Does Market Visioning Competence Mediate or Moderate the Relationship Between Entrepreneurial Orientation and Product Innovativeness?

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DOES MARKET VISIONING COMPETENCE MEDIATE OR MODERATE THE RELATIONSHIP BETWEEN ENTREPRENEURIAL ORIENTATION AND PRODUCT INNOVATIVENESS?

BY

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ACCEPTANCE

This dissertation was prepared under the direction of the JOHN. S. STOWELL Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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ABSTRACT

DOES MARKET VISIONING COMPETENCE MEDIATE OR MODERATE THE RELATIONSHIP BETWEEN ENTREPRENEURIAL ORIENTATION AND PRODUCT INNOVATIVENESS?

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High levels of innovation are associated with competitive economies, industry vigor, and firm competitive differentiation. High and stable technology firms compete in industries with intense market dynamism, which is characterized by the fast pace of technological change and resulting market ambiguities. These firms develop products with product innovativeness (PI) for competitive differentiation. High and stable technology firms also tend to have high levels of Entrepreneurial Orientation (EO), which sets the firm's priorities and structures towards innovation and has been shown to increase PI in literature. This study adds a cutting-edge competency, Market Visioning Competence (MVC), to firms with high EO to evaluate whether this innovation development competency acts as mechanism to sustain or increase levels of PI. MVC features networking, idea advocacy, proactive research to uncover unstated needs, and market forecasting tools. It is hypothesized that firms with high EO in high technology industries (e.g., software) have integrated MVC into their capabilities already (as a mediator) because of their need for a unique product development competency to sustain PI given intense market dynamism. It is also hypothesized that MVC may moderate EO for increased PI in stable technology firms (e.g. chemical) as a way to increase PI.

This study surveyed a panel of 201 product development executives in both high and stable technology firms. The study applied quantitative findings from descriptive statistics, correlation analysis and PLS-SEM modeling of the factors. The findings confirmed past studies that a high EO level increases the PI for firms in high and stable technology industries. MVC was found to be a mechanism (a mediator) between a firm's EO and the development of PI for high technology firms. This MVC mediation of EO to PI finding in high technology confirms the presence of MVC as a cutting-edge capability to develop technologically advanced products for differentiation and to offset market dynamism. MVC was not found to moderate EO and increase PI for stable technology industry firms. The lack of moderation of EO in stable technology firms is attributed to less market dynamism and the resulting tendency of stable technology firms to pursue more predictable, less advanced technology, incremental innovation.

*Keywords***:** entrepreneurial orientation, market visioning competence, product innovativeness, mediation, moderation

Chapter I: Introduction

I.1 Background

Product innovation can have major benefits for a firm and society. Product innovation generates wide competitive differentiation for a firm, thus increasing competitive advantage (Chen, Li, & Evans, 2012; Olson, Walker, & Ruckert, 1995). New technological innovations in product innovation are also likely to reset the limited growth curve of benefits for end users and dollar sales for firms, thus generating higher sales rates than existing technologies (Chandy & Tellis, 1998; see Appendix A). New technological innovations tend to improve the product innovativeness (PI) of new products and provide higher benefit levels to consumers (Thornhill, 2006). However, measuring product innovation can be a challenge (Garcia & Calantone, 2002). I have defined PI as "a measure of the potential discontinuity a product (or service) can generate in the marketing and/or technological process" (Garcia & Calantone, 2002, p. 113) for measurement validity and reliability purposes in this study.

Technological innovation can also have societal benefits. Firms at the aggressive edge of innovation are more likely to win in global markets and enhance the competitiveness of markets in their home countries (Atuahene-Gima & Ko, 2001; Tellis, Prabhu, Sethi, & Chandy, 2009). Among the various levels of innovation, radical innovation is typically the most technologically discontinuous and most impactful for competitive advantage. The launch of a radical new product sometimes creates an all new product category or reshapes an existing one (Chandy & Tellis, 2000). Successful radical innovation can also position a firm to leverage first-mover advantage and garner higher market demand (Chandy & Tellis, 2000). Firm business results are typically positive whether a firm launches a radical new product or one that is noticeably higher in innovativeness than the competitive set (Kleinschmidt & Cooper, 1991). Firms competing in high technology industries (e.g., software or pharmaceuticals; Kile & Phillips, 2009) and stable technology industries (e.g., specialty chemical or banking; Hall & Vopel, 1997) generate and experience continuous pressure to develop new products with an increasingly higher level of technology-centered innovation. The fast pace of innovation and the end user ambiguity along with the overall market turbulence is a phenomenon dubbed market dynamism (Achrol & Stern, 1988; Cui, Griffith, Cavusgil, & Dabic, M. 2006; Thornhill, 2006). Market dynamism is characterized by frequently changing technologies, shifting competitive structures, and rapidly evolving user expectations (Achrol & Stern, 1988; Cui et al. 2006; Thornhill, 2006). Firms from high technology industries, especially, and stable technology industries must continually widen their product differentiation and thereby enhance their competitive position or risk falling behind due to the market dynamism (Achrol & Stern, 1988; Cui et al. 2006; Thornhill, 2006).

For clarity sake on industry classifications by technology level, high technology firms are described as engaged in the design, development, and introduction of new products or manufacturing processes through the systematic application of scientific and technical knowledge (Heckler, 2005). Additional high technology aspects include using state-of-the-art techniques and employment of a high proportion of scientific or technical personnel.

Changing demographics also pressure firms to improve their capabilities in order to create more innovative products (Information Resources [IRI], 2017). Members of the Millennial generation and Generation Z have tended to be more demanding than members of previous generations about the technological innovativeness of new products (IRI, 2017). In summary, firm executives have been challenged to find new competencies that improve their companies' PI, raise innovation success rates, and shorten development cycles (Ahmetoglu, Akhtar, Tsivrikos, & Chamorro-Premuzic, 2018).

I.2 The Business Problem

Successfully developing and introducing innovative new products is a capability challenge for many firms. Firms that are effective at new product innovation will produce markedly different new-product success rates than firms with less effective development capabilities. Markham and Lee (2013) studied 453 companies globally and segmented those companies based on new-product innovation performance. The authors named the companies that ranked in the top 25% for product-development effectiveness *the best* and dubbed the remaining 75% of companies *the rest*. New products from the best firms had an 82% success rate (Markham & Lee, 2013). The rest of the firms achieved a 52% success rate with their new product introductions, forming a 30-point success-rate gap between the two groups (Markham & Lee, 2013). Further, the gap between the best and the rest on new product success rates widened 10 points between 2004 and 2012. Additionally, the best firms derived significantly more profit from highly advanced new products than the rest (Markham & Lee, 2013), positioning those firms' wider competitive differentiation. Boards of directors have made costly increases in research and development (R & D) or significant and disruptive changes in organizational structure to improve firms' innovation development capabilities and thereby generate higher PI in their firm's product lines. (Karim, 2009).

I.3 Study Constructs

Given the innovation development challenge created by market dynamism in technology-centered industries, I have selected two independent variables (constructs) for this study that existing literature linked to innovation development capabilities: the established construct of Entrepreneurial Orientation (EO) and the comparatively newer construct of Market Visioning Competence (MVC). EO has a positive, direct empirical relationship with PI (Avlonitis &

Salavou, 2007; Pérez-Luño, Wiklund, & Cabrera, 2011). EO can also act as a dispositional construct that enables firms to implement other more direct capabilities upon firm performance measures, such as PI (Zhou, Yim, & Tse, 2005). A dispositional construct acts as an antecedent for another factor to then intervene between it and act directly on the dependent variable. In simpler language, the dispositional construct (EO in this study) sets the stage for the intervening variable (MVC in this study) to then directly act upon the dependent variable (PI in this study). This factor interaction is called mediation. MVC has been found to be a firm competency in the development of advanced nanotechnology products (Reid & de Brentani, 2015) and may act as a mediator or moderator of EO to PI. A detailed discussion of this potentially significant relationship follows.

I.3.1 Entrepreneurial Orientation. Lumpkin and Dess (1996) proposed the construct of EO, which described a firm's disposition toward the cultural, strategy, and process capabilities of new-product development. They defined EO as "the processes, practices and decision-making activities that lead to new entry" (Lumpkin & Dess, 1996, p. 136). EO can act as a factor directly influencing a firm outcome, moderate another factor to the outcome, or take a dispositional nature in some business configurations with another factor mediating directly to the firm outcome (Matsuno, Mentzer, & Özsomer, 2002; Moreno & Casillas, 2008).

EO centers on strategy-setting processes that guide firms with a range of entrepreneurial choices and initiatives (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2005). This study analyzes the EO construct along three dimensions: innovativeness, proactivity, and risk taking (Covin & Slevin, 1989; Knight, 1997). The EO innovativeness dimension is "pursuit of creative or novel solutions to challenges confronting the firm, including the development and/or enhancement of products or services" (Knight, 1997, p. 214). This study focuses on the new goods development aspects of EO, not the new business formation aspect, for clarity sake.

EO has a positive empirical relationship with PI (Avlonitis & Salavou, 2007; Pérez-Luño et al., 2011) as both a construct with a direct relationship to the firm outcome and a construct of disposition that is an antecedent to another factor with a direct relationship to the firm outcome (Zhou, Yim, & Tse, 2005). It is the dispositional aspect of EO in firm configurations that forms the need to evaluate the impact of internal firm capabilities as mediators or moderators of EO to firm outcomes (Wales, Gupta, & Mousa, 2013). Wales (2016) framed a number of needed research directions for EO. Specifically, he suggested studies that might identify "certain firm capabilities that may lead to greater EO or enhance EO-outcome relationships" (Wales, 2016, p. 7). With this study, I seek to follow Wales's (2016) suggestion to better understand how MVC mediates or moderates the EO to PI relationship. PI is a firm outcome.

I.3.2 Market Visioning Competence. Market Visioning Competence (MVC) is defined as "a set of individual and organizational capabilities that enable the linking of advanced technologies to market opportunities of the future" (O'Connor & Veryzer, 2001). MVC is intriguing to study for three reasons. First, Reid and de Brentani (2015) codified MVC as a relatively new innovation development capability within the boundaries of the U.S. nanotechnology industry. While MVC was codified in the nanotechnology industry, the four dimensions of MVC bear similarities to aspects of other innovation development theories and practices (e.g. open innovation, latent needs, project championing) that have shown relevance across a broader set of industries than just the nanotechnology industry in extant literature. The MVC construct likely has relevance in firms that experience market dynamism (Achrol & Stern, 1988; Cui et al. 2006; Thornhill, 2006). Market dynamism is an environmental force and varies by the pace of change in industries (Thornhill, 2006). The fast pace of change creates market turbulence and ambiguity regarding the best new innovation to develop. In general, industries with higher R & D spending and advanced technological innovation generate higher market dynamism (Thornhill, 2006). Firms in industries with high market dynamism need MVC to cut through the uncertainty, forecast the best market opportunities, and then develop the advanced technological innovation for firm differentiation.

Second, studying MVC in combination with EO and PI could help close the research gap of firm-level moderators or mediators of the relationship between EO and firm outcomes reported by Wales (2016) and Wales et al. (2013). Finally, for practitioners, this study may uncover the potential to add a cost-efficient new product development competency to increase PI if firms have high EO. Firms have been known to significantly increase R & D or reorganize to improve P.I. The addition of MVC as an innovation development capability to a high EO firm may be a more cost effective and lower risk alternative to increase PI rather than larger scope and riskier organizational or firm investments changes (Karim, 2009).

***I.3.3* Product innovativeness.** PI was chosen as the third construct in this study and the dependent variable. PI is defined “as a measure of the potential discontinuity a product (or service) can generate in the marketing and/or technological process” (Garcia and Calantone (2002, p. 113). I have used Garcia and Calantone’s definition because other researchers frequently adopted it for its simplicity and relevancy to technology firms, and I wished to preempt any ambiguity about the type of innovation studied. A core attribute of PI is the level of technological discontinuity it brings to the technical features and benefits of new products (Garcia & Calantone, 2002).

I.4 The Study and Motivation

This study focused on the relationships among MVC, EO, and PI. For practitioners, the innovation-development challenge motivating this study has been especially relevant for firms in high and stable technology industries because of the ongoing pressures of market dynamism (Thornhill, 2006). Technological dynamism pressures firms to develop new and better capabilities that then generate more advanced innovation. Firms in technologically dynamic industries that do not continuously upgrade their innovation capabilities and generate more advanced new products risk losing competitive differentiation (Thornhill, 2006). Adding MVC to an EO disposition in a firm via a special capabilities team focused upon improving innovation would likely require fewer resources than more sweeping and riskier actions to improve innovation development capabilities, such as a large R & D spending increase or an organizational overhaul (Karim, 2009).

From a scholarly viewpoint, an opportunity existed to test the generalizability of the MVC construct beyond the nanotechnology industry where it first appeared (Reid & de Brentani, 2015). Evaluating MVC's generalizability as a competency for the balance of high technology or stable technology groups would determine its generalizability to other technology groups. Wales et al. (2013) also highlighted the need to study organizational capability moderators or mediators of EO to expand the knowledge footprint of the EO construct. This study is following that scholarly suggestion and should help determine whether MVC acts as an organizational capability mediator or moderator of the EO–PI relationship.

I.5 Research Questions

The research questions were threefold. First, does an increase in EO have a direct and positive effect upon PI? Second, will EO have an indirect effect on PI through MVC (as a mediator)? Third, as the value of MVC increases (as a moderator), will the positive effect of EO upon PI increase? R & D acts as a control in all three research questions. Each of these three questions will be answered for the two technology level groups in this study, high and stable technology firms. The technology level of the firm matters because especially high technology firms, and secondarily stable technology firms, undergo market dynamism (Thornhill, 2006). The market dynamism causes them to have to develop innovative new products to retain competitive differentiation. Firms from high technology industries experience the most intense market dynamism and are pressured to develop advanced technology, high PI new products on a consistent basis (Achrol & Stern, 1988; Cui, Griffith, Cavusgil & Dabic, 2005). High technology firms need special research and tools to assess the rapidly evolving marketplace and fast changing end user needs to sustain differentiation. Firms from stable technology industries experience market dynamism too, just to a lighter degree. Stable technology may use more traditional product development capabilities for less advanced technological new products to sustain differentiation. It is a new product portfolio balancing act for stable technology firms between developing more advanced technological products with higher PI, and developing less advanced, more predictable incremental innovation to sustain differentiation.

Chapter II: Literature Review

This literature review addresses the three constructs, their respective dimensions, and the rationales for their selection. It also addresses other key aspects, such as the reflective nature of the two independent constructs, EO and MVC, selected for the models. A glossary of terms is provided in Appendix E for reference sake.

Entrepreneurial Orientation

II.1.1 Entrepreneurial Orientation definition and performance linkages. EO is "the processes, practices and decision-making activities that lead to new entry" (Lumpkin & Dess, 1996, p. 136). A firm with EO engages in product innovations and seeks to bring new products to the market ahead of competitors (Miller, 1983). EO has a positive relationship with firm-level performance measures (Rauch et al., 2009) and traditionally has been related to financial measures of firm performance and nonfinancial measures which include innovation. Financial measures include sales increases, profit increases, or return on investment (Rauch et al., 2009). Firms that measure financial aspects have two sources of data: self-reported and archival. Self-reported data enables better comparisons across firms, but social desirability bias or other factors may shape the responses (Wiklund & Shepherd, 2005). Nonfinancial measures typically include customer satisfaction, global success ratings, or PI. Rauch et al. (2009) examined the significance and causality of relationships between EO and firm performance in a meta-analysis. Rauch et al. (2009) found a positive relationship between EO and firm performance, $k = 53$, corrected $r = .242$, 95% CI [.158, .225]. Firm performance in the Rauch et al. meta study was measured by determining the change in corrected r for the relationship between EO and the respective dependent variable in the 53 studies of the metastudy. The firm performance dependent variables were wide ranging in nature from revenue growth to profit growth to brand health measures.

Two studies in particular fit within the EO internal capability category to improve PI. The authors of these studies linked EO to PI through exploration and exploitation of new-product development activities. Avlonitis and Salavou (2007) compared firms with active (exploratory) and passive (exploitive) levels of EO toward new products and their resulting PI. The firms with more active levels of EO generated more unique new products that also performed better in the marketplace. The mean of product uniqueness for the active EO group was 5.1 compared to a mean of 4.2 for the passive group ($N = 150$, $F = 21.7$, $p = .00$). Pérez-Luño et al. (2011) demonstrated that EO positively influences both the number of new products developed by firms and the level of innovativeness measured in terms of adopted (i.e., exploited) or generated (i.e., exploratory) PI for new products (Pérez-Luño et al., 2011). Adopted PI corresponds to adopting new-product ideas from other firms and generated PI corresponds to developing more authentically new-product ideas internally or sourcing them from the outside (but not by copying competitive new products). EO had a positive relationship with PI along the three tiers of innovation that were measured.

