use of toxic agents, pollution, and waste". Thus, the environmental impact of a product ranges from raw material extraction and energy usage during the production process over the pollution caused during the use of the product through to its final disposal (Azapagic, 2010; Reap, Roman, Duncan, & Bras, 2008). Hence, green product innovations aim to address multiple environmental issues, ranging from 'cradle to grave' (or from 'cradle over recycling to cradle').

Especially within industries where all players have access to similar resources, the means for gaining competitive advantage have been limited. Hence, Markley and Davis (2007) claim that engaging in environmentally sustainable development is one of the few possibilities to outperform competitors. The authors argue that the creation of stakeholder value is of great importance for a sustainable competitive advantage. This means value should not only be created for shareholders in terms of profit-making, but also for other players with a certain relation to the firm (e.g. suppliers, customers, employees) (Freeman, Wicks, & Parmar, 2004). As customers are the primary source of revenue for most firms, they play a significant role in the strategic direction (Hillman & Keim, 2001). With concerns regarding climate change in the current century, the demands have shifted towards green products (Christmann & Taylor, 2001; Perkins & Neumayer, 2009). TMTs of various companies see the change towards green product innovation as driven by customer pressure and demand (Deloitte, 2015). Multiple studies showed that environmental concerns significantly impact consumer behavior, increasing the willingness to purchase green products and even the likelihood to boycott environmentally unfriendly companies (Chen, 2010; Line & Hanks, 2016; Pereira Heath & Chatzidakis, 2012).

One Tree Planted (2019) pointed out that 76% of customers would boycott a company as soon as they would learn about irresponsible operations or products. Additionally, more than half the population is willing to pay a premium for green products, led by 61% among all surveyed millennials (GlobalWebIndex, 2018). Hence, customers are very likely to influence the way companies do business.

2.2 Customer Orientation and Green Product Innovation

The important role of customers drives companies to understand and satisfy their needs, which is referred to as customer orientation (Liao, 2018). Ruekert (1992) defined this orientation as the degree to which a company uses customer information and implements tailored practices to assess customer needs and satisfaction. Based on the cultural theory, customer orientation is a corporate culture that encourages and supports the efforts to uncover and satisfy customer needs and preferences (Narver & Slater, 1990).

In today's competitive environment, customers have a wide choice of products to choose from, increasing the importance of demand-driven offers and innovations (Acar, Zehir, Özgenel, & Özşahin, 2013). Therefore, customer orientation has been a widely studied concept. Multiple scholars have found that this orientation leads to higher innovation efforts, a better innovation performance, and a competitive advantage (Frambach, Fiss, & Ingenbleek, 2016; Narver & Slater, 1990), while others argue it hinders the creation of breakthrough solutions (Atuahene-Gima, 1995; Gatignon & Xuereb, 1997). Despite much research, a more specific distinction between types of innovations emerging from this company culture need much more investigation. The growing interest in environmental solutions increases the importance of assessing the impact of customer orientation on the specific innovation of green products. To address changes in customer demands, customer orientation is a crucial factor (Feng, Sun, Zhu, & Sohal, 2012; Valenzuela, Mulki, & Jaramillo, 2010). As a customer-oriented company seeks

to satisfy its customers, this corporate culture can be seen to drive the development of demanded green products. As such, a corporate culture that supports customer satisfaction efforts and the discovery of customer needs is associated with an increase in green product innovations. Hence, the following hypothesis is formulated:

Hypothesis 1: Customer orientation has a positive effect on green product innovation.

2.3 Entrepreneurial Orientation

2.3.1 The Construct of Entrepreneurial Orientation

As product innovations – and specifically environmentally friendly product innovations – are critical to survive and succeed in today's business world (Markley & Davis, 2007), entrepreneurial activities are inevitable. EO is one of the most important drivers for innovation activities within firms (Covin & Wales, 2012; Wu, Chang, & Chen, 2008). While corporate entrepreneurship refers to a company's strategic renewal and new market entry, EO describes the key entrepreneurial processes, practices, and decision-making activities that lead organizations to new entry (Lumpkin & Dess, 1996). Before continuing with the mediating role of EO, the construct and dimensionality need to be assessed.

With the importance of innovations, EO has become a widely discussed topic in academic research. Multiple measurement possibilities and scales of the construct contribute to a depth of findings on individual and corporate levels. Much of this research has been based on the work of Miller (1983) who suggested that "[a]n entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with 'proactive' innovations, beating competitors to the punch" (p. 771). Covin and Slevin (1989) further defined EO with the entrepreneurial management styles of top managers where conservative, non-entrepreneurial firms are non-innovative, risk-averse, and passive. The focus on entrepreneurial management styles of top managers within this definition is in line with the

upper echelon theory of Hambrick and Mason (1984). This theory suggests that firm outcomes are affected by its TMT. More precisely, top managers' managerial backgrounds, traits, and characteristics highly influence their strategic choices, which in turn, impact firm outcomes. Thus, a TMT's EO has direct effects on the behavior of the entire firm. As the influence of upper management on organizational outcomes significantly increased over the past decades (Quigley & Hambrick, 2015), scholars and corporations must assess the relationship between TMTs' EO and outcomes. This thesis follows the upper echelons theory and will further investigate this relationship.

The research of Miller (1983) and Covin and Slevin (1989) led to the commonly used Miller/Covin and Slevin scale, using three dimensions of EO: innovativeness, risk-taking, and proactiveness (Do Couto Soares & Perin, 2019; Rauch et al., 2009). Miller (1983) and Covin and Slevin (1989) suggested that for a TMT to have an entrepreneurial orientation it has to be strong on all three dimensions, making it a unidimensional model. A few years later, Lumpkin and Dess (1996) contributed to the early research of EO, stating a direct link to firm performance and adding two further dimensions: autonomy and competitive aggressiveness. The authors found, in contrast to Miller (1983) and Covin and Slevin (1989), that all five dimensions are independent and multidimensional. They suggested that each dimension is influenced by organizational and environmental circumstances. This indicates that EO can also be present without every dimension being strong. Taking each dimension individually tells the researcher more than an aggregated model (Kreiser, Marino, & Weaver, 2002; Lumpkin & Dess, 2001; Poon, Ainuddin, & Junit, 2006). While there is empirical evidence that factors such as proactiveness have a positive linear relationship with organizational performance (Lumpkin & Dess, 2001), risk-taking often shows an inverted u-shaped relationship with performance (Begley & Boyd, 1987). Even Miller (2011) stated in a revised version of his initial and often cited paper from 1983 that one entrepreneurial factor would not exist for every study,

suggesting examining differences between the EO dimensions. A meta-analysis by Do Couto Soares and Perin (2019) on the relationship between EO and organizational performance found that there was no significant difference between the use of the initial three-dimensional model or the extended five-dimensional one. Furthermore, the analysis showed a significant effect in terms of dimensionality, suggesting that differences occur between dimensions. Due to the advancements in the field of EO and the differences between dimensions shown in previous studies, this thesis will follow a multidimensional construct. Additionally, based on the research of Do Couto Soares and Perin (2019), a three-dimensional approach with the initial and most-commonly used dimensions – innovativeness, risk-taking, and proactiveness – will be considered.

2.3.2 The Mediating Role of Entrepreneurial Orientation

The construct of EO has often been linked to the framework of the resource-based view. Drawing on this view, the dimensions of EO can be seen as a strategic, intangible resource that is valuable, rare, difficult to imitate, and non-substitutable, leading to a sustainable competitive advantage (Thoumrungroje & Racela, 2013). Nevertheless, critiques of this theory evolved, stating, that the classic resource-based view is firm-centered, static, and insufficient for explaining a strategic adaption to a changing environment (De Toni & Tonchia, 2003). Consequently, the concept of dynamic capabilities emerged. It refers to companies' structures, knowledge, and mindsets which help the firm to reconfigure its asset base for new profitable opportunities (Jantunen, Nummela, Puumelainen, & Saarenketo, 2008). Dynamic capabilities are not distinct from the resource-based view but rather expand it with a competitive advantage within evolving or changing markets.

According to Rosenbusch et al. (2013), EO refers to a critical capability to identify and take opportunities in a changing environment. Without EO, corporations would be stiff and unable

to adapt (Miles & Arnold, 1991). EO will, therefore, enable the firm to make use of emerging business opportunities and subsequently gain a competitive advantage (Zahra et al., 2006). Hence, the construct of EO can not only be seen as a valuable resource in a static surrounding but rather as a dynamic capability, which is built to respond to a changing market.

The current century that highlights the importance of green sustainability comes with great change. Rosenbusch et al. (2013) found that environmental dynamism, including a change in demands, drives a company's EO. They stated that environmental changes provide many opportunities that have to be explored and exploited. As a customer-oriented culture offers a source of new customer knowledge, EO as dynamic capability can seize such spotted opportunities (Jiang et al., 2018). In this regard, a company culture that is open to changing demands stimulates capabilities to explore and exploit (Hurley & Hult, 1998). Therefore, this culture encourages TMTs to be innovative, to proactively assess opportunities, and to take necessary risks in unfamiliar marketplaces. It stimulates an entrepreneurial mindset that embodies a dynamic capability as opposed to a conservative attitude.