Pérez-Luño et al. (2011) also found a positive relationship between market or environmental dynamism and levels of generative new products (exploratory, with higher uniqueness) versus adoptive new products (exploitive, with lower uniqueness). They attributed the higher level of generated new products to the need to generate more unique new products to retain competitive differentiation because of the ongoing, intense competitive pressure in more dynamic markets. I have selected EO as a factor in this study’s model because of the reported links to higher levels of PI in firms of varying technology levels. EO plays different roles depending upon the context and factor configuration. Some researchers have found positive, direct relationships between EO and firm outcomes such as PI (Avlonitis & Salavou, 2007; Pérez-Luño et al., 2011). Other researchers reported EO as a dispositional construct, with one or more factors intervening between EO and a firm outcome variable (Matsuno, Mentzer, & Özsomer, 2002) or having a direct relationship with an outcome variable (Wiklund & Shepherd, 2005).

II.1.2 Entrepreneurial Orientation cultural and new product process connections. EO links to the processes and organizational culture of new-product development capabilities (Lumpkin & Dess, 1996). Product-innovation development is a cross-functional strategic process that senior leaders can direct and is usually pursued to increase demand for a firm's products or services (Chandy & Tellis, 2000). Firms with an assertive EO are more likely to put in place processes that result in the launch of new products into the marketplace (Miller, 1983). Five major capabilities and processes make up innovation-development best practices (Cooper, Edgett, & Kleinschmidt, 2004; Holahan, Sullivan, & Markham, 2014): (a) the product-development process, (b) the product-development strategy, (c) the organization of product-development activities, (d) organizational culture, and (e) executive-leadership support. The construct of EO includes the practices and the processes around new entries and includes innovativeness as one of its three dimensions (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Rauch et al., 2009; Wiklund & Shepherd, 2005).

II.1.3 Context modifiers of Entrepreneurial Orientation. Rauch et al. (2009) and Rosenbusch, Brinckmann, and Bausch (2011) identified three categories of contextual modifiers of EO: (a) size of business, (b) level of technology in the firm's products (i.e. high, stable, or low technology), and (c) location in the United States, Europe, Asia, or Australia, which was framed as national culture. EO correlated positively with each contextual moderator. Some of the widest variations in corrected *r* occurred in the divide between high technology firms and low technology firms: $r = .396$ and $r = .231$, respectively. Furthermore, variations in corrected *r* across firm sizes showed $r = .198$ for small firms, $r = .345$ for micro firms. Large firms showed an EO-moderator corrected *r* of .240. I have split the study sample into high technology and stable technology groups using the industry classifications framed by Kile and Phillips (2009) because of the reported stronger influence of EO on high technology firms than on stable or low technology firms (Rauch et al., 2009). I have excluded low technology firms from the study because of the advanced technology definition of the MVC construct (Reid & de Brentani, 2015). Low technology firms are unlikely to develop advanced new technologies on a frequent basis. I provide further explanation of the rationale for excluding low technology firms in the review of MVC literature below and in Chapter 3. The third contextual modifier was that micro firms with fewer than 19 employees (Vaona & Pianta, 2008) were most influenced by EO. Therefore, I have excluded micro firms from the sample.

A caution regarding EO and firm performance is warranted. Researchers investigating the relationship between EO and firm performance have not always reported positive firm outcomes. Contextual moderators related to firm risk arise when firms engage in high EO. Start-up firms can be especially resource constrained and are therefore vulnerable to overly aggressive EO. The addition of incremental innovation-development streams soon after business founding with EO as a factor can result in negative firm performance. The negative firm performance can be as severe as bankruptcy if the EO is too aggressive (Atuahene-Gima & Ko, 2001; Rosenbusch et al., 2011).

II.1.4 Entrepreneurial Orientation literature gap for capability mediators and modifiers. As stated previously, some researchers have identified EO as a dispositional factor in a configuration that is mediated or moderated by a firm capability (Matsuno et al., 2002; Moreno & Casillas, 2008). The finding that EO can be a dispositional factor is in addition to the finding that EO can act as a direct factor of firm performance in some situations. EO tends to bind together and direct the acting entrepreneurial policies and practices for higher levels of firm performance (Zhou et al., 2005). EO is an inclination toward how a firm operates in some situations more than specific practices that are implemented to achieve growth goals (Wiklund & Shepherd, 2005). There is a shallowness in the EO literature around organizational capability mediators and moderators of the EO–firm performance relationship, according to two metastudies (Rauch et al., 2009; Wales et al., 2013). Whether EO is mediated or moderated to a firm outcome in a dispositional (antecedent) configuration or EO has a direct relationship to the firm outcome depends upon the firm and business dynamics.

Four organizational capabilities have received scholarly attention as mediators or moderators of EO to performance (Rezaei & Ott, 2018). The first capability is organizational learning and knowledge building in conjunction with EO. Organizational learning and knowledge building generally shows a positive correlation with EO to firm performance (Real, Roldán, & Leal, 2014; Rezaei & Ott, 2018; Wiklund & Shepherd, 2005). Organizational knowledge building enhances a firm’s ability to transform resources into competitive advantage (Lado, Boyd, & Wright, 1992). Organizational learning can become a strategic advantage over time and acts as a moderator and mediator of EO for positive firm performance, with contingencies for firm size (Real et al., 2014).

The second organizational capability is network orientation in a relationship between EO and firm performance. The business and relationship links that firm leaders have externally define network orientation and how those outside relationships moderate or mediate EO to firm performance. Walter, Auer, and Ritter (2006) described how external network ties and their mediation or moderation of EO affect firm spin-off for universities. Walter et al. (2006) determined that networking capability moderated EO for better university spin-off performance. Jiang, Liu, Fey, and Jiang (2018) demonstrated the value of building networks and taking value out of those networks to moderate EO for firm performance. With respect to the moderation of EO as a disposition to a firm outcome, Engelen, Gupta, Stenger, and Brettel (2015) found that transformational leadership behaviors moderated EO for higher levels of firm performance.

The third firm-capability moderator or mediator of EO to firm performance, market orientation, emphasizes the generation and ongoing maintenance of a superior value proposition to the customer (Narver & Slater, 1990). Market orientation mediates EO for positive firm performance (Matsuno et al., 2002).

The fourth moderator or mediator of EO to firm performance is the new-product development approach taken by a firm. Lisboa, Skarmeas, and Lages (2011) found that exploitive and explorative innovation capabilities for higher export rates positively moderated EO.

Researchers have also found positive, direct relationships between EO and other measures very similar to PI (Avlonitis & Salavou, 2007; Pérez-Luño et al., 2011). Avlonitis and Salavou (2007) studied the relationship between EO and PI in manufacturers and split the sample into active and passive entrepreneurs. The active entrepreneurs tended to have higher product uniqueness and higher new-product performance. Pérez-Luño et al. (2011) measured three PI-related tiers of PI: a generated tier (high), a combination generated and adopted tier (moderate), and an adopted tier (low). They found a positive relationship between EO and PI for all three tiers. Existing empirical support for a positive, direct relationship between EO and PI framed MVC as a possible mediator or moderator of EO (Avlonitis & Salavou, 2007; Baron & Kenny, 1986; Pérez-Luño et al., 2011). Per Barron and Kinney (1986), a direct relationship between two variables must be established first before an assessment of moderation or mediation can occur.

II.1.5 Construct configurations. This study's research model relies on unidimensional EO, a reflective construct first framed by Covin and Slevin (1989). The unidimensional construct has three dimensions of innovativeness, risk taking, and proactiveness. The rationale for selecting this construct definition was based on analytical conclusions of Rauch et al. (2009). Rauch et al., in their metastudy, analyzed the parameters of existing EO research through a comprehensive review of all EO research performed to date. Their meta-analysis summarized 53 quantitative studies on EO from across regions. A significant part of Rauch et al.'s metastudy focused on whether EO as a construct best performed with three, five, or more dimensions, and whether it was best as a reflective or formative construct. Of the 51 studies reviewed, 28 used the three-dimensional construct of Covin and Slevin. After analyzing the studies, Rauch et al. concluded that the original three-dimensional reflective construct was as effective in explaining firm-level performance as multidimensional, formative constructs, most of which had more than three dimensions. I have used the simpler three-dimensional, reflective construct of Covin and Slevin. in this study because of its approximately equivalent predictiveness to more complicated formative constructs.

II.1.6 Linkages to firm-level theory. EO links to root-level firm theory as a strategy-making mode (Mintzberg, 1973). The entrepreneurial mode is one of three strategy-making modes along with the adaptive mode and the planning mode. The entrepreneurial mode is characterized by four attributes. First, the active search for new opportunities dominates firm strategy making. Second, power tends to be centralized in the executive-leadership function, and particularly in the hands of the chief executive officer. Third, large jumps toward new opportunities tend to characterize firm initiatives, even with significant ambiguity of the risks and the environment. Fourth, growth is the primary objective of executive function and tends to drive most strategic decisions for the firm. Hart (1992) framed a more refined strategic mode setting with two of the five primary business-strategy modes having EO as a characteristic. The generative mode has EO as a characteristic, and the symbolic mode also included characteristics of EO, with firm-level actors responding to opportunities and challenges at the market level more on their own initiative than by awaiting direction from above.

II.2 Market Visioning Competence

II.2.2 Definition and linkage to innovativeness. MVC is "a set of individual and organizational capabilities that enable the linking of advanced technologies to market opportunities of the future" (O'Connor & Veryzer, 2001). MVC can help a firm form an understanding of where in the marketplace a new technology or idea will be relevant (Reid & de Brentani, 2010). A market vision, which results from MVC, is "a clear and specific model or image that organizational members have of a desired product market for a new or advanced technology" (Reid & de Brentani, 2010, p. 500). The market vision results from an application of MVC.

For context, if a firm forms a new market with an advanced new technology instead of entering an existing market, it must pinpoint which customers may seek the new innovative solution and what benefits they want that generate the demand for the innovation in the first place. MVC codifies what the technical or research function (or external supplier) articulates about the new product concept's attributes and benefits to potential end users. MVC then casts those attributes and benefits forward into a futuristic market setting, estimating to whom those benefits are relevant and the resulting positive economics for the firm from expected sales (i.e., the market vision). MVC originally appeared in firms specializing in nanotechnology, a niche high technology industry (Reid & de Brentani, 2015). Nanotechnology firms have used the MVC organizational capability to develop advanced, technology-centered, and highly innovative new products. MVC is a unidimensional reflective construct (Reid & de Brentani, 2015).

II.2.2 Market Visioning Competence potential contribution to knowledge. The importance of organizational capabilities such as MVC has increased as technological advances have accelerated and markets have become more turbulent, compelling firms to innovate on an ongoing basis (Chandy & Tellis, 2000). By evaluating MVC as a mediator or moderator of EO on PI, I aimed with this study to help close the gap in knowledge of organizational-capability moderators of EO identified by Wales et al. (2013). Researchers have not studied MVC outside the nanotechnology industry for its impact on commercialized new products. However, Thongpravati, Reid, and Dobele (2018) recently studied MVC's impact on the internal processes of firms and the relevancy of final new-product concepts before launch, and they concluded that there was a positive relationship. This study built on that scholarly work to determine the relationship between MVC and early-success indicators for future commercialized innovation. Understanding MVC's impact on PI overall, or its relationship with EO, in high or stable technology firms will improve its generalizability. The next section of this review contains more details on PI, the dependent variable of this study's model. Demonstrating successful mediation or moderation of EO by MVC to PI beyond nanotechnology into other high technology industries (e.g., software) or stable technology industries (e.g., specialty chemicals) has the potential to introduce a new competency to practitioners that may improve their new-product-development capabilities and thereby enhance their firms' PI.

***II.2.3 The four dimensions of Market Visioning Competence and its precursors*.** Reid and de Brentani (2015) studied nanotechnology and related high technology firms. They concluded that MVC had four underlying dimensions: (a) idea driving, (b) proactive market orientation, (c) market-learning tools, and (d) networking. Each dimension can be classified as either an individual- or firm-level capability and as either divergent or convergent. The divergent–convergent nature and process-management capability of MVC is important given the ambiguous nature of early innovation stages (Reid & de Brentani, 2010).

The first dimension is idea driving. Individuals who are part of a firm's competency for market visioning need to be able to quickly pivot from divergent idea collection and environment scanning to internal sharing and influencing through teams in order to move the innovation forward in development and garner resources.

A firm's ability to drive ideas is especially important in the early stages of product innovation (Reid & de Brentani, 2015). Markham and Lee (2013) termed those with a similar ability to push forward new ideas in the early stages of development *project champions*. Project champions play an especially important role in the development of advanced-innovation projects that often require more resources and time to develop than low- or incremental-innovation projects (Markham & Lee, 2013). Specifically, "the top three leadership methods used for radical innovation by the Best firms are professional project manager, full-time leader, and Project Champion" (Markham & Lee, 2013, p. 419). Markham and Lee covered all levels of technology and included high technology as a subset. The project champion activity is similar to MVC's dimension of idea driving in the nanotechnology subset of high technology. The similarity of the two activities (project champion and idea driving) identified by the two studies (Markham & Lee, 2013; Reid & de Brentani, 2015) points to the possibility that the MVC dimension of idea driving is relevant to a broader set of high technology firms than the area of nanotechnology in which Reid and de Brentani (2015) first suggested it. The finding of similar dimensions in the two studies is important because it has the potential to frame a model configuration for a broad set of high technology firms in which an active EO is mediated by the capability of MVC (including dimensions such as idea driving) to a firm outcome of positive PI.

Proactive market orientation, the second dimension of MVC, is a firm's ability to identify latent, rather than expressed, customer needs (Reid & de Brentani, 2015). Christensen (1997) critiqued businesses that generated new products with relatively low differentiation compared to the competitive set. According to Christensen, firms developing innovation were becoming too reactive to explicit, easy-to-identify consumer needs rather than uncovering future (or latent) needs and were, therefore, not developing more innovative and futuristic new products.

Latent needs are those needs that consumers often cannot express and may not be aware that they have (Narver, Slater, & MacLachlan, 2004). Latent needs theory states that firms developing innovation require marketplace intelligence around new or forming customer needs, which are those needs not previously captured in traditional market research (Leonard-Barton, 1992; Narver et al., 2004). Versions of latent needs theory are often applied in the advanced innovation development capabilities of high technology companies because traditional market research techniques for incremental (low PI) new products are insufficient for success (Carlgren, 2013; Narver et al., 2004).

The MVC dimension of proactive market orientation, studied by Reid and de Brentani (2015) within the nanotechnology subset of high technology, includes many similarities to the practical aspects of latent needs theory as applied in the larger area of high technology. These similarities point to the possibility that the overall MVC construct (with dimensions such as proactive market orientation) may be relevant in the MVC–EO–PI relationship among high technology firms.

The third dimension of MVC (Reid & de Brentani, 2015) is networking, which operates at the individual level. Networking is primarily an externally focused activity to seek and collect ideas from people outside the firm. Networking is also about key managers having a broad variety of business connections outside the firm across a wide set of functions and industries. This gives a key manager the ability to tap into an idea-generation pool. The networking dimension shows some similarities to open innovation, whereby new-product ideas are sourced outside the firm through a business ecosystem (Chesbrough & Appleyard, 2007).

The fourth dimension of MVC, market-learning tools, operates at the firm level and is about the use of forecasting tools to frame several possible market-penetration and technological-application scenarios before narrowing to specific targets. MVC is about keeping options open while forecasting market potential to help select the best market over time. Firms with market-learning tools are able to apply several methods and techniques before making market choices (Reid & de Brentani, 2010).

It is important to note two studies published prior to Reid and de Brentani’s (2015) codification of the four dimensions of MVC. Both studies included a wide range of firm technology levels in their sample. These two studies also had variables that bore resemblance to at least two of the MVC dimensions, both of which reported a positive association or moderating relationship to a measure of PI.

Rammer, Czarnitzki, and Spielkamp (2009) analyzed small- to-medium-sized enterprises in their innovation study of varying levels of technology. They concluded that there is a positive relationship between outside search for new product ideas and PI. The outside search activity bears similarities to the networking dimension of Reid and de Brentani (2015). Rammer et al. also found a positive relationship between teamwork (with team leadership) and PI. The teamwork activity shows similarities to the idea driving dimension of Reid and de Brentani (2015). However, these activities opportunistically improved PI; they were not core capabilities built to be sustaining development capabilities in and of themselves. To be precise, the Rammer et al. (2009) study reported that key managers that typically were not involved with innovation on a day-to-day basis or by title (e.g. general managers or R &D with previously just lab tasks) networked outside the firm to improve PI and helped lead development teams. So, their activities were opportunistic efforts to improve PI beyond their day-to-day, titled responsibilities.

Goldenberg, Lehmann, and Mazursky (2001) found similar results with a market estimation for new products that is similar to the market-learning tools dimension of MVC. Goldenberg et al. identified market forecasting and market assessment as positive moderating variables between another primary variable and a form of PI. Their concept of outside market forecasting shows similarities to the market-learning tools dimension of Reid and de Brentani (2015). Goldenberg et al. included firms from a mixture of technology levels including high technology.

Rammer et al. (2009) and Goldenberg et al. (2001) included firms of all technology levels and demonstrated that MVC-like variables had a positive relationship to a PI variable. However, the MVC-like dimensions reported by these authors were not necessarily formal, internal development capabilities. The MVC-like variables in the studies of Rammer et al. (2009) corresponded to opportunistic or secondary innovation-development work rather than fixed organizational innovation capabilities among the wide range of technology levels sampled. In a later chapter I build on this opportunistic development activity versus a formal, integrated innovation development capability distinction to create a set of mediation and moderation hypotheses based on a firm's technology level.

II.3.4 Market Visioning Competence as a two-phase capability model and performance. Reid and de Brentani (2010) framed a two-phase MVC theoretical model. To clarify how this model links to the research objectives of my study, I have focused solely on the MVC construct rather than market vision (the output of MVC in the model). A market vision is a "clear and specific mental model or image that organizational members have of a desired product market for a new, advanced technology" (Reid & de Brentani, 2010, p. 1). It is important in innovation development to crystalize market placement. Doing so enables champions to rally support for the new-product concept and help guide the technology and innovation development toward defined market needs. Despite the benefits of a market vision to a technologically based new-product development process, it is an output, not a capability. In this study, I seek to expand the knowledge base of EO around organizational competencies that moderate or mediate EO for better firm performance. Given that, MVC as a construct in my study is an organizational capability mediator or moderator of the EO–PI relationship.

Market visioning links an emerging technology that has the potential to be radical, with a high-level of PI, to a new or fledgling market. New technologies, such as the light bulb first patented by Edison or the World Wide Web created by Berners-Lee, provide new functionality that fulfills latent customer needs. The radical product may compete with other solutions that are based on older technologies. However, no other product with its unique benefits is offered on the market at the time of invention (Garcia & Calantone, 2002).

Figure 1 shows the stages of MVC organizational capability. Although not shown in the figure, the next step beyond market vision, the box on the far right, is early success with customers. Early success with customers is a new-product concept-testing phase with customers.

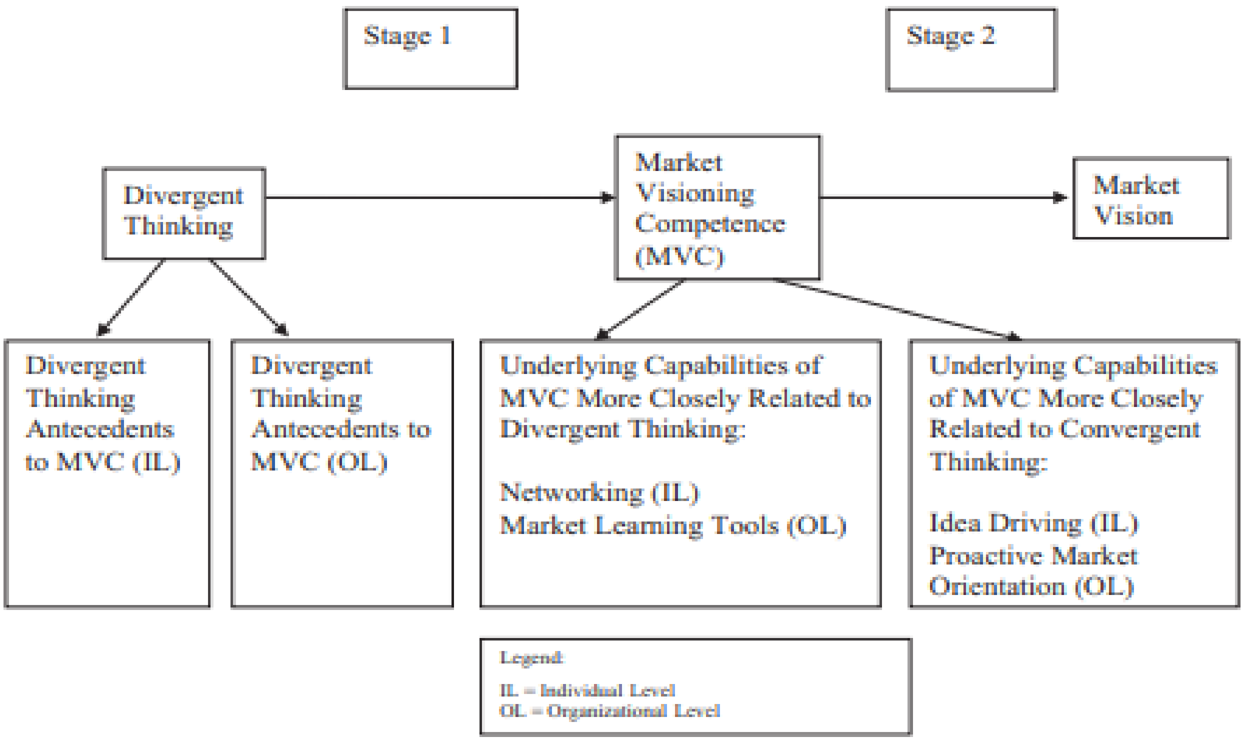


Figure 1. A model for marketing visioning competence process for radical innovation. From "Building a Measurement Model for Market Visioning Competence and its Proposed Antecedents: Organizational Encouragement of Divergent Thinking, Divergent Thinking Attitudes, and Ideational Behavior," by S. E. Reid and U. de Brentani, 2015, *Journal of Product Innovation Management*, *32*, p. 247. Copyright 2014 by Wiley Online. Reprinted with permission.

Reid and de Brentani (2010) analyzed the model using SEM, including the proposed structural relationship between MVC and market vision. Loadings on the respective latent factors were significant ($p \leq .05$). The researchers collected 227 completed questionnaires from two samples. Both samples were from high technology firms, with most of the firms in nanotechnology or related fields. Most of the firms were small.

Reid and de Brentani (2010) formed and demonstrated the MVC unidimensional reflective construct with its four dimensions. The scholars first conducted exploratory factor analysis then conducted CFA. Competitive model testing allowed them to confirm both hypotheses centered on MVC. First, the CFA confirmed that MVC was a stand-alone second-order construct. The MVC construct-focused study (Reid & de Brentani, 2010) also showed that MVC had a positive relationship with market vision and early success with customers.

II.4.5 Market Visioning Competence links to the resource-based view. MVC is rooted in firm-level theory of the RBV (Barney, 1991). The RBV centers on the theory that sustainable competitive advantage arises from the deployment of a combination of resources (e.g., valuable, tangible, or intangible) allocated by a firm’s leadership (Barney, 1991, 2001). Barney (1991) also framed the valuable, rare, inimitable, and non-substitutable framework. In this theoretical context, firms that develop special capabilities, often knowledge based, begin to form dynamic capabilities (Teece, Pisano, & Shuen, 1997). Dynamic capabilities comprise two interrelated aspects. The dynamic aspect refers to internal firm capabilities that can adjust to the changing external environment to help the firm stay insightful and effective in adapting to the marketplace. The capabilities aspect refers to the ability to adapt and reconfigure internal resources, which include organizational capabilities, to sustain competitive advantage (Teece, 2016; Teece et al., 1997). Given that MVC has played a capability role in the development of breakthrough technologies in the nanotechnology industry (Reid & de Brentani, 2010), and my study evaluates whether MVC mediates or moderates EO for higher PI, it is conceivable that sustained and successful formation of MVC in a firm with an EO could, with significant refinements over time, take on aspects of a dynamic capability. Further research, in addition to my study, could explore these phenomena.

Product Innovation and Innovativeness

***II.3.1 Historical inconsistency of the scholarly definition*.** Garcia and Calantone (2002) conducted a large metastudy of product innovation and the factors that drive new-product success. They found considerable ambiguity among the various definitions and typologies of innovation (or innovativeness) and whether the innovation is centered in new products, services, or processes (which tend to be more internal and operational). Further, they stated that many studies used dependent variables with subtle definitions inconsistent with the literature at the time of publication. One goal of Garcia and Calantone’s metastudy was to clarify the various typologies of measurement of new product and service (not process) innovation. The authors divided the measurement of product and service innovation into three areas: (a) product advantage, (b) PI, and (c) customer familiarity. PI is “a measure of the potential discontinuity a product (or service) can generate in the marketing and/or technological process” (Garcia & Calantone, 2002, p. 113).

II.3.2 Product innovation linkages to Entrepreneurial Orientation. EO has a positive and significant relationship with PI (Avlonitis & Salavou, 2007; Pérez-Luño et al., 2011), supporting the model used in my study. Baron and Kenny (1986) proposed that a direct independent variable to dependent variable relationship should be demonstrated before testing a moderator or mediator of that direct relationship. The prior establishment of an EO–PI relationship met this requirement for the model in my study.

II.3.3 Triadic categorization and advanced versus incremental innovation. For this study, I have used a triadic (three-tier) scale of PI. Many researchers conducting peer-reviewed studies have used the triadic scale to balance the need for design accuracy with ease of understanding by survey respondents. The three tiers distinguish sufficiently between levels of technological discontinuity in PI (Wheelwright & Clark, 1992) while maintaining sufficient simplicity for survey respondents to quickly comprehend and distinguish among the tiers. This strategy provided accurate responses without having to distinguish between the nuanced differences expressed by studies with five or more PI tiers, which can be too complex for survey respondents (Abernathy & Clark, 1985). The roots of the three-tier scale lie in Booz, Allen & Hamilton’s (1982) six-tier scale, which Kleinschmidt and Cooper (1991) compressed into three tiers.

Kleinschmidt and Cooper (1991) consolidated the fourth, fifth, and sixth tiers of Booz, Allen & Hamilton’s (1982) scale into the third tier and gave it the title of *low innovativeness*. Consolidated into the low innovativeness tier were product additions into existing lines, improvement of existing products, and reduced cost-base products. The first and second tiers were dubbed *highly innovative new products* (which included radical or discontinuous innovation) and *moderately innovative new products*, respectively. Pérez-Luño et al. (2011) conducted a more recent tripartite study of innovation. They also took a three-tier approach, except that the categorizations were *generative* (similar to exploration, or high innovativeness), *adoptive* (similar to exploitation, or low innovativeness), and a middle category that was a blend of generative and adoptive. My study has followed a similar tripartite scaling and set of definitions in the survey process. See Table 1 for an overview of the PI tiers.

Table 1

Triadic Tiers of Product Innovativeness and Levels of Technological Discontinuity

Tier	Examples	Level of technological discontinuity and benefits
High	First laser jet printer, World Wide Web, first smartphone	These products have the highest level of technological discontinuity and a new or dramatically expanded set of user benefits.
Moderate	Smartphone version 8 or Toyota Prius IV	These have a higher level of technological discontinuity versus the launching firm's portfolio of existing products and some of the market. The products provide a higher level of benefits to the end users than existing products from the producing firm.
Low	Lower sugar cereal, improved taste of a yogurt, or a lower cost configuration or formulation offered at the same technology level	These products offer a slight technological improvement and marginal benefits over the portfolio of existing products from the producer. Alternatively, they lower the producing firm's product costs without affecting quality.

Note. Adapted from Kleinschmidt and Cooper (1991) and Garcia and Calantone (2002).

Many PI scales rise from the lowest tier of technological discontinuity up to the highest tier with increasingly higher PI indicated at each tier (Garcia & Calantone, 2002). Each tier higher on the scale indicates higher innovativeness and differentiation. Scholarly debate has revolved around the actual firm benefits of the middle tier of PI on a triadic ladder, described as the moderate-PI tier in my study. Kleinschmidt and Cooper (1991) argued that for some performance measures, the performance curve is curvilinear so that products from the low-innovation tier score higher on key performance metrics (e.g., return on investment or achievement of sales objectives) than those from the moderate-innovation tier. In contrast, Rammer et al. (2009) and Goldenberg et al. (2001) pointed to moderate-tier new products with higher levels of technological discontinuity that outperformed low-tier new products on key metrics such as marketplace success. Goldenberg et al. defined marketplace success as surviving in the market rather than being withdrawn soon after launch due to poor performance and low distinctiveness. I considered the moderate tier of PI as having a greater benefit to end users and higher economic value to the firm than the lower tier. I have reached this conclusion because

Rammer et al. and Goldenberg et al. reported the higher value of the moderate tier over the lower tier. I acknowledged, however, that researchers had not reached consensus on the moderate tier value.

Linking to the market dynamism discussion in the Background section with MVC as a focus, high technology firms experience intense market dynamism and are pressured to develop more advanced new products as a higher percentage of their new product portfolio than the new product portfolios of stable technology firms (Koberg, Detienne & Heppard, 2003). Stable technology firms also experience market dynamism just not to the same degree. Stable technology firms are often more mature in age and the market dynamism doesn't pressurize them to develop advanced technological products as frequently as high technology firms need to pursue them. Instead, stable technology firms tend to pursue incremental innovation projects more frequently (Koberg, et al. 2003).

Rationale for the Hypotheses

II.4.1 EO direct and positive relationship to affect PI for both technology levels. Both high technology firms and stable technology firms have high EO as a strategic orientation. EO forms the structures, priorities and policies to pursue innovative new products. Both high technology and stable technology firms experience market dynamism and need to develop innovative new products to maintain firm differentiation, with high technology firms experiencing the highest level of market dynamism. Studies by Avlonitis and Salavou (2007) and Pérez-Luño et al. (2011) reported a direct, positive relationship between EO and PI. Each study covered firms from both technology levels, high and stable technology. Therefore, EO is hypothesized to have a direct positive relationship for firms of both technology levels. R & D spending was set as a control for factor modeling because of the report of innovation output moderation from a meta study of R & D spending by Artz, Norman, Hatfield, & Cardinal, L. B. (2010). Artz et al. (2010) reported positive relationships among higher levels of R & D intensity (R & D spending as a percentage of annual revenue) and both the number of patents issued to firms and of the number of new products launched by those firms. A patent signifies technological distinction in a fashion similar to the technological discontinuity aspects of the dependent variable, PI, used in this study. Therefore, R & D will be used as a control for all three hypotheses and the variable modeling.

II.4.2 Hypothesis 1a**:** An increase in EO will have a direct and positive effect upon PI for the high technology firm group, controlling for R & D spending.

II.4.3 Hypothesis 1b: An increase in EO will have a direct and positive effect upon PI for the stable technology firm group, controlling for R & D spending.

Avlontis and Salavou (2007) and Pérez-Luño et al. (2011) found a direct, positive relationship between EO and PI for sets of firms with a mix of technology levels. From a theoretical model-design standpoint, the direct EO–PI relationships in each of the two technology groups (high and stable technology) had to be established before any type of mediation or moderation analysis could occur (Baron & Kenny, 1986; Miles & Shevlin, 2001). Therefore, I assessed the EO–PI direct relationships given the literature support and merit of understanding the relationships, and to frame subsequent analyses for potential mediation or moderation of the variable relationships. What follow are the rationales for mediation and moderation by firm technology level groups (i.e.) and the corresponding hypotheses.

II.4.4 Mediation by MVC of the EO to PI relationship. There are three rationales that support the mediation hypotheses. First, there is more intense market dynamism in high technology industries than in stable technology industries (Thornhill, 2006). The more intense market dynamism in high technology industries creates a distinct need for firms to have a special, advanced technology development capability such as MVC as a new products development mechanism between EO and PI. MVC is defined as “a set of individual and organizational capabilities that enable the linking of advanced technologies to market opportunities of the future” (O’Connor and Veryzer, 2001). In other words, MVC is a needed, inherent capability to connect the advanced new technologies of high technology firms to the most attractive markets and generate PI. High technology firms need the advanced technology development just to keep pace with the advanced high technology launches of the competitive set and retain firm differentiation. MVC does not affect PI by association (moderation) in high technology firms; instead it acts as an internal mechanism to develop PI with EO as a stage setting strategic orientation. By contrast, stable technology firms do not experience market dynamism to the same degree that high technology firms experience it. Stable technology firms are not developing the most advanced new technology products to maintain competitive differentiation to the same degree as high technology firms. Stable technology firms frequently pursue a lower PI tier of incremental innovation, which typically includes a lower level of technology than the advanced technology products primarily developed by high technology firms. The stable technology firms have a new product portfolio balancing act. They may focus upon developing more advanced technology, higher PI new products to expand differentiation. Alternatively, they can develop less advanced incremental innovation. Stable technology firms likely do not inherently need the cutting edge MVC to continuously generate high PI for differentiation. It’s a distinctive choice that directs limited development resources between fewer, advanced, potentially high PI projects and a higher volume set of more predictable but lower PI incremental innovation projects.

Second, MVC was codified as a special new products capability in the nanotechnology industry, a high technology industry. There is evidence of MVC dimensions already being present in the advanced new product development capabilities of firms from other high technology industries beyond the nanotechnology sector. The MVC dimensions were acting as competency variables under different theoretical and best practice titles than MVC dimensions (e.g. open innovation instead of MVC networking, latent needs research instead of MVC proactive market orientation, etc.).