This dynamic capability, in turn, enables a TMT to reconfigure firm resources and facilitate the development of innovative solutions (Chen 2008; Gavronski, Klassen, Vachon, & do Nascimento, 2011). Previous research has shown that EO enables companies to explore and exploit opportunities, leading to traditional innovation (Covin & Wales, 2012; Wu et al., 2008). In this relationship and in accordance with the upper echelon theory, a TMT's EO is an important factor that influences a firm's strategy and innovation efforts (Atuahene-Gima & Ko, 2001; Miller, 1983). Initiating an innovation includes the critical part of being open to changes, which is determined by the willingness or resistance of employees and TMTs (Zaltman, Duncan, & Holbek, 1973). Van de Ven (1986) built on this, highlighting the importance of TMTs to recognize the need for new ideas and developments. Solely those firms which perceive

the significance of a certain environment may be able to take advantage of EO and use this capability to create highly demanded products (Rosenbusch et al., 2013).

Accordingly, a company culture consisting of a high customer orientation encourages entrepreneurial behavior among the TMT to address new demands. In turn, EO will be the capability that ultimately supports green product innovation. As these insights are built on the whole construct of EO, it is also necessary to view each of them individually:

Innovativeness: Schumpeter (1934) was one of the first scholars stating that innovation is the key operation of an entrepreneurial organization. Many scholars followed Schumpeter's arguments and considered innovation to be the basis of entrepreneurship (Baker & Sinkula, 2009; Covin & Miles, 1999; Jennings & Young, 1990). Here, innovativeness relates to the tendency to engage in and support experimentation, ideas, and creativity (Lumpkin & Dess, 1996). Hence, innovativeness fosters creativity and experimentation in new product development within an organization. Covin and Miles (1999) even argued that no matter the level of the other EO dimensions, if there is no innovativeness in a given company, it is by no means entrepreneurial. Subsequently, innovativeness can be linked to the support of new ideas enabling the development of green products. Based on the discussion above, a customer-oriented culture supports innovativeness to enable the generation of ideas on the basis of spotted opportunities. Thus, to create green products, the company must go beyond the state of the art and be innovative, which is driven by the customer orientation of a company. The following hypotheses are suggested:

Hypothesis 2a: Customer orientation has a positive effect on TMTs' innovativeness.

Hypothesis 2b: TMTs' innovativeness has a positive effect on green product innovation.

Hypothesis 2c: The relationship between customer orientation and green product innovation is positively mediated by TMTs' innovativeness.

Proactiveness: Proactiveness relates to a forward-looking perspective and an "anticipation of future problems, needs, or changes" (Lumpkin & Dess, 1996, p. 146). Proactive companies are trendsetters rather than followers, constantly ahead of competitors, and the first to develop new products (Rauch et al., 2009). Early research highlighted the importance of a first-mover advantage as the best strategy to uncover new markets while being able to charge premium prices (Chen, 2008; Lieberman & Montgomery, 1998, 1988). Hence, a TMT's proactiveness will enable a company to be a pioneer with new, green products. This position often goes along with radical innovations[1]. Scholars studying the effect of customer orientation on radical innovations have come to inconclusive results. Some scholars argued that a customer orientation focuses too narrowly on expectations of close-minded customers, hindering radical innovations (Atuahene-Gima, 1995; Gatignon & Xuereb, 1997). On the other hand, scholars refer to customer-oriented firms being specifically keen to create breakthrough innovations for their customers (Christensen & Bower, 1996; Govindarajan, Kopalle, & Danneels, 2011; Lukas & Ferrell, 2000). Drawing on the examination above, seeing EO dimensions as a dynamic capability that enables TMTs to proactively explore and exploit opportunities, a positive relationship can be hypothesized. With the willingness to satisfy customer demands, it can be expected that TMTs become proactive in creating the right solutions for their customers. This discussion leads to the following hypotheses:

Hypothesis 3a: Customer orientation has a positive effect on TMTs' proactiveness.

Hypothesis 3b: TMTs' proactiveness has a positive effect on green product innovation.

[1] A radical innovation refers to an innovation with a high degree of novelty as opposed to an incremental one (Souto, 2015).

Hypothesis 3c: The relationship between customer orientation and green product innovation is positively mediated by TMTs' proactiveness.

Risk-taking: Engaging in practices for new market entry goes along with uncertainties and involves different degrees of risk (Lumpkin & Dess, 1996). A high tendency of risk-taking refers to engagements in high-risk activities with chances of high returns and in actions within uncertain environments (Rauch et al., 2009). Entrepreneurs may not always view themselves as less risk-averse than non-entrepreneurs, but they generally perceive business opportunities more positively and more favorably (Busenitz, 1999). According to Baird and Thomas (1985), risk can take three forms: venturing into the unknown, committing a relatively large portion of assets, and borrowing heavily. Switching innovation efforts from regular products towards green ones does not only ask for additional investments in research and development but also for a venture into the unknown. Taking an opportunity asks for a certain degree of risk that has to be taken by the TMT (Rosenbusch et al., 2013). Betting on new, sustainable products always comes at a risk, especially as green products often have to be sold at a premium (Dangelico & Pujari, 2010). Hence, a customer-orientated culture supports TMTs to engage in risky activities to address demands with innovative products. Therefore, the following hypotheses can be proposed:

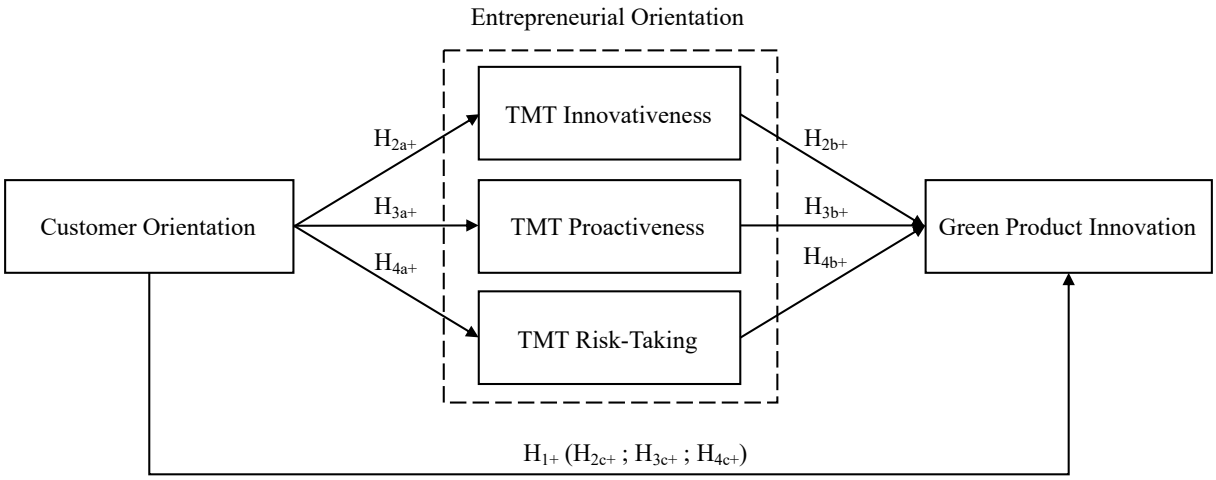
Hypothesis 4a: Customer orientation has a positive effect on TMTs' risk-taking.

Hypothesis 4b: TMTs' risk-taking has a positive effect on green product innovation.

Hypothesis 4c: The relationship between customer orientation and green product innovation is positively mediated by TMTs' risk-taking.

Figure 1

Conceptual Model



3. Methodology

The following section will outline the methodological approach. After presenting the research context consisting of the global construction industry, the data generation process and the variables will be described. Then, the mediation test based on the PROCESS macro by Hayes (2013) will be explained, and the initial decision to analyze EO as a multidimensional construct will be verified.

3.1 Research Context

The hypotheses within this thesis will be tested on a sample composed of companies operating within the global construction and engineering industry. This industry produces a wide range of products with many players being equally diverse (International Labour Organization, n.d.). The operations range from infrastructure over residential to industrial facilities. In the past years, the industry has been steadily growing (McKinsey, 2017). The volume of the global construction output is forecasted to further grow by 85% to $15.5 trillion by 2030 (PwC, 2017).

However, this enormous growth goes along with challenges for the environment. A study by Huang et al. (2018) showed that this sector has a large impact on worldwide CO_2 emissions. They stated that in 2009, the total emissions amounted to 5.7 billion tons, contributing over 20% of the global CO_2 emissions produced by economic activities. Particularly emerging economies caused about 60% of the global CO_2 emissions within the construction industry. Ten years later, in 2019, the World Building Council (2019) reported that construction companies are even responsible for 39% of worldwide emissions. 28% of these account for operational emissions (from energy used to heat, cool, and light buildings), while 11% account for so-called 'upfront' emissions, which are associated with processes before the use of the asset. Therefore, the council has released an ambitious vision of reducing 'upfront' emissions by at least 40% and operational emissions to net-zero by 2030.

Dodge Data & Analytics (2018) stated that the main driver for companies to engage in green construction activities is client demand. To achieve a greener vision and meet customer demands, new and green innovations were developed over the century. Although most innovations have been incremental, multiple green solutions evolved (Eco-Innovation Observatory, 2011). These include, for instance, energy-efficient, better-isolated windows (Green Building Alliance, 2016) or self-powered buildings through wind or solar energy (European Patent Office, 2018). By now, many construction companies noticed the need for change and joined the green building movement. LEED (Leadership in Energy and Environmental Design) certified buildings in the United States more than doubled from 32,396 in 2010 to 69,066 in 2019 (USGBC, 2019). The necessity for green product innovations and the growing customer demand within the construction industry makes this industry a proper context to test the relationship between the company's efforts to satisfy their customers, EO, and green product innovations.

3.2 Sample and Procedure

The data for the sample is gathered through primary and secondary data collection. The independent and dependent variables, customer orientation and green product innovation, were extracted from Thomson Reuters' ASSET4 database. This database provides data obtained through publicly reported information of over 7000 firms operating in 54 industries worldwide (Refinitiv, 2019). It consists of over 400 data points corresponding to 18 categories (e.g. 'Revenue/Client Loyalty' and 'Product Innovation'), which in turn are aggregated into the four clusters 'Economic', 'Social', 'Environmental', and 'Corporate Governance', in which customer orientation is part of the 'Economic' cluster and green product innovation part of the 'Environmental' one. The ASSET4 database has been recognized as a main source of information regarding corporate sustainable responsibilities. Drawn on this database, the sample for this study consists of companies within the industry of 'Construction & Engineering' labeled 522010 of Thomson Reuters Business Classifications (Refinitiv, n.d.). It relies on publicly listed companies only. This focus is essential as it does not only facilitate data transparency but also minimizes a potential moderating effect of small local companies against large global ones. Therefore, all companies are listed in one of the stock exchanges across the world, ensuring the reliability of published information as companies are subject to strict monitoring. Furthermore, a time frame from 2002 to 2018 is used. This timeframe enables gaining an extensive dataset of the current century in which corporate environmental responsibility has become a major mantra (Dyllick & Hockerts, 2002; Hart, 2011).

Based on the companies within the ASSET4 dataset belonging to the industry 'Construction & Engineering', annual reports from 75 companies across 22 countries were retrieved to assess the dimensions of EO. Hence, to measure the mediating variables, the accurate reporting of company information and annual reports gains additional importance. As no extensive database with all reports is freely available, the collection process was done manually by accessing the

website and investor relations page of a specific company. Similar to the independent and dependent variables, a time frame from 2002 to 2018 was used. While some companies disclosed their annual reports for all these years or even further back into the 20th century, others solely disclosed those of the preceding three to five years. Furthermore, most firms publish their annual reports at the end of a calendar year, but few firms publish them throughout the year. To have consistency across all companies, reports published in the first quarter of a given year fall under the preceding year, and those published in later quarters fall under the stated one. For instance, an annual report published in March 2019 got counted as an annual report from 2018, while one published in September 2018 got allocated to 2018. Among all annual reports found, only those which were not published in 'Form 10-K' were retrieved. This had the reason that 'Form 10-K' limits the linguistic complexity, which is particularly important as the EO will be measured by analyzing its written content, as further explained in the next section. From all gathered annual reports, the letters to shareholders written by a member of the TMT, most commonly the chairman or CEO, were extracted. The procedure led to a total of 948 letters to shareholders of 75 different companies across 22 countries. A detailed list of all companies is outlined in the appendix (Table 5).

3.3 Measures

To test the hypotheses, three focus variables were used supplemented by four additional control variables.

3.3.1 Focus Variables

To measure the dependent variable, **green product innovation**, the category 'Product Innovation' within Thomson Reuters' ASSET4 database is used. This category measures the development of eco-efficient products within a given company. It reflects the creation of new,

green technologies and eco-designed, dematerialized products with an extended lifetime, recycling possibilities, or green development processes. In total, 69 measurements create an aggregated score, a number ranging from 0 to 100, indicating how a given company performs compared to all other companies in the ASSET4 database. A score of 0 reveals no commitment and effectiveness, while a score of 100 indicates the highest commitment, always in comparison to other companies. Examples of single measures within this category include the following: "Has the company received product awards with respect to environmental responsibility?"; "Does the company report on at least one product line or service that is designed to have positive effects on the environment or which is environmentally labeled and marketed?"; "Does the company report about product features and applications or services that will promote responsible, efficient, cost-effective, and environmentally preferable use?" As product innovations usually take time to emerge after preceding actions were taken (Papagiannakis et al., 2019), a time lag of one year is used for this variable.

The independent variable, **customer orientation**, is also based on the ASSET4 database. The variable is measured with the category 'Revenue/Customer Loyalty' and shows a company's efforts and commitment to understand customer expectations by assessing the satisfaction of their customers while avoiding anti-competitive behavior and price-fixing. It accurately represents a customer-oriented company culture that cares about customer expectations and aims to satisfy these. The category consists of 28 different measurements to create the aggregated score of customer orientation, which ranges from the minimum value 0 to the maximum value 100. Examples of measuring this category are: "Does the company monitor the customer satisfaction or its reputation and relations with communities through the use of surveys or measurements?"; "Does the company have a policy to improve customer satisfaction?"; "Does the company report the percentage of customer satisfaction?" With diverse information from many sources outlined before, the categories will give a proper

measure of green product innovation and customer orientation among the companies within this study.

The mediating variables, **innovativeness**, **risk-taking**, and **proactiveness**, belonging to the construct of EO, were created following a content analysis. A content analysis is based on the assumption that words used in spoken or written forms give insights about a company's management and its operations (Duriau, Reger, & Pfarrer, 2007). Based on the aforementioned upper echelon theory (Hambrick & Mason, 1984), the letters to shareholders written by the TMT of each company are the basis to measure EO. These letters give the TMT a medium to share their thoughts about the most important topics affecting the company and represent their vision and aims to bring the company forward. Consequently, various scholars validated the relationship between words in letters to shareholders and firm outcomes (Barr, Stimpert, & Huff, 1992; Short, Broberg, Cogliser, & Brigham, 2010). As the data is based on previously written words within published letters, a content analysis is more reliable and less biased than questionnaires (Baruch, 1999; Krippendorff, 2004). Short et al. (2010) created an approach to conduct a content analysis specifically for the dimensions of EO. Based on a four-step approach, consisting of a thorough deductive and inductive analysis of suitable words, the authors created an extensive dictionary for each dimension (Appendix, Table 6). Compared to human coding, computer-aided text analysis involves lower costs, higher speed, and better reliability (Short et al., 2010). Using the computer software 'Linguistic Inquiry and Word Count', the number of EO-related words in each letter to shareholders got counted. The software also counted the total words within each letter. The mean number of total words was 1,526, with the shortest consisting of merely 170 words and the longest of 8,991 words. To ensure coherence among all letters with different lengths, the number of words of each EO dimension got divided by the total word count. This resulted in distinct scores for innovativeness, proactiveness, and risk-taking.

3.3.2 Control Variables

Next to the main measure, this study controls for five additional factors which could influence the results of this study. First, the study controls for **firm size** which is measured by the natural logarithm of company's average number of employees in a given year (Kimberly & Evanisko, 1981). As larger firms are expected to face higher stakeholder pressure for green innovations (Inoue, Arimura, & Nakano, 2013), this variable is particularly interesting. Second, the firm's **financial slack resources** are taken as a control to account for the assumption that firms with larger available resources have greater means to develop green products but might not see the necessity to be entrepreneurial (Surroca, Tribó, & Zahra, 2013). This variable is being measured by taking the ratio of total current assets to total current liabilities (Papagiannakis et al., 2019). Third, **shareholder orientation** will be considered. Although this thesis concentrates on the customer side, shareholders represent a second important stakeholder. Hardwig (2010) outlined that shareholders wield much power in our economy which comes along with high responsibility for ethical issues. As companies could share their efforts towards satisfaction or solely focus on one stakeholder group, shareholder orientation needs to be controlled for. This control variable is measured on a scale from 0 to 100 and retrieved from Thomson Reuters' ASSET4 database. Fourth, **year dummies** for the years 2009 and 2018 are created. These two years have been chosen to concentrate on the effects of the financial crisis[2] and today's environment in which climate change has been more present than ever before. Last, with 22 different countries, this sample covers multiple countries all over the globe. **Geographic dummies** will be based on the headquarters of the companies within this sample and will enable finding any geographical differences. This control variable is mainly based on the distinction between continents. However, as Iizuka (2015) stated that developing countries often prioritize industrialization over environmental sustainability, the distinction between developed and

[2] Although 2008 is considered the primary year of the financial crisis, 2009 is used to account for the implemented one-year time lag of green product innovation.

developing countries will also be considered. This results in the dummies 'Europe', 'North America', 'Australia', 'Africa', 'Asia excl. Japan', and 'Japan'[3]. Following the United Nations (2019) distinction, African based companies (South Africa) and most Asian based ones (China, Hong Kong, Taiwan, South Korea, Turkey, Malaysia, South Korea, and India) are located in a developing country. On the other hand, European based companies (Spain, United Kingdom, Netherlands, Germany, France, Denmark, Sweden, Austria, Luxembourg, and Finland), North American (The United States and Canada), Australian based ones (Australia), and Japanese companies are within a developed country. European companies have the biggest share in this sample (N = 28), followed by Asia excl. Japan (N = 13), Japan (N = 11), North America (N = 8) and Australia (N = 8), and last, Africa (N = 7). Europe will act as a base reference in the analysis.