Finally, mediation is defined as "a given function may be said to act as a mediator to the extent that it accounts for the relationship between the predictor and the criterion" (Baaron and Kinney, 1986, p. 1175). EO has already been demonstrated to be both a direct acting factor and a dispositional factor that sets up a direct causal agent, such as MVC, to intervene (mediate) and act upon the criterion variable (Matsuno et al., 2002; Walter et al., 2006). It stands to reason that in the nanotechnology industry MVC is acting as a mediator in the EO to PI chain, and that mediating relationship will carry over to the broader set of firms across high technology industries. However, there is no evidence or reported inherent need for cutting edge MVC advanced technological development capabilities to be a capability of stable technology firms.

***II.4.5 Hypothesis 2a*:** EO will have an indirect effect on PI through MVC (mediation) for the high technology firm group, controlling for R & D spending.

***II.4.6 Hypothesis 2b*:** EO will not have an indirect effect on PI through MVC (mediation) for the stable technology firm group, controlling for R & D spending.

II.4.7 Moderation by MVC of the EO to PI relationship. The moderating hypothesis is supported by two rationales. First, as described in the opening of the MVC literature review (Chapter 2), MVC is a relevant new products competency for firms in industries that experience market dynamism. Market dynamism is the market turbulence caused by new product introductions and a rapid pace of change. While stable technology firms do not experience market dynamism to the same degree as high technology firms, stable technology firms still experience market dynamism pressures and require product innovation (Thornhill, 2006). MVC could, speculatively, provide a positive, moderating increase to PI when stable technology firms with high EO choose to pursue more advanced technologies than the higher volume, incremental innovations that their typical new product development capabilities enable them to pursue.

The second reason is centered in a study that reports precursors of MVC dimensions by some of the factors involved with primarily stable technology companies. Only one other study has been published regarding MVC specifically (Thongpravati, Reid & Dobele, 2018) beyond the original study (Reid & de Brentani, 2015). The Thongpravati et al. 2018 study did not have a dependent, or criterion, variable close to PI. So, a literature review was conducted for EO, dimensions that bore similarities to the four MVC dimensions, and criterion variables/measures that are close to P.I. The one study that was found that had innovation development factors similar to that of the MVC dimensions, and a criterion variable similar to PI, was the study by Rammer, Czarnitzki & Spielkamp (2009). Rammer et al. surveyed companies of primarily stable technology firms and found a positive relationship between another independent variable, MVC-like dimensions (idea driving and external networking) and a measure similar to P.I. By contrast, the literature review found no studies were that reported MVC acting as a moderator in high technology firms to increase PI.

II.4.8 Hypotheses 3a: As the value of MVC increases (moderator), the positive affect of EO to PI will not increase for the high technology group**, c**ontrolling for R&D investment.

II.4.9 Hypothesis 3b**:** As the value of MVC increases (moderator), the positive affect of EO to PI will increase for the stable technology group**, c**ontrolling for R&D investment.

Given that stable technology industry firms do sometimes stretch for more innovative new PI to boost competitive differentiation, and the positive moderating results reported by the Rammer et al. study, MVC has been hypothesized to positively moderate the EO to PI relationship for the stable technology group. MVC is not hypothesized to moderate the EO to PI relationship for high technology firms because no literature was found to support the moderation. Further, high technology firms inherently require MVC just to offset the market dynamism and deliver upon ongoing PI requirements to sustain differentiation. MVC is a requirement to compete in high technology industries; not a PI increase driver.

II.5 Summary of Hypotheses

Hypothesis 1a: An increase in EO will have a direct and positive effect upon PI for the high technology firm group, controlling for R & D spending.

Hypothesis 1b: An increase in EO will have a direct and positive effect upon PI for the stable technology firm group, controlling for R & D spending.

Hypothesis 2a: EO will have an indirect effect on PI through MVC (as mediator) for the high technology firm group, controlling for R & D spending.

Hypothesis 2b: EO will not have an indirect effect on PI through MVC (as mediator) for the stable technology firm group, controlling for R & D spending.

Hypotheses 3a**:** As the value of MVC increases (as moderator), the positive affect of EO to PI will not increase for the high technology group**, c**ontrolling for R&D investment.

Hypothesis 3b: As the value of MVC increases (as moderator), the positive affect of EO to PI will increase for the stable technology group**, c**ontrolling for R&D investment.

Chapter III: Study Design, Sampling, and Method of Analysis

III. 1 Study Design

I conducted the study using an online survey targeted toward U.S. new product development executives with titles of director and above and job functions associated with innovation (e.g., R & D, marketing, or technical development). In this section, I detail additional criteria for the targeted sample and qualifying each one for inclusion in the study.

III.1.1 Initial target sample size and controls. The target sample size was 276: 138 for the high technology group and 138 for the stable technology group. I arrived at 138 by conducting an inverse square root calculation for partial least squares SEM (PLS-SEM) with a target minimum path coefficient of .22 (Kock & Hadaya, 2018) and an alpha of .05 for Type 1 errors.

I considered four controls for the study and accounted for each in the upfront qualifying questions of the survey, with one also becoming a control in R & D intensity. Rauch et al. (2009) identified three of the four moderators in their metastudy of EO: firm size, industry type (with technology level as a key attribute), and national culture. Some researchers have found that smaller firm size, especially at the micro firm level (19 or fewer employees), positively moderates EO to firm-performance measures (Rauch et al., 2009). Leaders with an EO in smaller firms have more direct day-to-day contact with employees than those in larger organizations, and that may enable those leaders to influence firm outcomes to a higher degree. I excluded respondents from micro firms from the study through the qualification process. I also only qualified respondents based in the United States to adjust for the national culture moderator identified by Rauch et al. (2009). R & D was both a respondent qualifier to participate in the survey and a moderator in the modeling. R & D was a qualifier for sample relevance purposes with a minimum qualifying score of 1% or higher of firm annual revenue to participate in the study given the targeted firms from high and stable technology industries. For context, R & D spending as a percentage of annual revenue (aka R & D intensity) for the average manufacturing firm in 2015 was 3.9% (nsf.gov.statistics.2017). Food and beverage manufacturing, which was an industry that qualified for the stable technology sample of this study, had R & D intensity of 1.5% in 2015. In general, high technology firms' R & D intensity ranges from approximately 7% to 13% with Pharmaceuticals marking the high end of the high technology range along with software and computer equipment (nsf.gov.statistics.2017; Kile and Phillips, 2009). There are scientific R & D service companies with R & D intensity of 27% that occupy a niche of the business universe, and these are largely labs for high technology development (e.g. nanotechnology, biotechnology, software programming) without a manufacturing or service component (nsf.gov.statistics.2017).

In general, stable technology firms' R & D intensity ranges from approximately 2% to 6% with specialty chemical marking the higher end of the range (nsf.gov.statistics.2017; Hall and Vopel, 1999). R & D spending was set as a control for factor modeling because of the results from a meta study of R & D spending and innovation outputs by Artz, Norman, Hatfield, & Cardinal, L. B. (2010). Artz et al. (2010) reported positive relationships among higher levels of R & D intensity and both the number of patents issued to firms (a measure of product technology differentiation similar to PI in this study) and of the number of new products launched by those firms. R & D investment was measured in this study as a percentage of annual revenues from 1% up to 10% and greater on a ladder of one percent increments, using the R & D intensity calculation.

I accounted for industry type by segmenting survey respondents into high technology and stable technology groups for analysis. The Kile and Phillips (2009) study of industries by SIC and GICS codes was my primary source of industry classifications. The Hall and Vopel (1997) study was also used on a secondary basis. I thanked survey respondents who self-identified in the upfront qualifying questions with low-technology industries (e.g., agriculture, construction, or retail) and excluded them from the study sample. Table B1 lists industries by technology level. I excluded those in low-technology industries because, in general, they do not develop products or services with significant levels of new technology in them. Low-technology industries tend to have much less industry dynamism and much lower levels of PI and differentiation than stable- or high technology industries (Thornhill, 2006). Furthermore, I aimed to answer questions about the relationships between MVC, EO, and PI. MVC is about projecting an advanced new product into the market. Low-technology industries often do not have new technology at the core of their products and tend to experience significantly less technology-driven dynamism (e.g., commodities with very similar components). Therefore, low-technology firms did not fit into a study that includes MVC as a capability construct.

III.1.2 Sample provider and survey-respondent qualifications. I administered the survey using Qualtrics, which also provided the survey sample. I inputted four criteria into Qualtrics to attract the appropriate survey respondents through e-mail solicitation. Each respondent had to be employed in a high or stable technology firm, possess a job title of director or above, perform a function related to innovation development (e.g., R & D or marketing), and have been with his or her firm for more than 3 years. The sample accrued over 2 weeks in March of 2019. Qualtrics identified qualifying respondents from its panel and invited them to participate in the survey. Although the target sample size was 276, the sample collected consisted of 201 completed (no missing data) surveys from qualified respondents. Six screening questions at the beginning of the survey ensured participation only by respondents with the right profile. The first screening question asked about tenure at the firm (only respondents with tenure of greater than three years qualified). The second screening question asked about job title (only respondents with title of director or above included). The third screening question asked about industry category from among 30 categories, which were classified into high-, stable-, or low-technology groups, with respondents from low-technology industries excluded. The fourth screening question asked about firm size (firms with fewer than 19 employees were excluded). The fifth screening question asked about R & D spending rate (respondents from firms with rates less than 1.0% of annual revenue were excluded). The sixth screening question asked about job function. Those in R & D, marketing, innovation, technical, new-product development, or program management were included in the sample. Those from sales, manufacturing, operations, or customer service were excluded. Failure to meet the criterion for any one of six screening questions excluded the respondent from the study.

Method of Analysis

I screened and cleansed the data file first and then applied three major analyses. I applied four data-cleansing criteria. I excluded any surveys that were not 100% complete. I excluded surveys that took less than 300 seconds to complete. I checked the job title given in each survey as a second check on seniority and function. To eliminate outliers, I also excluded surveys that reported zero new products or a number of new products that was more than twice the standard error of the mean.

The first analysis calculated descriptive statistics to test the normality and kurtosis of the data and to determine the characteristics of the data (mean, median, mode, and standard deviation). I produced histograms and bar charts to illustrate the data, especially normality and kurtosis. I used an independent-sample Mann-Whitney U test to compare the means for the high- and stable technology groups with each other and with the means for the entire sample. I used the categorizations of Kile and Phillips (2009) and Hall and Vopel (1997) to classify respondent's firms by industry type. I evaluated the internal consistency and reliability of the scales using Cronbach's alpha coefficient.

The second analysis explored the correlations between pairs of variables from among the construct's dimensions. The goal was to understand the strength and direction of the relationships between the variables and to test for homoscedasticity. I used Spearman's rho instead of Pearson's *r* because the data were non-normal.

The third analysis was PLS–SEM. The goal was to identify the relationships between the variables and identify latent variables. I expected the data to be non-normal because the survey used 7-point semantic differential scales for the two independent constructs. Semantic differential Likert-like scales often produce non-normal data in social science studies (Blanca, Arnau, Lopez-Montiel, Bono, & Bendayan, 2013). Hair, Sarstedt, Ringle, and Mena (2012) reported that 50% of the 311 studies in their metastudy cited non-normal data characteristics in bivariate models (e.g., non-normal or non-linear) as a primary reason to use PLS-SEM.

I conducted validity and reliability analysis of the models and the constructs before the PLS-SEM modeling. First, I analyzed the exogenous item levels for convergent validity and indicator reliability. Second, I analyzed the composite reliability and Cronbach's alpha scores for each construct. Third, I conducted discriminate validity analysis across constructs.

On the relationship models, I assessed the path coefficients and their significances with a focus on EO and MVC relationships with the dependent variable, PI, as part of the PLS-SEM. I calculated the effect size (F^2), and I evaluated the variance inflation factor (VIF) to assess how much, if at all, the standard error was inflated due to multicollinearity. I determined direct and indirect effects among the two independent variables (EO and MVC) and the dependent variable (PI). I also analyzed MVC as a mediator of EO to PI and MVC as a moderator of EO to PI by technology-level group. MVC as a competency is the type of internal mediator or moderator of EO identified by Wales et al. (2013) as attractive to be studied. I used Baron and Kenny’s (1986) model and criteria for the mediation and moderation analysis. I also used R & D spending as a control, given its potential to influence relationships with firm-performance measures or the number of new products developed (Markham & Lee, 2013; Rauch et al., 2009).

Table 2 summarizes the operationalization of measures and special calculations. The instrument had six qualifying questions, nine items linked to the three dimensions of EO, 13 items linked to the four dimensions of MVC, and four questions that addressed PI. The first PI question was an open-ended question that asked the number of new products launched in the past 3 years. The other three PI questions were linked as a forced-choice allocation of the percentage of new products launched in the past 3 years among the three tiers of high innovativeness, moderate innovativeness, and low innovativeness. The allocations across the three questions had to add to 100%, but respondents could allocate 0%–100% on any single tier.

Table 2

Operationalizing the Measures and Special Calculations

Item in survey order	Measure	Notes
Screener 1: tenure at firm	Nominal	3 or more years
Screener 2: function	Nominal, multichoice	R & D, marketing, innovation, technical, product development, project management, other (open), or sales (excluded)
Screener 3: title	Nominal, multichoice	Specialist, manager, or senior manager (all excluded); director, vice president, or president (all included); other (open-ended)
Screener 4: firm size	Nominal, 4 choices	Fewer than 20 (excluded), 20–49, 50–249, or > 249 employees
Screener 5: industry selection	Nominal, 28 choices	Addition of one open-ended question for 29 total choices
Screener 6: R & D as % of revenue	Ordinal, 11 choices	0%–1% (excluded) up to > 10%
EO Innovativeness 1	Ordinal, 7 choices	Semantic differential
EO Innovativeness 2	Ordinal, 7 choices	Semantic differential
EO Innovativeness 3	Ordinal, 7 choices	Semantic differential
EO Proactivity 1	Ordinal, 7 choices	Semantic differential
EO Proactivity 2	Ordinal, 7 choices	Semantic differential
EO Proactivity 3	Ordinal, 7 choices	Semantic differential
EO Risk Taking 1	Ordinal, 7 choices	Semantic differential
EO Risk Taking 2	Ordinal, 7 choices	Semantic differential
EO Risk Taking 3	Ordinal, 7 choices	Semantic differential
	Section 2[b]	
MVC Networking 1	Ordinal, 7 choices	Semantic differential
MVC Networking 2	Ordinal, 7 choices	Semantic differential
MVC Networking 3	Ordinal, 7 choices	Semantic differential
MVC Idea Driving 1	Ordinal, 7 choices	Semantic differential
MVC Idea Driving 2	Ordinal, 7 choices	Semantic differential
MVC Idea Driving 3	Ordinal, 7 choices	Semantic differential
MVC Proactive Market Orientation 1	Ordinal, 7 choices	Semantic differential
MVC Proactive Market Orientation 2	Ordinal, 7 choices	Semantic differential
MVC Proactive Market Orientation 3	Ordinal, 7 choices	Semantic differential
MVC Market-Learning Tools 1	Ordinal, 7 choices	Semantic differential
MVC Market-Learning Tools 2	Ordinal, 7 choices	Semantic differential
MVC Market-Learning Tools 3	Ordinal, 7 choices	Semantic differential
MVC Market-Learning Tools 4	Ordinal, 7 choices	Semantic differential
No. new products launched last 3 years	Continuous	Open-ended, self-entry box format
% new products high innovativeness	Open-ended box	All 3 innovation items must add up to 100%.
% new products moderate innovativeness	Open-ended box	All 3 innovation items must add up to 100%.
% new products low innovativeness	Open-ended box	All 3 innovation items must add up to 100%.

Note. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence; R & D = research and development.

[a]EO items based on Covin and Slevin (1989) with text slightly contemporized for clarity.

[b]MVC items based on Reid and de Brentani (2015) with text slightly adjusted for clarity.

Chapter IV: Findings

IV.1 Data Collection, Cleansing, and Statistical Power

Potential respondents were identified and solicited from a professional panel of Qualtrics. Chapter 3 describes the screening criteria for respondents. See Table B1 for a summary of industries by technology level. The survey took place from March 5, 2019, to March 20, 2019. A total of 901 respondents entered the survey. Of the 901, 487 were disqualified for not passing the first five screening questions, 67 were eliminated for noncompletion, 78 were eliminated for not taking enough time to complete the study, and 66 were eliminated for out-of-scope job titles. Two additional respondents were eliminated for outlier scores on the number of new products launched in the last three years. Both cases were more than twice the standard error from the mean. The final number of respondents was 201, with 106 respondents in the high technology group and 95 in the stable technology group.

The subsample sizes were less than the target of 138 for each of the two technology groups. The original sample size calculation was based on the inverse square root rule with a Type 2 error target of .80, Type 1 error target of $p \leq .05$, and a 95% confidence interval (Kock & Hadaya, 2018). However, the bootstrapping functionality of SmartPLS (Version 3.0) is designed in part to work with smaller samples. PLS–SEM in SmartPLS draws a larger number of subsamples (by applying replacement), estimates new models to include restated significance levels, and calculates standard errors of coefficients to evaluate statistical significance, excluding the original sample and distribution assumptions to assist in the process. With that said, the actual sample size versus the target sample size is a limitation of the study.