3.4 Analytical Strategy

The main analysis for testing the hypotheses of the multiple mediation model is based on ordinary least squares regressions. Specifically, the SPSS macro PROCESS by Hayes (2013) is used for multiple reasons. First, it has the advantage to directly test the indirect effect of the mediation model. Compared to the traditional causal steps approach by Baron and Kenny (1986), PROCESS looks at the model as a whole instead of relying on each path individually. Second, unlike the Sobel's test, PROCESS allows for bootstrapping. This method does not rely on the data distribution to be approximately normal, an assumption that is rarely met in reality (Hayes, 2013; Shrout & Bolger, 2002). Although a log transformation of positively skewed variables has been common practice, advancements in statistical calculations enabled getting superior results by using the bootstrapping method instead of log transformations (Barber & Thompson, 2000; Russell & Dean, 2000). Last, homoscedasticity is nearly as rare in practice

[3] The differentiation between the dummies „Asia excl. Japan" and "Japan" are due to the classification of developing and developed areas, respectively (United Nations, 2019).

as a normal distribution (Grissom, 2000). Nevertheless, one has to account for heteroscedastic residuals. PROCESS offers the function to employ a heteroskedasticity-consistent (HC) estimator (Hayes, 2013). Much empirical evidence suggests that the best results are generated by using HC3, no matter whether the error terms are homoscedastic or heteroscedastic (Hayes & Cai, 2007; Long & Ervin, 2000). HC3 is specifically suggested for small samples as it gives less weight to influential observations, but also most suggested for larger ones (Long & Ervin, 2000). Taking these advantages together, the analysis will follow the recommendation of Hayes (2013) and will employ a 50,000 bootstrap sample. Additionally, the superior HC3 estimator by Davidson and MacKinnon (1993) will be used to gain heteroscedasticity-consistent standard errors. In total, two tests will be run, one with a 95% confidence interval to calculate significance at 5% and one with a 90% confidence interval to also account for marginally significant results at 10% significance.

Before testing the hypotheses using the bootstrapping approach with PROCESS, preliminary steps had to be taken within SPSS. First, to avoid bias in the regression outcomes, outliers have been removed by following Burns and Burns (2008) procedure: Outliers were detected by standardizing the variables. Any resulting value above 3.29Z or below -3.29Z was considered an outlier. As these were only found in a few cases of the three EO variables, a deletion of outliers was possible without a drastic reduction of the sample size. Second, with little consistency among the dimensionality of the EO construct in existing literature, the initial decision for a multidimensional EO model outlined in the literature review had to be verified. To support this decision, correlations between the dimensions need to be tested. These correlations show whether the dimensions covary and predict the outcome in the same manner. Short et al. (2010) stated that a significant correlation over .5 suggests the construct to be unidimensional, while correlations lower than .5 hint towards a multidimensional model. As Table 1 shows, none of the three dimensions significantly correlate at a 5% (nor at a 10%)

confidence level, supporting the original decision for taking a multidimensional approach. Cronbach's Alpha presents another way to test EO's dimensionality (Shehu & Mahmood, 2014). The score of .029 further underlines the multidimensional approach (Appendix, Table 7).

Table 1

Descriptive Statistics and Correlations among EO Dimensions

	N	Mean	SD	1	2	3
1. TMT Innovativeness[1]	940	.56	.34			
2. TMT Proactiveness[1]	939	.12	.12	.03		
3. TMT Risk-Taking[1]	936	.10	.12	.00	0.03	

Note. [1]EO dimension words per 100 total words. $^{*}p \leq .1$; $^{**}p \leq .05$; $^{***}p \leq .01$.

Third, as already touched upon, product innovations usually take time to materialize (Papagiannakis et al., 2019), a time lag of one year is used. This time lag was incorporated by shifting the independent, mediating, and control variables to the preceding year in the dataset (t-1). Along with missing values and the aforementioned outlier analysis, the resulting effective sample consists of 684 observations.

As the last step, conditions for a regression analysis were examined. The sample size within this study exceeds the requirements by far. It is an appropriate size to represent the population for powerful bootstrap results (Hayes, 2013), to meet the assumptions of regular regressions (Burns & Burns, 2008), and to have accuracy using HC3 (Long & Ervin, 2000). Additionally, multicollinearity got tested by assessing the variance inflation factor (VIF) of all variables used in the model. The highest VIF among all regressions is with 1.442 far below the threshold of 10 (Barringer & Bluedorn, 1999), suggesting no concern for multicollinearity is present. Although PROCESS enables conducting the analysis without a normal distribution and with

heteroscedasticity, tests have been run to investigate the models further. The Kolmogorov-Smirnov (K-S) and Shapiro-Wilk (S-W) tests are used to determine normality, while the Koenker test is used to assess homoscedasticity. Table 3 shows that these two conditions are not met for most models, which is coherent with the statements of many researchers that normality and homoscedasticity are barely met in practice (Grissom, 2000; Hayes, 2013; Shrout & Bolger, 2002). These outcomes further support the use of bootstrapping and HC3.

4 Results

Before discussing the main findings, this section presents the results of the multiple mediation study. The correlations of the main variables will first be analyzed. Afterwards, each hypothesis will be examined.

4.1 Descriptive Statistics and Correlations Analysis

Before proceeding with the hypothesis tests, a first analysis will be done by assessing the descriptive statistics and correlations between the main variables. The normality tests, as well as skewness and kurtosis checks, showed that the variables are not normally distributed. Hence, the non-parametric correlation test Kendall's Tau is used and displayed in Table 2.

Among the three EO dimensions, it can be seen that the mean of proactiveness and risk-taking with 0.11 and 0.09 are similar. The mean of innovativeness, however, is considerably higher with 0.56. One cannot simply conclude that this is due to higher innovativeness of the TMT but has to take into account the larger variety of words related to this dimension. While 86 words within the dictionary by Short et al. (2010) relate to innovativeness, only 27 relate to proactiveness and 37 to risk-taking (Appendix, Table 7). As this study does not focus on the effects between the three dimensions, a standardization of the variables according to the word list is not necessary. Although the correlations among the EO dimensions have already been analyzed in a previous step, it is important to see whether results are still coherent within the

final, effective sample. The insignificant correlations between innovativeness and risk-taking (r_τ = .03, p = .361) as well as proactiveness and risk-taking (r_τ = .02, p = .397) are consistent with the previous correlation assessment and underline the multidimensionality of EO. Solely the correlation between innovativeness and proactiveness became marginally significant (r_τ = .05, p = .064). Nevertheless, the correlation coefficient of .05 is far below the threshold of .5, concluding the validity of a multidimensional construct (Kreiser et al., 2002).

A significant correlation can be seen between customer orientation and green product innovations (r_τ = .25, p < .001). This is consistent with Hypothesis 1. Additionally, the independent variable, customer orientation, is significantly but weakly correlated with all three dimensions (innovativeness: r_τ = .08, p = .002; proactiveness: r_τ = -.06, p = .02; risk-taking: r_τ = .06, p = .023). Surprising is the negative correlation with proactiveness. The correlations between the dependent variable, green product innovations, and the mediators, innovativeness and risk-taking, are also significant (innovativeness: r_τ = .10, p < .001; risk-taking: r_τ = .05, p = .051). Nevertheless, no significant correlation exists between green product innovation and proactiveness (r_τ = -.01, p = .772). Table 2 further shows significant correlations among the control variables. One can see that all correlation coefficients are below the threshold of .7, indicating no multicollinearity within this study (Burns & Burns, 2008).

Table 2

Descriptive Statistics and Correlations

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Shareholder Orientation	*53.86*	*30.98*																
2.	Firm Size	*9.21*	*2.48*	.01															
3.	Resource Slack	*1.34*	*.47*	.14***	-.18***														
4.	Year 2009	*.06*	*.23*	-.02	.05*	-.03													
5.	Year 2018	*.06*	*.25*	.13***	-.09***	.07**	-.06*												
6.	Europe	*.45*	*.50*	-.12***	.31***	-.25***	.02	-.06											
7.	North America	*.13*	*.34*	.21***	.04	.21***	.02	-.01	-.35***										
8.	Australia	*.09*	*.29*	.17***	-.23***	-.02	-.03	.06	-.29***	-.12***									
9.	Africa	*.05*	*.21*	.08**	-.07**	-.02	-.05	.05	-.20***	-.09**	-.07*								
10.	Asia excl. Japan	*.12*	*.32*	-.01	.02	.11***	-.01	-.02	-.33***	-.14***	-.12***	-.08**							
11.	Japan	*.17*	*.37*	-.18***	-.24***	.08**	.01	.03	-.40***	-.17***	-.14***	-.10***	-.16***						
12.	Innovativeness[1]	*.56*	*.34*	.02	.11***	-.01	-.10***	.04	-.03	.02	.06*	-.11***	.00	.03					
13.	Proactiveness[1]	*.11*	*.13*	.01	.01	.02	.08**	-.01	-.06*	.12***	-.05	-.02	-.01	.02	.05*				
14.	Risk-Taking[1]	*.09*	*.11*	-.02	.02	-.12***	-.02	-.02	.00	-.06*	.07**	.11***	-.01	-.05	.03	.02			
15.	Customer Orientation	*51.95*	*28.57*	.10***	.21***	-.08***	-.03	.11***	.19***	.01	-.09***	-.08**	-.03	-.12***	.08***	-.06**	.06**		
16.	Green Product Innovation	*68.90*	*27.29*	.01	.24***	-.07***	.01	.02	.21***	-.01	-.23***	-.08***	-.16***	.09***	.10***	-.01	.05*	.25***	

Note. N = 684. [1]EO dimension words per 100 total words. *p ≤ .1; **p ≤ .05; ***p ≤ .01.

4.2 Multiple Mediation Analysis

After recognizing significant correlations, the multiple mediation analysis has been conducted. Tables 3 and 4 show the main results using the SPSS macro PROCESS with 50,000 bootstrap samples. The more detailed PROCESS outputs, including the heteroscedasticity-consistent (HC3) standard errors, t-values, R-values, and 95% confidence intervals for all five models, can be found in Tables 8a to 8e in the appendix. Additionally, a summary of the hypothesis assessments is shown in Table 9 of the appendix.