IV.2 Descriptive Statistics

All 22 observable independent variables (nine for EO and 13 for MVC) in the total sample had non-normal distributions, according to the Kolmogorov–Smirnov test, $p < .05$. All 22 skewed left. The 22 questions corresponding to these variables used a 7-point Likert-like semantic differential scale. Also, in the total sample two of the nine EO items and all 13 MVC items showed signs of kurtosis. This meant that a majority of the respondent scores on the 7-point Likert-like semantic differential scales were at the high ends of their ranges. See Table B3, and Appendix C for visual representations. The standard applied to determine kurtosis was multiplication by 1.96 times the standard error followed by addition or subtraction from the kurtosis statistic. A result that crossed zero indicated kurtosis. The creation of three standardized subscales for EO partially reduced the skewness and kurtosis.

The high technology group followed a similar skewness and kurtosis pattern. Two of the nine EO items had high skewness and 12 of the 13 MVC items had high skewness and high kurtosis. Again, the creation of the subscales for each construct reduced the skewness and kurtosis. The stable technology group showed less skewness for the nine EO variables, with none of them skewing and three showing high kurtosis. Eight of the 13 MVC variables showed kurtosis. I created composite standardized scales following the same method used for the high technology group. See Appendix C for histograms that illustrate the skewness and kurtosis.

I tested internal reliability and consistency testing for the constructs and scales for the high technology group and the stable technology group. I computed Cronbach's alpha coefficients and interitem correlations for all EO and MVC scales in both technology-based groups. Table 3 summarizes the Cronbach's alpha coefficient indicators of internal reliability at the construct and scale level.

Table 3

Internal Reliability and Consistency for Constructs and Scales Using Cronbach's Alpha Coefficient Indicators

	Cronbach's alpha	
Scale	High technology group (*N* = 106)	Stable technology group (*N* = 95)
EO dimension	.841	.877
EO innovativeness scale	.734	.801
EO proactivity scale	.504	.504
EO risk taking scale	.792	.700
MVC dimension	.939	.913
MVC networking scale	.750	.677
MVC idea driving scale	.750	.810
MVC proactive market orientation scale	.844	.844
MVC market-learning tools scale	.889	.889

Note. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence.

Except for the EO proactivity scale, the EO and MVC dimensions and all of the scales had Cronbach's alpha coefficients greater than .70, showing good internal consistency (DeVellis, 2016). Pallant (2013) suggested that Cronbach's alpha coefficients are sensitive when there are fewer than 10 items per scale, which sometimes results in low Cronbach's alpha coefficients. The three EO scales and three of the four MVC scales had three items. The MVC market-learning tools scale had four items.

I used interitem correlation analysis in addition to Cronbach's alpha coefficients to adapt to the low number of items per scale characteristic of the survey design (Pallant, 2013). Briggs and Cheek (1986) suggested interitem correlation to analyze scales with a low number of items per scale. The tables in Appendix C report these correlations. All of the interitem correlations of the EO and MVC scales for the high technology group and stable technology group were positive, with a majority of the coefficients in the preferred range of .20–.50 and a few in the tolerable range of .10–.70 (Briggs & Cheek, 1986). However, the MVC market-learning tools scale had coefficients of .753 and .713 in the high and stable technology groups, respectively. Briggs and Cheek suggested that high interitem correlations are often due to the items being very narrow in scope or redundant in content. The market-learning tools items asked about the use of software analysis to project market size and forecast growth models. It is plausible that respondents viewed these software tools for market sizing survey questions as overlapping and scored the items similarly.

To summarize the reliability and consistency, Cronbach’s alpha coefficients indicated good internal consistency for the EO and MVC constructs. At the scale level, all MVC and EO scales showed preferred or tolerable levels of interitem correlation except for the MVC market-learning tools scale, which was slightly above the .700 threshold for both technology-level groups. This is to be expected for items that are narrow in scope (Briggs & Cheek, 1986), which the MVC market-learning tools items are in nature. I assessed the constructs and scales of the study as consistent and reliable.

I computed basic descriptive statistics to compare the total sample group to the high technology group and to the stable technology group on the construct dimensions shown in Table 4.

Table 4

Descriptive Statistics for Entrepreneurial Orientation (EO) and Market Visioning Competence (MVC) by Technology-Level Group

Group and subscale	*N*	Minimum	Maximum	*M*	*SD*
			EO		
Total sample					
EO innovativeness	201	1.00	7.00	4.88	1.41
EO proactivity	201	1.00	7.00	5.06	1.20
EO risk taking	201	1.00	7.00	4.74	1.35
High tech					
EO innovativeness	106	1.00	7.00	5.09	1.41
EO proactivity	106	2.33	7.00	5.24	1.17
EO risk taking	106	1.00	7.00	4.94	1.42
Stable tech					
EO innovativeness	95	1.00	7.00	4.66	1.39
EO proactivity	95	1.00	7.00	4.87	1.20
EO risk taking	95	1.00	7.00	4.51	1.23
			MVC		
Total sample					
MVC networking	201	1.00	7.00	5.46	1.07
MVC idea driving	201	1.00	7.00	5.86	1.03
MVC proactive market orientation	201	1.67	7.00	5.88	1.13
MVC market learning tools	201	2.50	7.00	5.67	1.13
High tech					
MVC networking	106	1.67	7.00	5.63	1.10
MVC idea driving	106	3.33	7.00	5.93	0.91
MVC proactive market orientation	106	2.33	7.00	6.06	1.07
MVC market-learning tools	106	2.75	7.00	5.77	1.15
Stable tech					
MVC networking	95	1.00	7.00	5.27	1.01
MVC idea driving	95	1.00	7.00	5.79	1.16
MVC proactive market orientation	95	1.67	7.00	5.69	1.18
MVC market-learning tools	95	2.50	7.00	5.57	1.10

Note. All items used the semantic differential 7-point Likert-like scale.

For each of the seven EO and MVC subscales, the mean for the high technology group was above the mean for the stable technology group. This finding triggered an analysis to determine whether the groups' distributions were similar enough to aggregate them for PLS–SEM as a single group. I applied Mann-Whitney U tests to compare these two groups nonparametrically. Seven of the nine tests did not support the null hypothesis that the groups' distributions were similar ($p \geq .05$). Given this outcome, I treated the groups as statistically different with a focus upon the high technology group separate from the stable technology group in PLS-SEM modeling.

I calculated descriptive statistics for the dependent variable in the model, PI. I calculated the value of the dependent variable by multiplying the percentage of high innovativeness by 3.0, the percentage of moderate innovativeness by 2.0, and the percentage of low innovativeness by 1.0. The final score was the sum of these three products. The lowest possible score was 1.0 (1 × 100% low innovativeness). The highest possible score was 3.0 (3 × 100% high innovativeness). Table 5 displays the results.

Table 5

Descriptive Statistics for Product Innovativeness

Group	*N*	Minimum	Maximum	*M*	*SD*
Total sample	201	1.00	3.00	2.15	0.387
High-tech group	106	1.25	3.00	2.18	0.360
Stable-tech group	95	1.00	3.00	2.12	0.405

Note. Scale ranges from 1.00 to 3.00. Total product innovativeness = % high innovativeness × 3.0 + % moderate innovativeness × 2.0 + % low innovativeness × 1.0.

Descriptive statistics were also calculated for R & D intensity, the control in all six models. These are shown in Table 6. There are two particular insights. First, it is noteworthy that the stable technology group had a mean of 7.87 with a standard deviation of 2.61. A mean of 7.87 on this instrument's scale would be an approximate reported R & D intensity mean of 6.8% for the group. So, the stable technology group R & D intensity mean was above the stable technology group approximate range of 2% to 6% (nsf.gov.statistics.2017; Hall and Vopel, 1999). The standard deviation for the stable technology group was also noticeably higher than that of the high technology group. The high technology group R & D intensity mean of approximately 7.64 (adjusted for item scale) was in the low end of the approximate high technology group range of 7% to 13% (Hall and Vopel, 1999; Kile and Phillips, 2009; nsf.gov.statistics.2017).

Table 6

Descriptive Statistics for R & D Intensity (Control)

Group	*N*	Minimum	Maximum	*M*	*SD*
Total sample	201	2.00	11.00	8.28	2.48
High-tech group	106	2.00	11.00	8.64	2.30
Stable-tech group	95	2.00	11.00	7.87	2.61

Note: the item scale ranges from 1 to 11. The R & D intensity selection options were: 0% to 1% =1, 1.1% to 2% =2, 2.1% to 3% =3, 3.1% to 4% =4, 4.1% to 5.0%=5, 5.1% to 6% =6, 6.1% to 7% =7, 7.1% to 8%=8, 8.1% to 9% =9, 9.1% to 10%=10, and 10.1 or >10.1%=11. R & D Intensity was defined for the respondents as annual R & D $ spending divided by annual firm $ revenues.

IV.3 Correlation Analysis

I conducted Spearman's rho correlations for the total sample, high technology group, and stable technology group. Because the data had non-normal distributions, I applied Spearman's rho rather than the parametric Pearson's *r* so that deviation from normality would not affect the results. I conducted the analyses to identify the direction and strength of relationships among the three EO dimension scales, to and among the four MVC dimension scales, and to the dependent variable, PI. The following assessment divides the results by sample group. All correlations were positive and significant at the $p < .05$ level with one exception. The highest correlation was .774 (MVC market-learning tools to MVC proactive market orientation), which was below the .900 threshold of multicollinearity (Pallant, 2013). The one exception was a correlation of .159 between EO innovativeness and PI for the stable technology group that was not significant at the $p < .05$ level.

IV.3.1 Total sample. All correlations among the three dimensions of EO, MVC, and PI were positive and significant at the $p < .01$ level. Correlations among the three EO dimensions and four MVC dimensions were medium to large in strength and positive and ranged from .323 to .750 (Cohen, 1988). Correlations among the four MVC dimensions were large in strength and positive and ranged from .614 to .774. Interestingly, the lowest correlations among the independent variables and the dependent variable occurred among the EO to PI and MVC to PI relationships. For EO to PI, the lowest and highest correlations were .232 for EO Innovativeness to PI (a small strength and positive relationship), and.345 for EO proactivity to PI (a medium strength and positive relationship), respectively. The four MVC to PI correlations were all small and positive relationships and ranged from .282 to .340. The correlations between R & D intensity (control) and the other variables varied from .172 (p<.05) for MVC idea driving to R & D intensity to .346 (p<.01 level) for MVC market-learning tools to R & D intensity (control). The R & D intensity correlation to PI, the dependent variable of this study, was a small and positive strength correlation at .235 (p<.01). See Appendix D for the table and details.

IV.3.2 High technology group. All correlations among the three dimensions of EO, four dimensions of MVC, and PI were positive and significant at the $p < .01$ level for the high technology group. See Table 7. Correlations among the three EO dimensions and four MVC dimensions were medium to strong and positive and ranged from .404 to .574 (Cohen, 1988). The largest strength correlations were positive and were among the four MVC dimensions that ranged from .652 to .781 (p<.01 level). The lowest correlation was .275 (small and positive) from EO innovativeness to PI, p <.01.

The R & D intensity (control) variable correlation to PI was .221 (p<.05), so the strength of the correlation was positive and small (Cohen, 1988).

Table 7

High Technology Group Correlations

Group (n=106)	1	2	3	4	5	6	7	8
1. EO innovativeness	—							
2. EO proactivity	.584**	—						
3. EO risk taking	.581**	.596**	—					
4. MVC networking	.495**	.516**	.437**	—				
5. MVC idea driving	.502**	.480**	.404**	.732**	—			
6. MVC proactive market orientation	.514**	.553**	.429**	.724**	.652**	—		
7. MVC market-learning tools	.538**	.574**	.554**	.781**	.706**	.774**	—	
8. Product innovativeness	.275**	.303**	.226**	.330**	.317**	.315**	.343**	—
9. R & D intensity	.344**	.320**	.344**	.383**	.329**	.458**	.402**	.221*

***Correlation is significant at 0.01 level (two tailed). *Correlation is significant at .05 level (two tailed)*

IV.3.3 **Stable technology group.** All correlations among the three dimensions of EO, four dimensions of MVC, and PI were positive and significant at the p < .05 level, except for the relationship between EO innovativeness and PI, with a correlation of .159, p = .123 (insignificant). See Table 8 for details. Correlations among the three EO dimensions and four MVC dimensions ranged from small and positive at .248 to large and positive .582 (Cohen, 1988). The correlations among the four MVC dimensions were some of the largest. The MVC correlations ranged from .497 to .662 among the four dimensions. The correlations among all the EO and MVC independent variable dimensions to PI were positive and significant except one.

The correlation between EO innovativeness and PI was not significant at p ≤.05 level. The R & D intensity (control) variable correlation to PI was .265 (p<.05), so the strength of the correlation was positive and small (Cohen, 1988).

Table 8

Stable Technology Group Correlations

Group (n=95)	1	2	3	4	5	6	7	8
1. EO innovativeness	—							
2. EO proactivity	.667**	—						
3. EO risk taking	.551**	.582**	—					
4. MVC networking	.501**	.434**	.209*	—				
5. MVC idea driving	.438**	.519**	.248**	.586**	—			
6. MVC proactive market orientation	.524**	.548**	.288**	.518**	.595**	—		
7. MVC market-learning tools	.454**	.551**	.325**	.610**	.497*	.662**	—	
8. Product innovativeness	.159	.386**	.319**	.269**	.248**	.259*	.309**	—
9. R & D intensity	.190	.233*	.170	.066	.019	.269**	.245**	.264**

***Correlation is significant at 0.01 level (two tailed). *Correlation is significant at .05 level (two tailed)*

Partial Least Squares Structural Equation Modeling Validity and Reliability Analyses

I conducted three preparatory PLS–SEM analyses (using SmartPLS, Version 3.0) of each of the two data sets (high technology and stable technology) to ensure that the measures, constructs, and reflective models were valid and reliable (Hair, Hult, Ringle, & Sarstedt, 2017). Each technology group had associated with its model a hypothesis on the direct EO to PI relationship, zero or one mediation hypotheses, and zero or one moderation hypotheses. The first analysis for each group was at the exogenous-item level for convergent validity, indicator reliability, and average variance extracted. The second analysis was on the internal consistency and reliability of the subscales. I analyzed composite reliability analysis and Cronbach’s alpha for each construct. The Cronbach’s alpha results are reported in the Descriptive Statistics section. The third analysis was application of discriminate validity checks across constructs. I calculated the heterotrait–monotrait ratio to detect correlations across construct measures. I also applied the factor-loading test to ensure that no subscale was loading more significantly on a factor in the model other than the intended construct. Where not stated explicitly, I used an alpha level of .05 for all statistical tests. Detailed analysis appears at the end of each model summary below.

The high technology group model passed convergent validity (load factors .83 to .93) and internal consistency checks (composite reliability at .88 and .93). The average variance explained was well above the .50 benchmark, with EO at .71 and MVC at .78. The model also showed evidence of discriminate validity as the confidence intervals of the high technology group and stable technology groups did not cross over 1. In the cross-loading test, all subscales loaded at a higher rate on their intended construct than any other construct in the model. Details appear in Table 9.

Table 9

High Technology Group PLS SEM Modeling Validity and Reliability

	Convergent validity		
Variable dimension	Loading	Average variance explained	Internal consistency (composite) reliability
Benchmark	> .70	> .50	.60–.90
EO innovativeness	.86	.71	.88
EO proactivity	.83	.71	.88
EO risk taking	.83	.71	.88
MVC networking	.89	.78	.93
MVC idea driving	.83	.78	.93
MVC proactive market orientation	.89	.78	.93
MVC market-learning tools	.93	.78	.93

Note. Cross loadings: No factor loaded upon another construct at a higher rate than the intended construct. With regard to discriminant validity, for all variable dimensions the high technology and medium-technology confidence intervals did not include 1.0. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence. Format adapted from "An Assessment of the Use of Partial Least Squares Structural Equation Modeling in Marketing Research," by J. F. Hair, M. Sarstedt, C. M. Ringle, and J. A. Mena, 2012, *Journal of the Academy of Marketing Science, 40*, p. 38. Copyright 2012.

The stable technology model passed the convergent validity (load factors .79 to .92) and internal consistency checks (composite reliability .91). The average variance explained was well above the .50 benchmark at .77 for EO and .70 for MVC. The model also showed evidence of discriminate validity with the confidence intervals for high technology and medium technology not crossing over 1. Furthermore, all subscales loaded at a higher rate on their intended construct than any alternative construct (see Table 10).