The description of the results will follow the different models that are based on the paths within multiple mediation models. These paths are displayed in Figure 2 for a better understanding. Here, the c-path describes the total effect between customer orientation and green product innovation (Model 1). By contrast, the c'-path corresponds to the direct effect of customer orientation on green product innovation while accounting for the mediating variables of EO (Model 5). The a-paths describe the relationship between customer orientation and the EO dimensions (Models 2 to 4) and the b-paths the relationship between the EO dimensions and green product innovation (Model 5).

Figure 2

Multiple Mediation Model

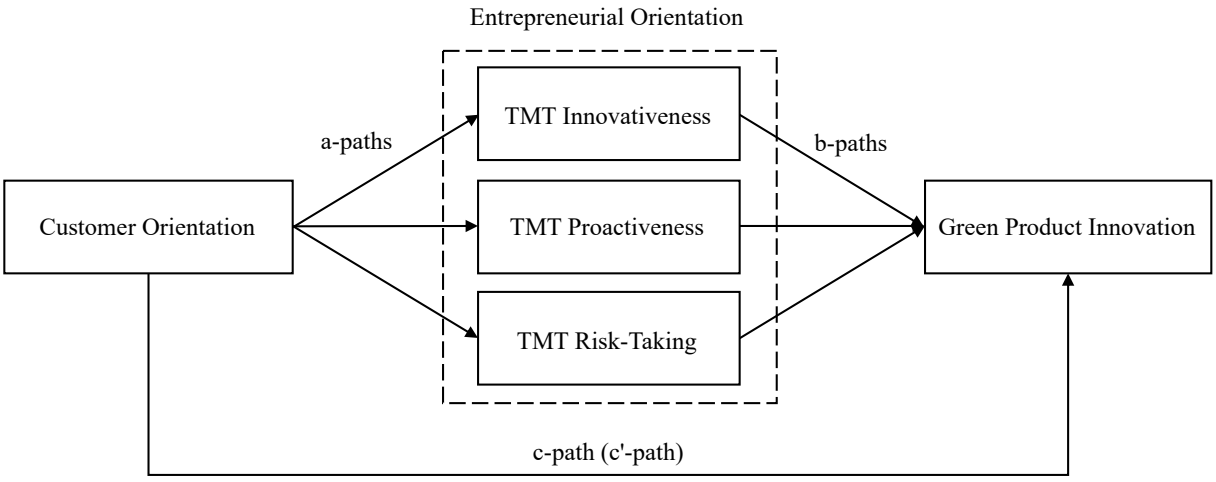


Table 3

Regression Result

	Model 1 (c-path)	**Model 2 (a-path)**	**Model 3 (a-path)**	**Model 4 (a-path)**	**Model 5 (c'-path & b-paths)**
Dependent Variable	Green Product Innovation	TMT Innovativeness	TMT Proactiveness	TMT Risk-Taking	Green Product Innovation
Constant	57.773***	.342***	.094***	.149***	51.965***
Customer Orientation	.262***	.001**	-.001**	.0003**	.243***
TMT Innovativeness	-	-	-	-	7.223***
TMT Proactiveness	-	-	-	-	-3.952
TMT Risk-Taking	-	-	-	-	24.926***
Firm Size	.238	.020***	.003	-.002	.159
Resource Slack	-2.232	-.050*	.009	-.038***	-.893
Shareholder Orientation	.066**	-.0001	.000	-.0001	.069**
Year 2009	1.560	-.181***	.041*	-.011	3.295
Year 2018	3.632	.046	.010	-.027*	4.002
North America	-7.471**	.071*	.059***	-.005	-7.619**
Australia	-28.442***	.171***	-.026*	.035	-30.644***
Africa	-17.067***	-.122***	-.018	.062**	-17.794***
Asia excl. Japan	-20.701***	.135**	.008	.012	-21.952***
Japan	7.319***	.090**	.015	-.004	6.839***
R^2	.272	.079	.057	.060	.290
F-Statistics (HC3)	F(11,672) = 25.900	F(11,672) = 8.594	F(11,672) = 3.529	F(11,672) = 4.440	F(14,669) = 23.186
Overall p-value	.000	.000	.000	.000	.000
Kolmogorov-Smirnov (sig.)	.000	.000	.000	.000	.000
Shapiro-Wilk (sig.)	.000	.000	.000	.000	.000
Koenker (sig.)	.000	.000	.001	.067	.001

Note. N = 684. *p ≤ .1; **p ≤ .05; ***p ≤ .01.

Model 1 describes the c-path between customer orientation and green product innovation while taking all control variables into account. It shows an overall significance ($F(11, 672) = 25.900$, $p < .001$). The independent and control variables explain 27.15% of the variance in green product innovations. As the main relation is significantly positive, the initial assumption that a company's commitment to satisfy its customers leads to a higher degree of green product innovation within this particular company can be backed ($\beta = .262$, $p < .001$). Hence, Hypothesis 1 is supported. Additionally, various control variables are significant. First, if a company commits to not only satisfy customers but also shareholders, this company seems to create slightly more green innovations compared to a company with lower efforts to satisfy shareholders ($\beta = .066$, $p = .032$). The geographic areas also play a role in the development of green product innovations. The model shows that solely Japanese companies engage more in green product innovations than European ones ($\beta = 7.319$, $p = .001$). Compared to all other geographic regions, European companies are stronger in these innovations, with Australian ones showing the least engagement ($\beta = -28.442$, $p < .001$).

The a-paths between customer orientation and the three EO dimensions are tested in Models 2, 3, and 4. All models are statistically significant (Model 2: $F(11, 672) = 8.594$, $p < .001$; Model 3: $F(11, 672) = 3.529$, $p < .001$; Model 4: $F(11, 672) = 4.440$, $p < .001$) but explain solely between 5.65% to 7.87% of the variance in the respective EO dimension.

Starting with **Model 2**, a significant relation between customer orientation and a TMT's innovativeness exists ($\beta = .001$, $p = .017$), supporting Hypothesis 2a. Additionally, the control variable, firm size, measured by the natural logarithm of the number of employees, has a significantly positive effect on innovativeness ($\beta = .020$, $p = .001$). This indicates that large firms tend to have a more innovative TMT. Resource slack, which is the ratio of current assets

over current liabilities, has a marginally significant negative effect on innovativeness (β = -.050, p = .054). While the year 2018 is not significant, 2009, representing the financial crisis, has a negative effect on innovativeness (β = -.181, p < .001). Last, all geographic dummies are at least marginally significant. TMTs of companies with headquarters in North America (β = .071, p = .078), Australia (β = .171, p = .002), Asia excl. Japan (β = .135, p = .012), and Japan (β = .090, p = .017) have a higher and positive effect on innovativeness than European TMTs. Solely African-based TMTs have a less innovative mindset compared to European ones (β = -.122, p = .001).

Second, **Model 3** shows the relationship between customer orientation and the EO dimension proactiveness. Contrarily to the initial predictions but in line with the correlation output, a company's culture striving for customer satisfaction has a significantly negative effect on proactiveness (β = -.001, p = .015). Hence, Hypothesis 3a is not supported, and opposite results can be observed, indicating that a customer-oriented firm culture hinders TMTs from being proactive. The control variables slightly differ from Model 2. Few controls became insignificant, while the time dummy 2009 (β = .041, p = .070) and the geographic dummy Australia (β = -.026, p = .065) became marginally significant with opposite signs compared to the previous model. This shows that proactiveness was slightly higher in the year 2009, and Australian TMTs appear to be less proactive than European ones.

Finally, the relationship between customer orientation and TMTs' risk-taking is displayed in **Model 4**. The significant result shows evidence that a company's commitment to satisfy its customers encourages the TMT to be slightly more risk-taking (β = .0003, p = .049). Therefore, Hypothesis 4a is supported. Similar to Model 2, a higher resource slack has a significantly negative effect on a TMT's risk-taking (β = -.038, p < .001). Moderate significance can also be seen in the most recent year 2018 (β = -.027, p = .074), indicating that risk-taking behavior was

lower in 2018 compared to other years. As the model further shows, risk-taking is barely influenced by the geographic headquarter of the companies. Solely African TMTs are more risk-taking than European ones (β = .062, p = .010). To conclude Models 2 to 4, the R-squared of each model suggests that many more unknown factors influence the dimensions of EO. Additionally, one has to consider the low coefficients of each dimension. However, this is due to the character of measuring EO with written words, resulting in means between .09 and .56, as displayed in Table 2.

All three b-paths, which explain the effect of the mediators TMTs' innovativeness, proactiveness, and risk-taking on the green product innovations of a company, are shown in **Model 5**. One can see that customer orientation and the mediating EO dimensions, together with the controls, explain 28.98% of the variance in green product innovation. Furthermore, it shows that an innovative (β = 7.223, p = .007) and risk-taking (β = 24.926, p = .001) mindset of TMTs support their company's innovation activities for green products. This supports Hypotheses 2b and 4b. On the contrary, the dimension proactiveness is insignificant and does not affect green product innovation within this sample (β = -3.952, p = .589). Therefore, Hypothesis 3b is not supported. Additionally, all control variables are similar to Model 1. The model further displays the c'-path, which indicates the direct effect of customer orientation on green product innovation while accounting for the three mediators. The significance of customer orientation (β = .243, p < .001) reveals that no complete mediation exists within this study. It indicates that customer orientation does not only lead to green product innovation through a TMT's EO but also through additional factors, yet unexplored. Nevertheless, the reduced coefficient from .262 in Model 1 to .243 in this model explains the existence of partial mediations.

Table 4 further underlines the existence of a mediation effect at a 95% and 90% confidence level. As the 95% confidence interval of the total effect does not incorporate zero, it can be seen that the total mediation model is positively significant (95% *CI* [.004, .036]). Nevertheless, it is most important to consider each mediation effect individually, enabling deeper insights into the different EO dimensions. With a 95% confidence interval of .001 to .020, TMTs' innovativeness acts as a mediator between customer orientation and green product innovation. Hence, the commitment of a company to satisfy its shareholders leads to an innovative mindset of the TMT, which, in turn, acts as a dynamic capability that fosters innovation efforts for green products. This supports Hypothesis 2c. Second, TMTs' risk-taking also mediates the independent and dependent variables at 95% confidence (95% *CI* [.000, .019]), showing a significant effect. Hence, customer orientation stimulates green product innovation through a risk-taking behavior of the TMT. Therefore, Hypothesis 4c can also be supported. Last, Table 4 shows that proactiveness is neither significant at a 95% (95% *CI* [-.005, .010]) nor at a 90% (90% *CI* [-0.004, 0.008]) confidence level. Therefore, proactiveness does not have a mediating role, and Hypothesis 3c is rejected.

Table 4

Indirect Effects

	Effect	SE	Lower Level CI	Upper Level CI
			95% Confidence Level	
Total	.019	.008	.004	.036
TMT Innovativeness	.009	.005	.001	.020
TMT Proactiveness	.002	.004	-.005	.010
TMT Risk-Taking	.008	.005	.000	.019
			90% Confidence Level	
Total	.019	.008	.007	.033
TMT Innovativeness	.009	.005	.002	.018
TMT Proactiveness	.002	.004	-.004	.008
TMT Risk-Taking	.008	.005	.001	.017

Note. N = 684.

4.3 Robustness Tests

Drawing on the common practice that green product innovations usually need time to materialize (Papagiannakis et al., 2019), the study incorporates a time lag of one year. At the same time, it is assumed that a company's culture has an immediate effect on a TMT's EO and hence, occurs in the same year. To verify this initial assumption, two robustness tests with different time frames were conducted. These additional analyses are based on a modification of variables and have the potential to uncover assumption errors (Lu & White, 2014).

First, Rosenbusch et al. (2013) touched upon the possibility that environmental conditions might take some time before affecting EO. Hence, it could be that a customer-oriented culture does not stimulate EO right away. With this robustness test, a period of three years is taken into account, assuming that customer orientation happens first (t-2), followed by EO a year later (t-1) and green innovation in a consecutive year (t). As Table 10a in the appendix shows, mediating effects show no significance. The focus variables, including customer orientation,

innovativeness, proactiveness, and risk-taking, became either insignificant or solely marginally significant at a 90% confidence level. These results support the initial assumption that customer orientation has an immediate effect on TMTs' EO.

Second, building on the assumption above, TMTs' mindsets could not only be influenced by a customer-oriented culture in the previous year but also in the given year combined. In other words, this test combines the initial assumption of an immediate effect and the first robustness test of taking a one year lag into account. For this, the independent variable, customer orientation, and the control variable, shareholder orientation, were recoded by taking the average of the sum of the previous (t-2) and the initially used year (t-1). The observations of EO (t-1) and product innovation (t) remained as in the initial model. It can be seen in Table 10b of the appendix that the mediating effects of innovativeness and risk-taking are significant, and, hence, act as mediators similar to the initial model. It is important to note that the model in this robustness test explains between 5.67% to 8.04% of the variance in the respective EO dimension. Compared to the initial model explaining between 5.65% and 7.87%, this percentage is only slightly higher. Nevertheless, future research could further examine whether multiple preceding years of a particular corporate culture or environmental condition could affect EO and, in turn, green product innovation or, more generally, innovation.

5. Discussion

Bearing in mind the international importance of climate change, green products gained high importance. As the construction sector is one of the main contributors to CO_2 emissions, customers see high potential in combatting climate change by opting for companies that offer green solutions (Huang et al., 2018). With growing competition and the need to differentiate, prior literature pointed out that the change of customer demands within the current century significantly drives companies to engage in green innovation (Christmann & Taylor, 2001;

Perkins & Neumayer, 2009). In the past years, efforts in green solutions have resulted in many environmentally friendly buildings (USGBC, 2019). These buildings, for instance, cover part of its electricity use with its own green power generators while saving energy by having better isolations of walls, doors, and windows. Despite the higher initial costs for customers, it has been shown that the willingness to pay a premium for green products still drives demand (GlobalWebIndex, 2018).

5.1 The Effect of Customer Orientation on Green Product Innovation

This study has built upon the relationship between customer demand and green innovation by taking the internal company perspective, specifically a customer-oriented company culture into account. The results highlight that one significant driver for green product innovation is customer orientation. This means that a firm that encourages to uncover customer demands and satisfy needs is more engaged in green product innovation compared to a firm without this external focus. With the concern for climate change among customers, customer-oriented companies notice the need for action and respond by creating green products. The finding is in line with previous research that found a positive relationship between market orientation and green innovation (Kesidou & Demirel, 2012; Liao, 2018). With customer orientation being one main dimension of market orientation, this study underlines the importance of keeping track of customer demands and expectations. Looking at a broader view, it further supports that an external focus stimulates a company's responsiveness and the development of new ideas (Hurley & Hult, 1998). As green product innovations have often been promising investments to generate economic growth, profitability, and a sustainable competitive advantage (Dangelico, 2016; Horváthová, 2010), it can be recommended to have an outside perspective on current and evolving customer expectations.

5.2 The Mediating Role of Entrepreneurial Orientation

After finding a positive effect between customer orientation and green product innovation, the mediating question remains: How does a company translate the willingness to satisfy customers and the knowledge of demand into green product innovations? As this thesis focuses on the mediating role of EO, first, customer orientation as an antecedent will be addressed. Following this, the impact of EO together with customer orientation on green product innovation will be discussed to finally come to the conclusion of mediating roles.

First, the study investigates the effect of customer orientation on EO, contributing to the EO literature with significant antecedents. The results show that a company which encourages to satisfy customer expectations stimulates its TMT to be innovative and risk-taking. This finding can be linked back to the study by Rosenbusch et al. (2013) who stated that EO is a mindset that is fostered in changing environments. Innovativeness and risk-taking enable TMTs to put emphasis on recognizing the needs for new developments (Van de Ven, 1986). Hence, a company culture that supports the efforts to meet continually changing customer expectations supports TMTs to be innovative and risk-taking as opposed to being conservative. In other words, this external view encourages a mindset that allows the creation of new ideas and is willing to engage in risky projects. Important to note is the significantly negative effect of customer orientation on TMTs' proactiveness. While it has been assumed that this relationship is similar to the other EO dimensions, a possible explanation can be drawn from the theory of radical innovation. As proactiveness refers to being ahead of the competition with breakthrough products, it can be related to the creation of radical product innovations. Salavou and Lioukas (2003) underlined this by stating that proactiveness favors radical as opposed to incremental innovation. Despite inconsistent results, multiple scholars argue that customer orientation harms radical innovation (Arnold, Fang, & Palmatier, 2011; Christensen & Bower, 1996; Lukas & Ferrell, 2000). The reason can be best explained with the famous quote by the founder of the

automotive company Ford, Henry Ford: “If I had asked people what they wanted, they would have said faster horses” (as cited in Walsh, 2017). Accordingly, it has been argued that a customer view could hinder radical innovation as customers are less likely to be aware of breakthrough possibilities (Arnold et al., 2011). Hence, linking proactiveness with a mindset for radical innovation can explain the negative effect of customer orientation on proactiveness. This, however, needs further investigation in future research.

Second, the results highlight the relevance of the two EO dimensions innovativeness and risk-taking on green product innovation. Accordingly, TMTs’ innovativeness and risk-taking have positive effects on green product innovation. This is in line with previous research, which examined the relationship between EO and traditional innovations (Covin & Wales, 2012; Wu et al., 2008). It further supports the positive effect of the adapted construct of green EO on environmentally friendly innovations (Jiang et al., 2018; Roxas et al., 2017). Drawing on the upper echelon theory, the TMT’s capabilities of innovativeness and risk-taking have a direct impact on their company’s environmental strategy. Hence, TMTs who stimulate the creation of new ideas and are willing to take risks associated with innovative solutions enable the company to engage in the development of green products. Nevertheless, not all EO dimensions examined are related to green product innovations. The results show that at least in the construction industry, TMTs’ proactiveness does not have a significant influence on green product innovation. This insignificance could be due to the absence of differentiating incremental and radical green innovation. Reports by the National Endowment for Science, Technology and the Arts (2007) as well as the Eco-Innovation Observatory (2011) stated that incremental innovations shape this industry. This explains why no relationship between proactiveness and general green product innovation can be found.