Table 10

Stable Technology Group PLS SEM Reliability and Validity

Variable dimension	Convergent validity: Loading	Convergent validity: Indicator reliability	Average variance explained	Internal consistency (composite) reliability
Benchmark	> .70	> .50	> .50	.60–.90
EO innovativeness	.90		.77	.91
EO proactivity	.92		.77	.91
EO risk taking	.83		.77	.91
MVC networking	.79		.70	.91
MVC idea driving	.83		.70	.91
MVC proactive market orientation	.88		.77	.91
MVC market-learning tools	.87		.70	.91

Note. Cross loadings: No factor loaded upon another construct at a higher rate than the intended construct. With regard to discriminant validity, for all variable dimensions the high technology and medium-technology confidence intervals did not include 1.0. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence. Adapted from "An Assessment of the Use of Partial Least Squares Structural Equation Modeling in Marketing Research," by J. F. Hair, M. Sarstedt, C. M. Ringle, and J. A. Mena, 2012, *Journal of the Academy of Marketing Science*, *40*, p. 38.

Hypotheses, Technology Group Model, and Partial Least Squares Structural Equation Modeling Results

IV.6.1 Hypothesis 1a and Model 1: Direct model high technology. An increase in EO will have a direct and positive effect upon PI for the high technology firm group, controlling for R & D spending. (Figure 2).

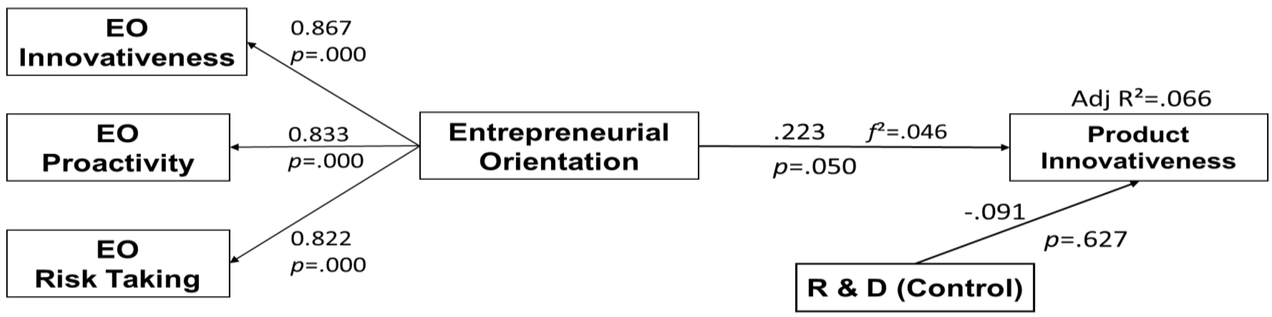


Figure 2. Model 1: Direct model in the high technology group. Entrepreneurial Orientation (EO) to product (PI) innovativeness direct model relationship. R & D = research and development.

The three factors loaded onto EO with EO innovativeness at .867, $t = 6.906$, EO proactivity at .833, $t = 6.386$, and EO risk taking at .822, $t = 4.609$. Therefore, all factors loaded and were significant at the $p<.01$ level. The EO to PI relationship was significant with a direct path coefficient of .223, $t(106) = 1.960$, $p = .050$, small effect size, $f^2 = .046$ (Cohen, 1992). R & D was not significant, with $p = .627$ and a path coefficient of -.091. In summary, there was a positive relationship between EO and PI with a small amount of variation explained, and it was significant. The effect size was also small. The bootstrapping function of SmartPLS (Version 3.0) produced significance levels for the direct relationship of EO to PI from $p = .047$ to $p = .055$ through multiple 5,000 sample bootstraps. The model structural fit and predictive relevance was tested against the criteria outlined by Hair et al. (2012). First, the primary path of EO to PI was significant. Second, the multicollinearity was measured by VIF. The highest exogenous, first order factor, VIF was 4.056, within the threshold of 5. The highest endogenous, second order, VIF was 1.176, well below the high multi-collinearity threshold of 5. Third, the coefficient of determination was weak and still meaningful at adjusted $R^2 = .066$. The predictive relevance, according to PLS-SEM analysis using the blindfolding technique, was $Q^2 = .057$, above the threshold of zero. Therefore, the high technology EO to PI model with R & D as a control was structurally fit and predictively relevant.

IV.6.2 *Hypothesis 1b and Model 2:* Direct model stable technology. An increase in EO will have a direct and positive effect upon PI for the stable technology firm group, controlling for R & D spending (Figure 3).

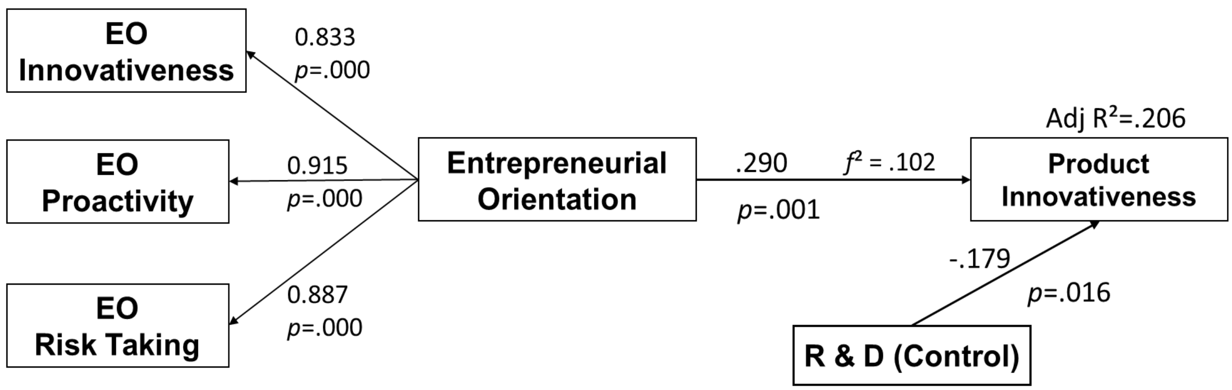


Figure 3. Model 2: Direct model in the stable technology group. EO = Entrepreneurial Orientation (EO) to Product Innovativeness (PI); R & D = research and development.

The three factors loaded onto EO with EO innovativeness at .833, t = 8.385, EO proactivity at .915, t = 21.034, and EO risk taking at .887, t = 15.511. Therefore, all factors loaded and were significant at the $p < .01$ level. The EO to PI relationship was significant with a direct path coefficient of .290, $t(95) = 3.306$, $p = .001$, small effect size, $f^2 = .102$ (Cohen, 1992), and moderate coefficient of determination, adjusted $R^2 = .206$. R & D was significant, with $p = .016$ and a path coefficient of −.179. In summary, there was a positive relationship between EO and PI in the stable technology group, with a moderate amount of variation explained and effect size. R& D was also significant as a control with a small, negative path coefficient. I tested the model for structural fit and predictive relevance against the criteria outlined by Hair et al. (2012).

First, the direct path of EO to PI was significant. Second, multicollinearity was measured for the exogenous and endogenous variables. The first order, exogenous highest VIF among the variables was 2.918. The second order, endogenous variables highest VIF, was 1.078. Both of the highest VIF scores were well below the high multicollinearity threshold of 5 (Benetiz, Henseler, Castillo and Schuberth, 2019). Third, the coefficient of determination was moderate, adjusted R^2 = .206. The effect size was small, f^2 =.102 (Cohen, 1992). The predictive relevance, according to PLS-SEM analysis using the blindfolding technique, was Q^2 = .146, above the threshold of zero. Therefore, the stable technology EO to PI with R & D as a control model was structurally fit and predictively relevant.

Table 11

PLS-SEM Performance of the Endogenous Construct Relationships for the Direct Models

Relationship	Coefficient	*t*	*p*	*Adj.* R^2	f^2
High Technology					
EO to PI	.223	1.961	.050	.066	0.046
R & D to PI	−.091	0.486	.627		0.014
Stable Technology					
EO to PI	.290	3.306	.001	.206	0.102
R & D to PI	−.179	2.421	.016		0.015

Note. EO = Entrepreneurial Orientation; PI = product innovativeness; R & D = research and development.

Table 12

PLS-SEM Performance of the Exogenous Dimensions for the Direct Models

1st Order Dimension	Load Factor	*T*	*p*
High Technology Direct			
EO Innovativeness	.867	7.059	.000
EO Proactivity	.833	6.279	.000
EO Risk Taking	.822	4.823	.000
MVC Proactiveness	N/A	-----	-----
MVC Networking	N/A	-----	-----
MVC Idea Driving	N/A	-----	-----
MVC Learning Tools	N/A	-----	-----
Stable Technology			
EO Innovativeness	.833	9.686	0.000
EO Proactivity	.915	17.820	0.000
EO Risk Taking	.887	12.218	0.000
MVC Proactiveness	N/A	-----	-----
MVC Networking	N/A	-----	-----
MVC Idea Driving	N/A	-----	-----
MVC Learning Tools	N/A	-----	-----

Note. EO = Entrepreneurial Orientation; PI = product innovativeness; R & D = research and development.

***IV.6.3 Hypothesis 2a and Model 3*:** Mediation model high technology. EO will have an indirect effect on PI through MVC (as mediator) for the high technology firm group, controlling for R & D spending. (Figure 4)

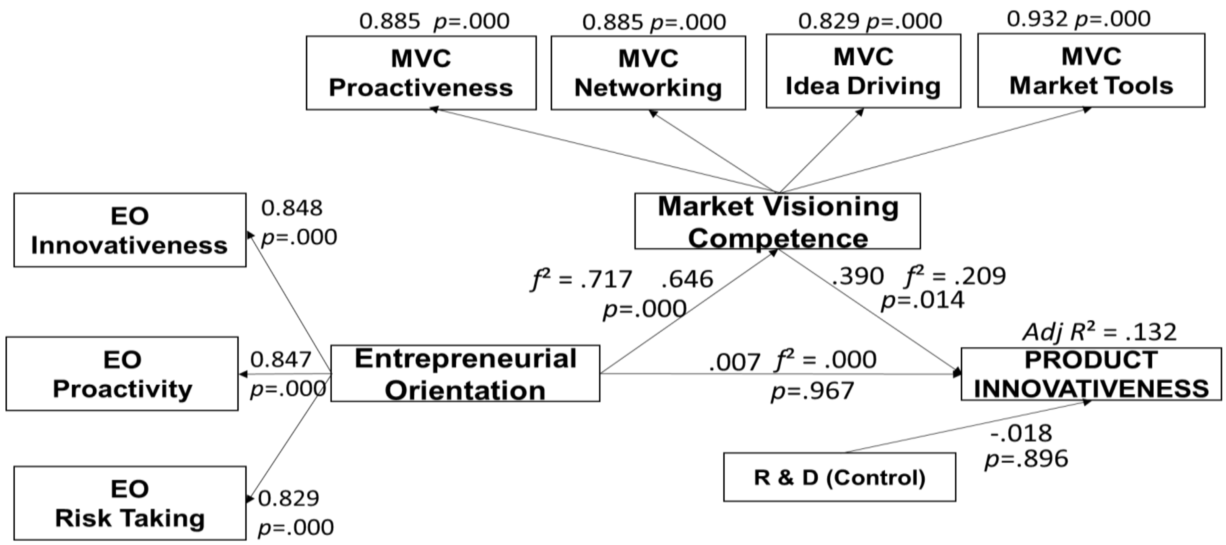


Figure 4. Model 3. Mediation model high technology group. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence; R & D = research and development.

The three EO factors loaded onto EO with EO innovativeness at .848, t = 25.959, EO proactivity at .847, t = 21.509, and EO risk taking at .829, t = 16.170. Therefore, all EO factors loaded onto EO and were significant at the $p < .01$ level. The four MVC factors loaded onto MVC with MVC proactiveness at .885, t = 44.850, MVC networking at .885, t = 30.498, MVC idea driving at .829, t = 24.683, and MVC market-learning tools at .932, t = 74.908. Therefore, all four MVC factors loaded onto MVC and were significant at the $p < .01$ level.

The overall model passed the mediation criteria of Baron and Kenny (1986) and Miles and Shevlin (2001). To substantiate the mediation assessment, the two indirect paths of the model were as follows. The EO to MVC indirect path coefficient was .646, $t(106) = 9.621$, $p = .000$. The MVC to PI indirect path coefficient was .390, $t(106) = 2.493$, $p = .014$. And the direct EO to PI path coefficient was lowered to .007 from .223 by the mediation of MVC and was no longer significant, $\alpha = .05$, $p = .967$. The direct EO to PI path coefficient under mediation was now less than the single EO to PI (dependent variable) path coefficient described as the direct model, H1a. Because the direct EO to PI path coefficient in the mediated model was less than the path coefficient in the non-mediated model, and the mediated model EO to PI path was no longer significant at $\alpha = .05$, full mediation occurred (Baron & Kenny, 1986; Miles & Shevlin, 2001). The model's total effect was .259 (indirect coefficients of .646 × .390 plus a direct effect of .007). The coefficient of determination for the overall mediated model was adjusted $R^2 = .132$. R & D was not significant, with $p = .896$ and a path coefficient of −.018.

I tested the model structural fit and predictive relevance against the criteria suggested by Hair et al. (2012). First, the two mediation indirect pathways were significant. Second, multicollinearity was measured by VIF. The highest first order, exogenous variables VIF was 4.056. The highest second order, endogenous VIF, was 1.789. Both VIF scores were below the multicollinearity threshold of 5 (Benetiz, 2019). Third, the coefficient of determination was weak and still meaningful, adjusted $R^2 = .132$. The effect size was medium, $f^2 = .209$ (Cohen, 1992) for the MVC to PI pathway. Finally, the predictive relevance, according to PLS-SEM analysis using the blindfolding technique was $Q^2 = .043$, above the threshold of zero. Therefore, the high technology EO to PI model with MVC as mediator and R & D as a control was structurally fit and predictively relevant.

IV.6.5 Hypothesis 2b and Model 4: Mediation model stable technology. EO will not have an indirect effect on PI through MVC (as mediator) for the stable technology firm group, controlling for R & D spending. (Figure 5).

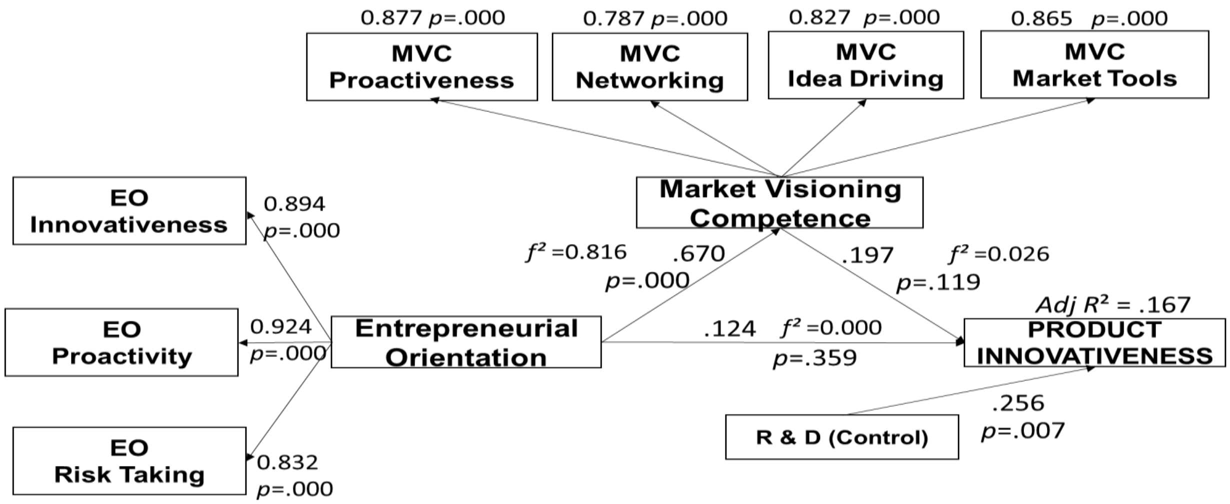


Figure 5. Model 4: Mediation model in the stable technology group. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence; R & D = research and development.

The three EO factors loaded onto EO with EO innovativeness at .894, t = 36.806, EO proactivity at .924, t = 70.773, and EO risk taking at .832, t = 14362. Therefore, all EO factors loaded onto EO and were significant at the $p < .01$ level. The four MVC factors loaded onto MVC with MVC proactiveness at .877, t = 35.925, MVC networking at .787, t = 14.027, MVC idea driving at .827, t = 16.896, and MVC market-learning tools at .865, t = 24.737. Therefore, all four MVC factors loaded onto MVC and were significant at the $p < .01$ level.