Last, combining these findings, one can already conclude a mediation effect of innovativeness and risk-taking. Indeed, the analysis unveiled that at least a partial support for an indirect effect between customer orientation and green product innovation exists. Hence, a customer-oriented corporate culture enhances green product innovation through a TMT's innovativeness and risk-taking. The significantly positive relationship between customer orientation and green product innovation while accounting for the EO dimensions reveal that TMTs' EO is one of many other potential mediating factors. Based on Jiang et al. (2018), stating that companies can utilize green EO as a dynamic capability to exploit market opportunities, EO will enable TMTs to seize opportunities spotted by understanding customer needs. Accordingly, establishing a customer-oriented culture will support entrepreneurial activities. This culture will support the TMT to be innovative and risk-taking as opposed to conservative and risk-averse. It will support an entrepreneurial mindset that embodies the dynamic capability required to drive the development of green products. Nevertheless, this culture might hinder a proactive approach to enable breakthrough ideas, hindering radical innovation. Therefore, managers are advised to build a customer-oriented culture, encourage employees to analyze customer needs, but also leave creative space to enable out-of-the-box thinking.

The study combines previous research by (1) looking at EO as a dynamic capability fostered in companies with an external focus (Rosenbusch et al., 2013) and by (2) considering the upper echelon theory, stating that this capability of TMTs influences firm outcomes (Hambrick & Mason, 1984). Taking a multidimensional approach in this study enabled the differentiation between the three dimensions innovativeness, proactiveness, and risk-taking. This unveiled that proactiveness does not act as a mediator as opposed to innovativeness and risk-taking. Hence, this study highlights the importance of viewing each EO dimension individually.

5.3 Limitations and Future Research Direction

In spite of the findings which contribute to a significant gap in existing literature, a number of limitations must be acknowledged together with opportunities for future research.

First, and as already touched upon in the discussion section, no differentiation between radical and incremental green product innovation has been taken into account. As proactiveness is often related to fostering radical innovations (Salavou & Lioukas, 2003), a distinction is specifically useful for the effect of this specific EO dimension. Furthermore, the construction industry is little involved in innovations with a high degree of novelty, underlining the insignificant result between proactiveness and green product innovation. Hence, future research could not only examine the relationship between customer orientation, proactiveness, and radical green product innovation but also investigate a sample of companies within an industry more involved in radical changes, such as high-tech industries.

Second, the fact that the relationship between customer orientation and green product innovation is not entirely but only partially mediated by a TMT's innovativeness and risk-taking reveals that many more mediating effects exist, which are yet to be explored. The first findings of this study open many possibilities for future research. One could, for instance, examine additional individual or firm-wide capabilities. Additionally, the low R-squared considering the a-paths between customer orientation and the three EO dimensions highlight that EO has many more antecedents with great potential to be further explored.

Third, the second robustness test revealed that two consecutive years of a customer-oriented culture explain slightly higher variances of the EO dimensions. The thought that cultures shape a TMT over a longer period might be the explanation. This time lag can be further investigated when paying attention to possible staff changes within a TMT. As such, new senior managers who are not impacted by a company culture in the year before could bias the findings.

Fourth, due to the nature of panel data within this study, the possibility of a heterogeneity bias appears. In this case, one has to consider a higher likelihood of a type II error, indicating that a null hypothesis was not rejected although it should have been rejected (Burns & Burns, 2008). As this study found evidence for most hypotheses and solely failed to reject the null hypothesis between proactiveness and green product innovation, this error has little effect. Additionally, the reason for the insignificant result in the relationship can be explained and further investigated with the above-mentioned points concerning radical innovation. As a specific industry was chosen and geographical differences controlled for, the likelihood of severe heterogeneity got further reduced (Leiponen & Drejer, 2007).

Fifth, as explained in the methodology section, most models showed heteroscedasticity, which led to the use of heteroscedastic-consistent standard errors. Although research has demonstrated that HC3 has very high power (Long & Ervin, 2000), further research could test the robustness with less heterogeneity.

Last, considering the methodology for examining the EO dimensions, one has to take into account that words written by the TMTs have been used on the basis of a predefined dictionary. Although it has been shown that this method is robust and reliable, a slight bias could persist due to the difference between communicated EO and the actual establishment of this capability within TMTs.

5.4 Conclusion

Environmental sustainability is the mantra of the current century (Dyllick & Hockerts, 2002; Hart, 2011). While green product innovations have gained high importance, the drivers for firm engagements are diverse. This study has shown that the internal factor of a customer-oriented culture has a significant impact on the company's development of green solutions. Customer orientation enables the company to detect demands and increases the willingness to satisfy

needs. With a large concern for climate change, these companies notice the need for action and create green products. Because the pure knowledge of customer demands does not necessarily lead to green innovation per se, this study focused on a mediation effect of EO as a dynamic capability. Overall, results show that customer orientation has a positive influence on TMTs' innovativeness and risk-taking. This indicates that a company culture that is open to meet customer expectations allows TMTs to encourage the creation of new ideas and to take certain risks for new projects. On the other hand, this study has emphasized on the necessity of a multidimensional EO construct by finding a negative relationship between customer orientation and TMTs' proactiveness. This negative effect can be linked to the ongoing discussion about whether customer orientation fosters or hinders the engagement in radical innovation. In this context, proactiveness seems to be a capability for radical innovation and is, therefore, negatively impacted by a customer focus. Drawing on the upper echelon theory, TMTs' innovativeness and risk-taking affect the entire company and ultimately lead to the development of green products. Hence, one can conclude that TMTs' innovativeness and risk-taking act as a mediator between customer orientation and green product innovation. These dynamic capabilities are encouraged in a customer-oriented culture and enable the creation of demand-driven, innovative products that contribute to the fight against climate change.

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Appendix

Table 5

List of Companies Within the Sample

Company	Location
Acciona	Spain
ACS Group	Spain
AECOM	United States
Aecon Group	Canada
Amec Foster Wheeler	United Kingdom
Aveng	South Africa
Babcock International	United Kingdom
Balfour Beatty	United Kingdom
BAM Groep	Netherlands
Basil Read	South Africa
Bilfinger Berger	Germany
Boskalis Westminster	Netherlands
Cape	United Kingdom
Cardno	Australia
Carillion	United Kingdom
China Railway Corporation	China
China Railway Group	China
China State Construction International Holdings	Hong Kong
Chiyoda Corporation	Japan
CIMIC Group	Australia
Comsys	Japan
CTCI	Taiwan
Daelim Industrial	South Korea
Daewoo Engineering & Construction	South Korea
Decmil Group	Australia
Eiffage	France
Enka İnşaat ve Sanayi	Turkey
Ferrovial	Spain
FLSmidth & Co.	Denmark
Fluor Corporation	United States
Fomento de Construcciones y Contratas	Spain
Galliford Try	United Kingdom
Gamuda Berhad	Malaysia
GEA Group	Germany
Group Five	South Africa

Table 5 (continued)

Company	Location
GS Engineering & Construction	South Korea
Harsco	United States
Hochtief	Germany
IJM Corporation	Malaysia
Jacobs Engineering Group	United States
JGC Holdings	Japan
Kajima	Japan
Keller	United Kingdom
Kier Group	United Kingdom
Kinden	Japan
Larsen & Toubro	India
Macmahon Holdings	Australia
Monadelphous Group	Australia
Morgan Sindall Group	United Kingdom
Murray & Roberts	South Africa
NCC	Sweden
Nishimatsu	Japan
NRW Holdings	Australia
Obayashi Corporation	Japan
Okumura	Japan
Quanta Services	United States
Raubex Group	South Africa
Reliance Infrastructure	India
Sacyr	Spain
Severfield	United Kingdom
Shimizu	Japan
Skanska	Sweden
SNC-Lavalin	Canada
Stefanutti Stocks	South Africa
Strabag	Austria
Taisei	Japan
Tenaris	Luxembourg
The Metallurgical Corporation Of China	China
Toda	Japan
Transurban Group	Australia
Trimble	United States
Vinci	France
Watpac	Australia
Wilson Bayly Holmes	South Africa
YIT	Finland

Table 6

Dictionaries to Measure EO Dimensions

EO Dimension	Content Analysis Words
Innovativeness	Ad-lib, adroit, adroitness, bright-idea, change, clever, cleverness, conceive, concoct, concoction, concoctive, conjure-up, create, creation, creative, creativity, creator, discover, discoverer, discovery, dream, dream-up, envisage, envision, expert, form, formulation, frame, framer, freethinker, genesis, genius, gifted, hit-upon, imagination, imaginative, imagine, improvise, ingenious, ingenuity, initiative, initiator, innovate, innovation, inspiration, inspired, invent, invented, invention, inventive, inventiveness, inventor, make-up, mastermind, master-stroke, metamorphose, metamorphosis, neoteric, neoterism, neoterize, new, new-wrinkle, innovation, novel, novelty, original, originality, originate, origination, originative, originator, patent, radical, recast, recasting, resourceful, resourcefulness, restyle, restyling, revolutionize, seethings, think-up, trademark, vision, visionary, visualize
Proactiveness	Anticipate, envision, expect, exploration, exploratory, explore, forecast, fore-glimpse, foreknow, foresee, foretell, forward-looking, inquire, inquiry, investigate, investigation, look-into, opportunity-seeking, proactive, probe, prospect, research, scrutinization, scrutiny, search, study, survey
Risk-Taking	Adventuresome, adventurous, audacious, bet, bold, bold-spirited, brash, brave, chance, chancy, courageous, danger, dangerous, dare, daredevil, daring, dauntless, dicey, enterprising, fearless, gamble, gutsy, headlong, incautious, intrepid, plunge, precarious, rash, reckless, risk, risky, stake, temerity, uncertain, venture, venturesome, wager

Note. Adopted from "Construct Validation Using Computer-Aided Text Analysis (CATA): An Illustration Using Entrepreneurial Orientation" by J. C. Short, J. C. Broberg, C. C. Cogliser, and K. H. Brigham, 2010, *Organizational Research Methods, 13*(2), 320–347.