The overall model did not pass the mediation criteria of Baron and Kenny (1986) and Miles and Shevlin (2001). First, the direct EO to PI relationship path coefficient was .124, $t(95) = .936$, $p = .359$, so it was not significant, which did frame the potential for mediation given that the direct path of EO to PI for the stable technology group in Hypothesis H1b was significant. However, one of the two indirect paths, MVC to PI, was not significant, so mediation did not occur. The EO to MVC indirect path coefficient was .670, $t(96) = 10.661$, $p = .000$, was significant, and was similar in path coefficient strength and significance to the same path of the high technology group mediation model. However, the MVC to PI indirect path coefficient was .197, *t*(95) = 1.559, *p* = .119, and was not significant, precluding mediation. The coefficient of determination for the overall mediated model was adjusted R^2 = .167. Multicollinearity was measured by VIF. The highest first order, exogenous variables multicollinearity was 2.558. The highest second order, endogenous VIF was 1.836. Both orders highest multicollinearity relationships were well below the high multi-collinearity threshold of 5 (Benetiz et al., 2019). However, because one of the mediation construct paths was not significant, the overall model was not structurally sound or predictively relevant.

Table 13

PLS SEM Performance of the Endogenous Constructs for the Mediating Models

Relationship	Coefficient	*T*	*p*	*Adj* R^2	f^2
High Technology					
EO to PI mediated by MVC				.132	
EO to PI	.007	0.041	.967		0.000
EO to MVC	.646	9.621	.000		0.717
MVC to PI	.390	2.493	.014		0.097
R & D to PI	-.018	0.131	.896		0.001
Stable Technology					
EO to PI mediated by MVC				.167	
EO to PI	.124	0.936	.359		0.010
EO to MVC	.670	10.661	.000		0.810
MVC to PI	.197	1.559	.119		0.026
R & D to PI	.256	2.712	.007		0.025

Note. EO = Entrepreneurial Orientation; PI = product innovativeness; MVC = Market Visioning Competence; R & D = research and development.

Table 14

PLS SEM Performance of the Exogenous Dimensions for the Mediating Models

1st Order Dimension	Load Factor	*t*	*p*
High Technology Mediation			
EO Innovativeness	.848	25.959	.000
EO Proactivity	.847	21.509	.000
EO Risk Taking	.829	16.170	.000
MVC Proactiveness	.885	44.850	.000
MVC Networking	.885	30.498	.000
MVC Idea Driving	.829	24.683	.000
MVC Learning Tools	.932	74.908	.000
Stable Technology Mediation			
EO Innovativeness	.894	36.806	0.000
EO Proactivity	.924	70.773	0.000
EO Risk Taking	.832	14.362	0.000
MVC Proactiveness	.877	35.925	0.000
MVC Networking	.787	14.027	0.000
MVC Idea Driving	.827	16.896	0.000
MVC Learning Tools	.865	24.737	0.000

Note. EO = Entrepreneurial Orientation; PI = product innovativeness; MVC = Market Visioning Competence; R & D = research and development

IV.6.5. Hypothesis 3a and Model 5: Moderation model high technology. As the value of MVC increases (as moderator), the positive affect of EO to PI will not increase for the high technology group, controlling for R&D investment (Figure 6).

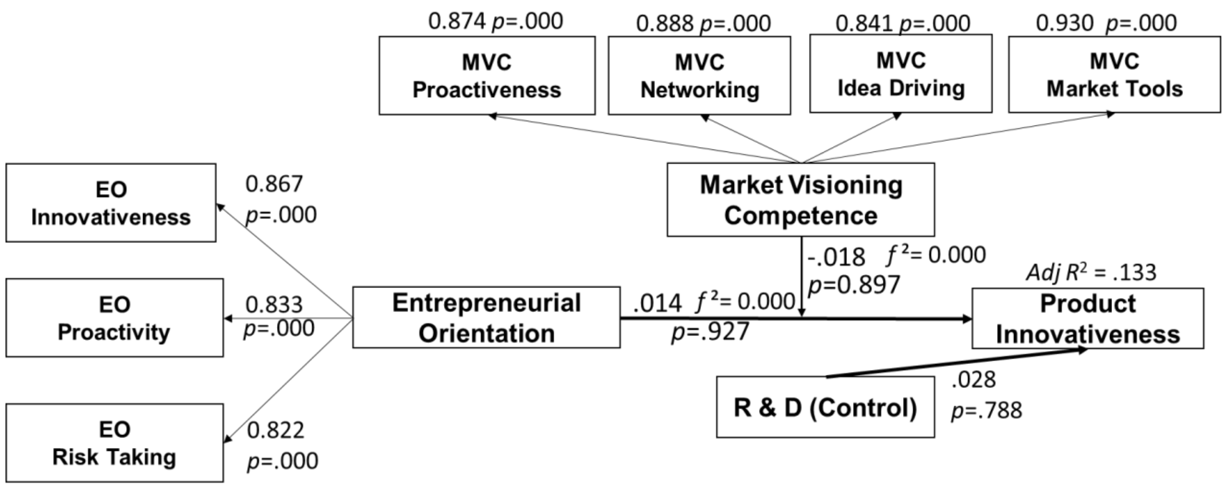


Figure 6. *Model 5.* Moderation model in the high technology group. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence; R & D = research and development.

The three EO factors loaded onto EO with EO innovativeness at .867, t = 6.788, EO proactivity at .833, t = 6.213, and EO risk taking at .822, t = 4.737. Therefore, all EO factors loaded onto EO and were significant at the $p < .01$ level. The four MVC factors loaded onto MVC with MVC proactiveness at .874, t = 35.548, MVC networking at .888, t = 26.841, MVC idea driving at .841, t = 23.704, and MVC market-learning tools at .930, t = 62.088. Therefore, all four MVC factors loaded onto MVC and were significant at the $p < .01$ level.

The direct EO to PI relationship was not significant, with path coefficient of .014, $t(106)$ = 0.091, p = .927. MVC did not moderate the EO to PI relationship, with path coefficient −.018, $t(105)$ = .129, p = .897, so the relationship was not significant. The R & D control of PI was also insignificant, with path coefficient.-.018, $t(106)$ = .131, p = .896. The MVC to PI relationship had a path coefficient of .382, $t(105)$ = 2.511, p = .011, and was significant. For this model, adjusted R^2 = .133. Multicollinearity of the variable relationships was measured using VIF. The highest multicollinearity among the first order, exogenous variables was 4.056. The highest VIF score among the second order, endogenous variables was 1.770. Both highest VIF scores were well below the high multi-collinearity threshold of 5 (Benetiz et al. 2019). However, the overall model had key pathway relationships that were not significant (e.g., the direct EO to PI pathway, and the moderating pathway) so it was not structurally fit.

***Hypothesis 3b and Model 6*:** Moderation model in stable technology. As the value of MVC increases (as moderator), the positive affect of EO to PI will increase for the stable technology group, controlling for R&D investment. (Figure 7).

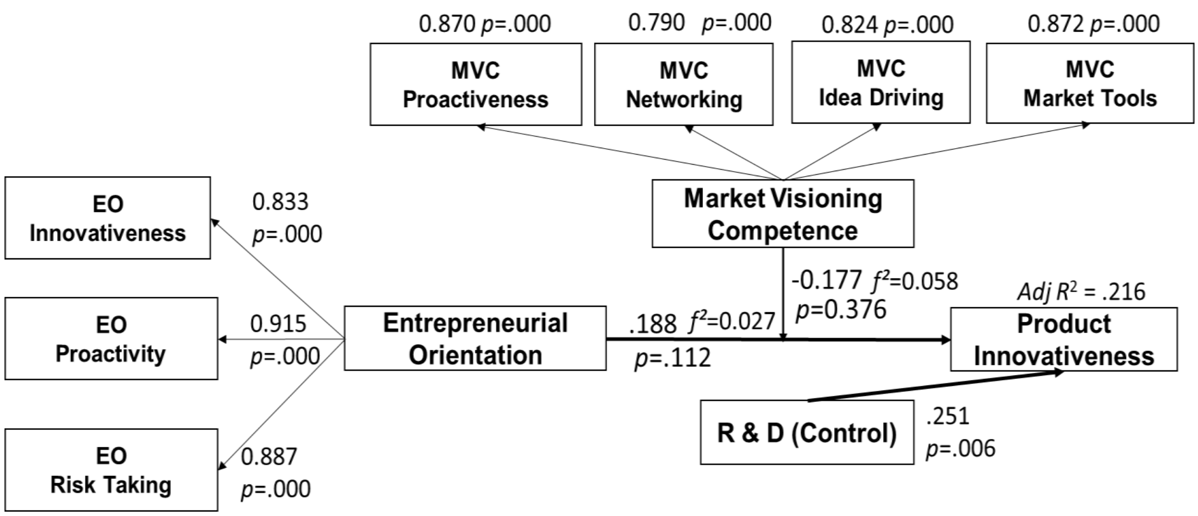


Figure 7. Model 6: Moderation model in the stable technology group. EO = Entrepreneurial Orientation; MVC = Market Visioning Competence; R & D = research and development.

The three EO factors loaded onto EO with EO innovativeness at .833, t = 8.258, EO proactivity at .915, t = 15.320, and EO risk taking at .887, t = 13.002. Therefore, all EO factors loaded onto EO and were significant at the $p < .01$ level. The four MVC factors loaded onto MVC with MVC proactiveness at .870, t = 15.844, MVC networking at 0.790, t = 11.070, MVC idea driving at .824, t = 12.160, and MVC market-learning tools at .872, t = 15.144. Therefore, all four MVC factors loaded onto MVC and were significant at the $p < .01$ level.

The direct EO to PI relationship was not significant, with path coefficient .188, $t(95)$ = .920, p= .112. MVC did not moderate the EO to PI relationship, with moderated path coefficient −.177, $t(95)$ =.764, p = .376, so the relationship was not significant. The R & D control of PI was significant, with path coefficient .251, $t(95)$ = 2.731, p = .006. The MVC to PI relationship had a path coefficient of .186, $t(96)$ = 1.419, p = .156, and was not significant. The model coefficient of determination was medium strength, adjusted R^2 = .216. Multicollinearity was measured by VIF. The highest first order, exogenous variables multicollinearity was 2.558. The highest second order, endogenous VIF was 1.716. Both of the highest VIF scores were well below the high multi-collinearity threshold of 5 (Benetiz et al. 2019). However, the model had pathway relationships that were not significant (e.g. the direct EO -PI relationship and the EO-PI moderated by MVC pathway) so it was not structurally fit.

Table 15

PLS SEM Performance of Endogenous Construct Relationships for Mediation Models

Relationship	Coefficient	*T*	*p*	*Adj* R^2	f^2
High Technology					
EO to PI moderated by MVC				.133	
EO to PI	.014	.091	.927		0.000
EO to MVC	—	—	—		0.088
Moderating effect	−.018	0.129	.897		0.000
MVC to PI	.382	2.456	.011		—
R & D to PI	.028	0.358	.788		0.000
Stable Technology					
EO to PI moderated by MVC				.216	
EO to PI	.188	1.559	.112		0.027
EO to MVC	—	—	—		0.020
Moderating effect	−.177	0.885	.376		0.058
MVC to PI	.186	1.419	.156		—
R & D to PI	.251	2.726	.006		0.077

Note. EO = Entrepreneurial Orientation; PI = product innovativeness; MVC = Market Visioning Competence; R & D = research and development.

Table 16

PLS SEM Performance of the Exogenous Dimensions for Moderation Models

1st Order Dimension	Load Factor	*t*	*p*
High Technology Moderation			
EO Innovativeness	.867	6.788	.000
EO Proactivity	.833	6.213	.000
EO Risk Taking	.822	4.737	.000
MVC Proactiveness	.874	34.548	.000
MVC Networking	.888	26.941	.000
MVC Idea Driving	.841	23.704	.000
MVC Learning Tools	.930	62.088	.000
Stable Technology Moderation			
EO Innovativeness	.833	8.258	0.000
EO Proactivity	.915	15.320	0.000
EO Risk Taking	.887	13.002	0.000
MVC Proactiveness	.870	15.844	0.000
MVC Networking	.790	11.070	0.000
MVC Idea Driving	.824	12.160	0.000
MVC Learning Tools	.872	15.144	0.000

Note. EO = Entrepreneurial Orientation; PI = product innovativeness; MVC = Market Visioning Competence; R & D = research and development.

Chapter V: Discussion

V.1 Conclusions

The fast pace of competitive product launches and the rapid changes in end user needs in technology-centered industries create situations where firms have to make innovation development decisions with ambiguous market insights. Market dynamism describes these turbulent market conditions (Achrol & Stern, 1988; Thornhill, 2006) The stakes of the innovation development decisions are high because the product innovativeness (PI) of new products will shape a firm's competitive differentiation, especially in high technology industries (Cooper, Edgett and Kleinschmidt, 2001) . High technology firms have a strong need to improve their product development capabilities on an ongoing basis given the intense market dynamism of their industries (Achrol & Stern, 1988; Thornhill, 2006). Stable technology firms experience market dynamism from their industries too, just not as intensely (Thornhill, 2006).

This study has evaluated two theoretical constructs with linkages to product innovativeness (PI): Entrepreneurial Orientation (EO) and Market Visioning Competence (MVC). The study has extended theory and has informed practitioners that face the market dynamism in high and stable technology industries. Entrepreneurial Orientation (EO) is a strategic orientation towards the pursuit of innovative new products through a firm's structure, policies and practices (Rauch et al, 2009). EO has demonstrated a positive direct relationship with PI in the literature (Avlonitis & Salavou, 2007; Pérez-Luño et al., 2011).

However, there are gaps in the EO literature around organizational capability mediators and moderators of EO to firm performance measures (Wales, 2013). Market Visioning Competence (MVC) is an innovation development competency that bridges advanced new technologies to future market opportunities (Reid & de Brentani, 2015). MVC was first reported by studies of the fast-growing high technology industry of nanotechnology (Reid & de Brentani, 2015, 2013, 2010). MVC has the potential to maintain or enhance firm innovation development capabilities to generate PI. Given the market dynamism that firms face in technology-centered industries and the resulting pressure to upgrade innovation development competencies for PI, this study was designed to answer three interrelated EO and MVC construct questions. A hypothesis was framed for each of the three questions for analytical rigor sake. PI was the measured outcome for each hypothesis. Research and Development (R & D) was also used as a control in all three hypotheses (Artz et al., 2010). The R & D control findings will be discussed after the findings from the three hypotheses are examined. I discuss the hypotheses findings through a theoretical lens first and then through a lens of the innovation practitioner.

The first hypothesis was that EO would have a positive relationship with and increase PI for firms from high and stable technology industries. R & D was used as a control (Artz et al.2010). This first hypothesis was confirmed for both firms from both high and stable technology industries. This finding aligns with the EO literature which reports that EO has a positive relationship to a wide range of firm performance measures (Rauch, et al. 2009). Further, the first hypothesis finding confirms similar findings of a positive, specific EO to PI relationship from Pérez-Luño et al. (2011) and Avlonitis and Salavou (2007). The R & D control was not significant for the direct EO to PI high technology model and was significant in the stable technology model with a small, negative correlation coefficient.

The study's second hypothesis was that MVC would mediate the EO to PI relationship for high technology firms, but not for stable technology firms. R & D was used as a control (Artz et al. 2010). This second hypothesis of mediation of the EO to PI relationship by MVC was confirmed for the high technology firms' group. MVC mediated the EO and PI relationship for firms from high technology industries but not for stable technology industry firms. This finding for the high technology firms' group was pre-figured by MVC literature. The initial studies and measure formation of MVC by Reid and de Brentani (2010, 2013, 2015) primarily focused on nanotechnology firms, a subset of high technology. This study's positive MVC mediation finding for the high technology group likely indicates that high technology firms have MVC as an inherent capability. The high technology firms have MVC as an inherent capability to develop the advanced technology new products with high PI that are needed to keep pace with the intense market dynamism of their industries (Thornhill, 2006). By contrast, as hypothesized, MVC did not mediate the EO to PI relationship for stable technology firms. R & D was insignificant as a control for the high technology mediation model of EO to PI mediation. R & D was significant for stable technology mediation model.

The finding that MVC would not mediate the EO to PI relationship in stable technology firms was expected. Stable technology firms tend to be in mature industries (e.g. chemical, automotive) where incremental new product innovation may be sufficient to maintain competitive differentiation (Markham & Lee 2013). While firms from stable technology industries experience market dynamism, the need to deploy advanced new product development capabilities for high PI is not as acute when compared to the need for advanced product development capabilities in high technology industries. It is conceivable that stable technology firms are applying traditional product development competencies instead of the cutting-edge MVC (Markham & Lee, 2013; Reid & de Brentani, 2015). Advanced technology new product development typically consumes significantly more resources and has longer lead times than incremental new product development (Markham & Lee, 2013). A likely outcome of the more traditional new product development competencies in stable technology firms would be more incremental innovation projects and fewer advanced technology projects, with lower PI per project (Markham & Lee 2013). This warrants more investigation.

The third and final hypothesis was that MVC would positively moderate the EO to PI relationship in stable technology firms but not high technology firms. The findings were that MVC did not moderate the EO to PI relationship for either the high technology firm group or the stable technology firm group. Again, R & D was used as a control (Artz et al. 2010). R & D was not significant as a control for the high technology group and was significant and positive for the stable technology group. While it was anticipated that there would be no moderation in the high technology firms, it came as a partial surprise that MVC did not positively affect the EO to PI relationship through moderation. Perhaps there is a lack of moderation in the stable technology group because the firms are pursuing more incremental innovation projects with lower PI per project. Incremental innovation projects would tend to be more predictable and provide sufficient competitive differentiation in stable technology industries without requiring the more advanced new technologies that MVC develops (Cooper, Edgett and Kleinschmidt, 2001: Reid & de Brentani, 2015).