Table 7

Cronbach's Alpha of EO Dimensions

	Cronbach's Alpha	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
Innovativeness	.029	.019	.041
Proactiveness		.018	.019
Risk-Taking		.022	.015

Note. N = 919.

Table 8a

Detailed Regression Results of Model 1

R	R^2	MSE	F(HC3)	df1	df2	p
.5211	.2715	551.3953	25.8988	11	672	.0000

	Coefficient	SE (HC3)	t	p	LLCI	ULCI
Constant	57.7725	6.1149	9.4478	.0000	45.7658	69.7792
CO	.2617	.0333	7.8546	.0000	.1963	.3272
Firm Size	.2382	.4949	.4813	.6305	-.7336	1.2100
Resource Slack	-2.2321	2.2437	-.9948	.3202	-6.6375	2.1733
SO	.0661	.0307	2.1536	.0316	.0058	.1263
Year 2009	1.5597	3.9193	.3979	.6908	-6.1359	9.2552
Year 2018	3.6320	3.8062	.9542	.3403	-3.8415	11.1055
North America	-7.4710	3.4142	-2.1882	-.0290	14.1749	-.7672
Australia	-28.4420	4.3269	-6.5732	.0000	36.9380	-19.9461
Africa	-17.0673	4.9139	-3.4733	-.0005	26.7157	-7.4189
Asia excl. Japan	-20.7013	3.3055	-6.2626	.0000	27.1917	-14.2108
Japan	7.3189	2.2831	3.2056	.0014	2.8359	11.8018

Note. Dependent variable: Green Product Innovation. N = 684. CO = Customer Orientation; SO = Shareholder Orientation. Number of bootstrap samples: 50,000.

Table 8b

Detailed Regression Results of Model 2

R	R^2	MSE	F(HC3)	df1	df2	p
.2805	.0787	.107	8.5937	11	672	.0000

	Coefficient	SE (HC3)	t	p	LLCI	ULCI
Constant	.3422	.0727	4.7036	.0000	.1993	.485
CO	.0012	.0005	2.3832	.0174	.0002	.0022
Firm Size	.0199	.0062	3.2263	.0013	.0078	.0321
Resource Slack	-.05	.0259	-1.9316	.0538	-.1009	.0008
SO	-.0001	.0005	-.1521	.8791	-.001	.0008
Year 2009	-.1805	.0434	-4.1552	.0000	-.2657	-.0952
Year 2018	.046	.05	.9193	.3583	-.0523	.1443
North America	.0709	.0402	1.7646	.0781	-.008	.1498
Australia	.1705	.0545	3.1302	.0018	.0635	.2774
Africa	-.1215	.035	-3.4748	.0005	-.1902	-.0529
Asia excl. Japan	.1354	.0537	2.5202	.012	.0299	.2409
Japan	.0895	.0373	2.3957	.0169	.0161	.1628

Note. Dependent variable: Innovativeness. N = 684. CO = Customer Orientation; SO = Shareholder Orientation. Number of bootstrap samples: 50,000.

Table 8c

Detailed Regression Results of Model 3

R	R^2	MSE	F(HC3)	df1	df2	p
.2377	.0565	.0151	3.5287	11	672	.0001

	Coefficient	SE (HC3)	t	p	LLCI	ULCI
Constant	.0935	.0287	3.2591	.0012	.0372	.1499
CO	-.0005	.0002	-2.4326	.0153	-.0008	-.0001
Firm Size	.0025	.002	1.277	.202	-.0014	.0064
Resource Slack	.0089	.0128	.6957	.4869	-.0162	.0339
SO	.0000	.0002	-.2224	.8241	-.0004	.0003
Year 2009	.0411	.0227	1.8155	.0699	-.0034	.0856
Year 2018	.0099	.0208	.4739	.6357	-.031	.0508
North America	.0587	.0186	3.1624	.0016	.0222	.0951
Australia	-.0258	.0139	-1.8515	.0645	-.0532	.0016
Africa	-.0183	.0184	-.9927	.3212	-.0544	.0179
Asia excl. Japan	.0077	.0169	.456	.6486	-.0255	.0409
Japan	.0151	.0148	1.0186	.3088	-.014	.0442

Note. Dependent variable: Proactiveness. N = 684. CO = Customer Orientation; SO = Shareholder Orientation. Number of bootstrap samples: 50,000.

Table 8d

Detailed Regression Results of Model 4

R	R^2	MSE	F(HC3)	df1	df2	p
.2455	.0603	.0125	4.4402	11	672	.0000

	Coefficient	SE (HC3)	t	p	LLCI	ULCI
Constant	.1487	.0287	5.1791	.0000	.0923	.2050
CO	.0003	.0002	1.9684	.0494	.0000	.0007
Firm Size	-.0022	.0022	-.9939	.3206	-.0066	.0022
Resource Slack	-.0378	.0083	-4.5734	.0000	-.0541	-.0216
SO	-.0001	.0002	-.5486	.5835	-.0004	.0002
Year 2009	-.0108	.0155	-.6980	.4854	-.0411	.0196
Year 2018	-.0266	.0149	-1.7881	.0742	-.0558	.0026
North America	-.0053	.0121	-.4394	.6605	-.0291	.0184
Australia	.0348	.0214	1.6262	.1044	-.0072	.0769
Africa	.0615	.0238	2.5830	0.0100	.0147	.1082
Asia excl. Japan	.0122	.0156	.7796	.4359	-.0185	.0428
Japan	-.0043	.0129	-.3317	.7402	-.0297	.0211

Note. Dependent variable: Risk-Taking. N = 684. CO = Customer Orientation; SO = Shareholder Orientation. Number of bootstrap samples: 50,000.

Table 8e

Detailed Regression Results of Model 5

R	R^2	MSE	F(HC3)	df1	df2	p
.5383	.2898	539.9428	23.1862	14	669	.0000

	Coefficient	SE (HC3)	t	p	LLCI	ULCI
Constant	51.9650	6.3325	8.2061	.0000	39.5310	64.3989
CO	.2429	.0337	7.2148	.0000	.1768	.3090
Innovativeness	7.2228	2.6739	2.7013	.0071	1.9727	12.4730
Proactiveness	-3.9517	7.3042	-.5410	.5887	-18.2936	10.3903
Risk-Taking	24.9258	7.6468	3.2596	.0012	9.9112	39.9404
Firm Size	.1592	.4935	.3227	.7470	-.8097	1.1282
Resource Slack	-.8926	2.2645	-.3942	.6936	-5.3391	3.5539
SO	.0688	.0304	2.2620	.0240	.0091	.1286
Year 2009	3.2947	3.8587	.8538	.3935	-4.2821	10.8714
Year 2018	4.0017	3.8801	1.0313	.3028	-3.6169	11.6203
North America	-7.6188	3.4257	-2.2240	.0265	-14.3452	-.8924
Australia	-30.6437	4.1962	-7.3027	.0000	-38.8830	-22.4044
Africa	-17.7941	4.7829	-3.7204	.0002	-27.1853	-8.4029
Asia excl. Japan	-21.9518	3.3270	-6.5981	.0000	-28.4844	-15.4192
Japan	6.8392	2.3447	2.9169	.0037	2.2354	11.4430

Note. Dependent variable: Green Product Innovation. N = 684. CO = Customer Orientation; SO = Shareholder Orientation. Number of bootstrap samples: 50,000.

Table 9

Overview of the Hypothesis Assessments

	Hypothesis	Assessment
Hypothesis 1	Customer orientation has a positive influence on green product innovations.	Supported
Hypothesis 2a	Customer orientation has a positive influence on TMTs' innovativeness.	Supported
Hypothesis 3a	Customer orientation has a positive influence on TMTs' proactiveness.	Not supported - opposite results found
Hypothesis 4a	Customer orientation has a positive influence on TMTs' risk-taking.	Partially supported
Hypothesis 2b	TMTs' innovativeness has a positive influence on green product innovation.	Supported
Hypothesis 3b	TMTs' proactiveness has a positive influence on green product innovation.	Not supported
Hypothesis 4b	TMTs' risk-taking has a positive influence on green product innovation.	Supported
Hypothesis 2c	The relationship between customer orientation and green product innovations is positively mediated by TMTs' innovativeness.	Supported
Hypothesis 3c	The relationship between customer orientation and green product innovations is positively mediated by TMTs' proactiveness.	Not supported
Hypothesis 4c	The relationship between customer orientation and green product innovations is positively mediated by TMTs' risk-taking.	Partially supported

Table 10a

Results of First Robustness Test

	Effect	SE	Lower Level CI	Upper Level CI
TMT Innovativeness	.007	.005	-.0001	.018
TMT Proactiveness	.001	.002	-.003	.007
TMT Risk-Taking	.007	.005	-.0001	.018

Note. N = 632. 95% confidence level. Customer orientation: t-2; TMT EO dimensions: t-1; green product innovations: t. Number of bootstrap samples: 20,000.

Table 10b

Results of Second Robustness Test

	Effect	SE	Lower Level CI	Upper Level CI
TMT Innovativeness	.010	.006	.001	.022
TMT Proactiveness	.001	.003	-.005	.008
TMT Risk-Taking	.008	.005	.0004	.019

Note. N = 632. 95% confidence level. customer orientation: (t-2+t-1)/2; TMT EO dimensions: t-1; green product innovations: t. Number of bootstrap samples: 20,000.