The finding that MVC did not moderate EO to increase PI, which is a measure of innovativeness of each new product launched, not of the quantity, would align with the findings from the study by Koberg et al. (2003). Koberg et al. (2003) found that more mature industries tended to weight their new product portfolio mix towards incremental innovation and develop advanced technology innovation (or radical) more sparingly. Stable, often mature, industries do experience market dynamism (Achrol & Stern, 1988, Thornhill, 2006). However, resource constraints induce stable technology firms to weight their new product portfolio mix towards lower development cost incremental innovation. Often the incremental innovation is sufficient for competitive differentiation and shows higher predictability of returns even if less differentiated.

The findings of a positive and significant association between R & D as a control and PI for two stable technology group models (mediation and moderation) warrant further explanation. Two potential dynamics are speculated as having played a role of R & D (control) increasing PI in the stable technology firm group models. First, there are two interrelated possible explanations from a study data findings standpoint. First, a stable technology R & D intensity adjusted mean of 6.8% (Chapter 4, Descriptive Statistics) exceeded the approximate stable technology level R & D intensity range of 2% to 6% (Hall and Vopel, 1999; Kile and Phillips, 2009; nsf.gov.statistics.2017). This indicates that the stable technology group R & D intensity is higher than might have been expected for a sample group in this study. This is a limitation of the study. Second, the correlation between the R & D intensity and PI for the stable technology group was positive and higher at .264 than the same correlation of .221 for the high technology group (Chapter 4, Correlations). This indicates a higher level of R & D intensity (control) to PI influencing the stable technology models than might have been expected otherwise.

The second explanation for the positive R & D (control) to PI relationship in two stable technology models is centered in R & D theory. The explanation also relates to the PI item measurement in this study. Artz et al. (2010) and Pakes & Gillickes (1984) found that there is a strong, positive relationship between R & D spending and the number of new patents that a firm secures. Since the PI measure in this study is centered in differentiation and technological discontinuity of the innovation, not the quantity of new products, and differentiation is an attribute of a patentable innovation, it is conceivable that the higher than expected level of R & D intensity discussed above for the stable technology group increased PI.

Finally, from a scholar’s standpoint, EO was the second of two independent variables in this study with linkages to PI (Avlonitis & Salavou, 2010; Pérez-Luño et al., 2011). The positive effect that EO had on PI in the direct relationships for both high and stable technology firm groups confirmed the findings by Avlontis & Salavou, 2010 and Pérez-Luño et al., 2011.   The findings around MVC mediation and moderation of EO to PI has helped close the organizational capabilities knowledge gap pinpointed by Wales et al. (2013). This study’s findings have helped explain the types of internal firm mediators or moderators of EO that are significant.

For practitioners in high and stable technology industries, a high EO appears to be a foundation for forming a capability, such as MVC, to develop higher PI. High technology and stable technology industries are turbulent and dynamic, placing pressures on firms and their leaders to develop a continuous stream of innovation. High EO presence probably means the firms have (a) enough desire among executive leaders to pursue new products in the first place, (b) a proactive bent to develop relevant and more technologically discontinuous new products, and (c) enough of a risk-taking disposition to launch the new products and incur the risk and reward tradeoffs in dynamic markets (Covin & Slevin, 1986).

Understanding the individual dimensions of MVC could provide a significant enabler for innovation practitioners in high technology industries. The four major elements of MVC from Reid and de Brentani (2015) of networking, idea driving, proactive market orientation, and market-learning tools could become systematically integrated sub-competencies in an innovation leader’s new-product-development ecosystem. Two MVC dimensions, in particular, contain pieces of other established, innovation-related theories. MVC proactive market orientation (Reid & de Brentani, 2015) includes activities resembling those of latent-needs research (Narver et al., 2004). The goal of latent-needs research is to ascertain new and futuristic solution ideas that customers often cannot accurately articulate because they are not in the customers' current consideration set. Apple's iPhone is an example of a solution that customers could not fully envision until after launch, and then end users experienced the benefits viscerally.

The MVC networking dimension (Reid & de Brentani, 2015) also has pieces that are similar to another innovation theory. Some activities described in the MVC networking dimension, such as actively networking outside the firm for new ideas and maintaining a broad network of professional relationships across functions and industries, are elements of open-innovation theory (Chesbrough & Appleyard, 2007). Open-innovation theory emphasizes the need for modern firms to tap into, and coexist with, an external business ecosystem for new ideas and complimentary resources.

From the standpoint of practicality of implementation, deploying an MVC-centered team and integrating it into a high technology firm's existing innovation development could be a much less costly way to improve innovativeness rather than significantly increasing R & D spending or reorganizing the whole firm. An MVC team could, hypothetically, be a four to six person addition to the firm that has the MVC skills to develop more innovative product ideas and drive them toward commercialization. A team of that size with those tools could cost approximately $1,000,000–$1,500,000 annually to staff and support with user research and forecasting software. By contrast, a one-point increase in R & D spending as a percentage of annual revenue for a $1,000,000,000 ($1B) firm (e.g. from 4% to 5% of annual revenue) is a $10,000,000 increase in operating cost. Furthermore, the costs and risks of a company reorganization for better innovation development capabilities, or an acquisition for higher product innovativeness, makes the formation of an MVC team a high-potential, low-cost and low-risk bet.

V. 2 Research Ideas and Limitations

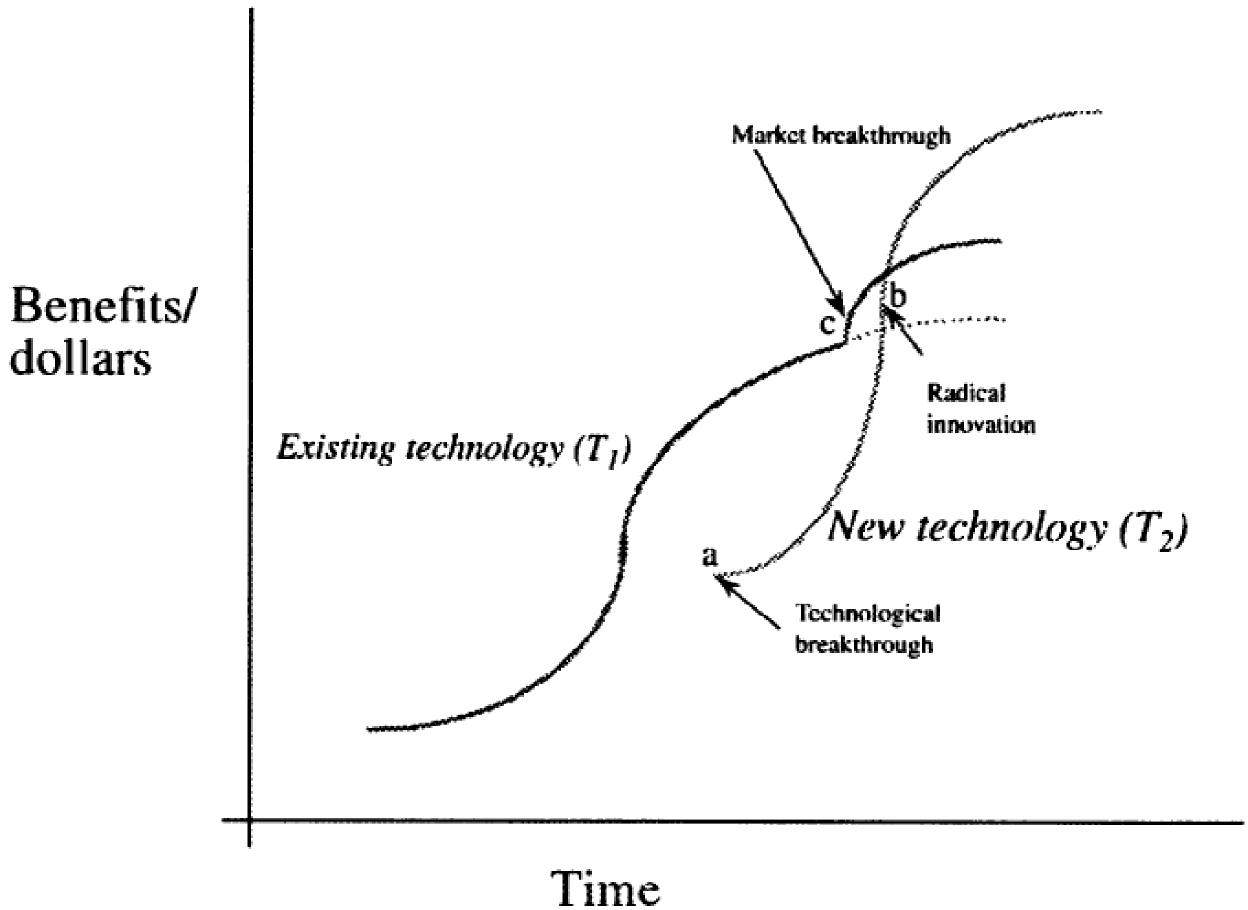
The finding that MVC mediates EO to generate PI merits further study. Are the boundaries of MVC as broad as all high technology industries, as the findings seem to indicate? Understanding the generalizability of MVC as a mediator of EO to PI at deeper and broader levels holds significant promise for future research. Additionally, this study did not investigate any sub-classifications within high technology industries (e.g., information technology specifically or pharmaceuticals specifically) as they relate to MVC or EO. Furthermore, studies that evaluate the relative importance of the four dimensions of MVC in greater depth could illuminate which MVC dimensions are most relevant to the various high technology subsectors. On the face of it, the MVC (Reid & de Brentani, 2015) dimension of proactive market orientation (with potential links to latent needs theory) and the MVC dimension of networking (with potential links to open-innovation theory) are worthy of further research. Future researchers could also explore MVC as a direct competency link to other foundational capabilities, such as new-product-development processes. It is possible that MVC could be a major enabler of processes to produce higher levels of PI (see Appendix F).

Regarding the limitations of this study, a larger sample size for each technology level would have been preferable. As discussed previously, the stable technology R & D intensity was unexpectedly high. From a firm or industry scope standpoint, this study focused only on high and stable technology industries. The exclusion of low technology industries (e.g., agriculture) made sense given the objectives of the study and the advanced technology definition of MVC. However, the exclusion of low technology firms in this study reduced the precision of comparisons with other studies that linked EO and PI and included low technology industries (Avlonitis & Salavou, 2007; Pérez-Luño et al., 2011).

From a respondent qualification standpoint, this study only admitted directors with at least three years of experience in the same firm. I selected these criteria to ensure respondents had at least a three-year historical view of their firm's product pipeline, not a recent history view. However, a three-year tenure criterion may not make sense for rapidly evolving sectors in high technology, such as information technology and software. New product development cycles are shortening (Markham & Lee, 2013), and competencies and process configurations are adjusting to keep up, especially in the IT sectors of high technology. This study also only focused on employees of U.S. firms. Clearly, an opportunity exists to study this topic globally, or at least regionally. Given the global nature of firms, understanding the EO to MVC and PI relationships of firms with national culture roots outside the US could challenge the conclusions of this study and extend knowledge to a larger, more globally relevant, set of scholars and practitioners.

Appendix A

Innovation S Curve



From "Organizing for Radical Innovation: The Overlooked Role of Willingness to Cannibalize," by R. K. Chandy and G. J. Tellis, 1998, *Journal of Marketing Research, 35,* p. 4, https://doi.org/10.1177/002224379803500406. Sage Journals, 1998. Gratis reuse permission granted on October 27, 2019.

Appendix B

Industry technology classifications

Table B1

Industry Technology Classifications

Classification	Industries
High technology[a]	Biotechnology Communications/information Computer hardware Computer software Computer reseller Engineering Information technology/ Internet Service Pharmaceuticals/drugs Telecommunications
Stable technology[a]	Accounting Advertising Banking/financial Brokerage Chemicals Consumer packaged goods manufacturing Food and beverage manufacturing Insurance Non-high-tech manufacturing Market research[c]
Low technology[b]	Agriculture Construction Hospitality or foodservice Printing and publishing Real estate Retail (grocery, convenience, apparel, big box) Transportation (scheduled air, bus, or truck) Wholesale

Note. From "Using industry classification codes to sample high technology firms: Analysis and recommendations," by G. O. Kile & M. E. Phillips, 2009, *Journal of Accounting, Auditing & Finance, 24*, also from. *Innovation, Market Share and Market Value,* by B. H. Hall & K. Vopel, 1997, Berkeley: University of California, Berkeley; [a]Included in the study.[b]Excluded from the study.

Table B2

High Technology Group Entrepreneurial Orientation and Market Visioning Competence Skewness and Kurtosis

Variable	Minimum	Maximum	*M*	*SD*	Skewness	Kurtosis
EO Innovativeness 1	1	7	4.92	2.024	−0.816	−0.683
EO Innovativeness 2	1	7	5.24	1.595	−0.711	0.029
EO Innovativeness 3	1	7	5.11	1.563	−0.908	0.444
EO Proactivity 1	1	7	5.11	1.703	−0.899	0.043
EO Proactivity 2	1	7	5.46	1.544	−1.241	1.023
EO Proactivity 3	1	7	5.14	1.687	−0.845	0.001
EO Risk Taking 1	1	7	4.89	1.675	−0.772	−0.050
EO Risk Taking 2	1	7	4.81	1.816	−0.667	−0.449
EO Risk Taking 3	1	7	5.13	1.580	−0.842	0.189
MVC Networking 1	3	7	5.60	1.216	−0.522	−0.648
MVC Networking 2	1	7	5.70	1.243	−0.980	0.928
MVC Networking 3	1	7	5.59	1.379	−1.167	1.261
MVC Idea Driving 1	2	7	5.85	1.145	−0.902	0.442
MVC Idea Driving 2	3	7	6.06	1.050	−0.971	0.170
MVC Idea Driving 3	2	7	5.87	1.155	−1.286	1.709
MVC Proactive Market Orientation 1	2	7	6.13	1.147	−1.614	2.260
MVC Proactive Market Orientation 2	1	7	5.87	1.331	−1.480	1.925
MVC Proactive Market Orientation 3	2	7	6.17	1.175	−1.630	2.098
MVC Market-Learning Tools 1	2	7	5.90	1.187	−1.155	0.802
MVC Market-Learning Tools 2	2	7	5.92	1.228	−1.252	1.224
MVC Market-Learning Tools 3	1	7	5.61	1.522	−1.087	0.462
MVC Market-Learning Tools 4	1	7	5.66	1.344	−1.105	0.745

Note. Valid N = 106. For skewness, SE = 0.235. For kurtosis, SE = 0.465.

Table B3

Stable Technology Group Entrepreneurial Orientation and Market Visioning Competence Skewness and Kurtosis

Variable	Minimum	Maximum	*M*	*SD*	Skewness	Kurtosis
EO Innovativeness 1	1	7	4.68	1.823	−0.636	−0.565
EO Innovativeness 2	1	7	4.79	1.472	−0.607	0.210
EO Innovativeness 3	1	7	4.49	1.630	−0.615	−0.185
EO Proactivity 1	1	7	4.68	1.709	−0.538	−0.451
EO Proactivity 2	1	7	4.98	1.509	−0.875	0.522
EO Proactivity 3	1	7	4.94	1.450	−0.872	0.379
EO Risk Taking 1	1	7	4.42	1.470	−0.293	−0.036
EO Risk Taking 2	1	7	4.38	1.696	−0.335	−0.695
EO Risk Taking 3	1	7	4.76	1.507	−0.567	−0.312
MVC Networking 1	1	7	5.27	1.292	−0.800	1.163
MVC Networking 2	1	7	5.46	1.278	−0.681	0.360
MVC Networking 3	1	7	5.07	1.298	−0.675	0.739
MVC Idea Driving 1	1	7	5.74	1.408	−1.362	1.672
MVC Idea Driving 2	1	7	6.02	1.271	−1.531	2.508
MVC Idea Driving 3	1	7	5.62	1.385	−1.226	1.714
MVC Proactive Market Orientation 1	1	7	5.80	1.456	−1.461	1.546
MVC Proactive Market Orientation 2	1	7	5.36	1.304	−1.019	1.033
MVC Proactive Market Orientation 3	1	7	5.92	1.318	−1.579	2.435
MVC Market-Learning Tools 1	2	7	5.74	1.160	−0.930	0.660
MVC Market-Learning Tools 2	1	7	5.53	1.328	−1.242	1.473
MVC Market-Learning Tools 3	1	7	5.61	1.386	−1.275	1.393
MVC Market-Learning Tools 4	1	7	5.39	1.424	−0.968	0.637

Note. Valid $N = 95$. For skewness, $SE = 0.247$. For kurtosis, $SE = 0.490$.

Appendix C

Descriptive Statistics

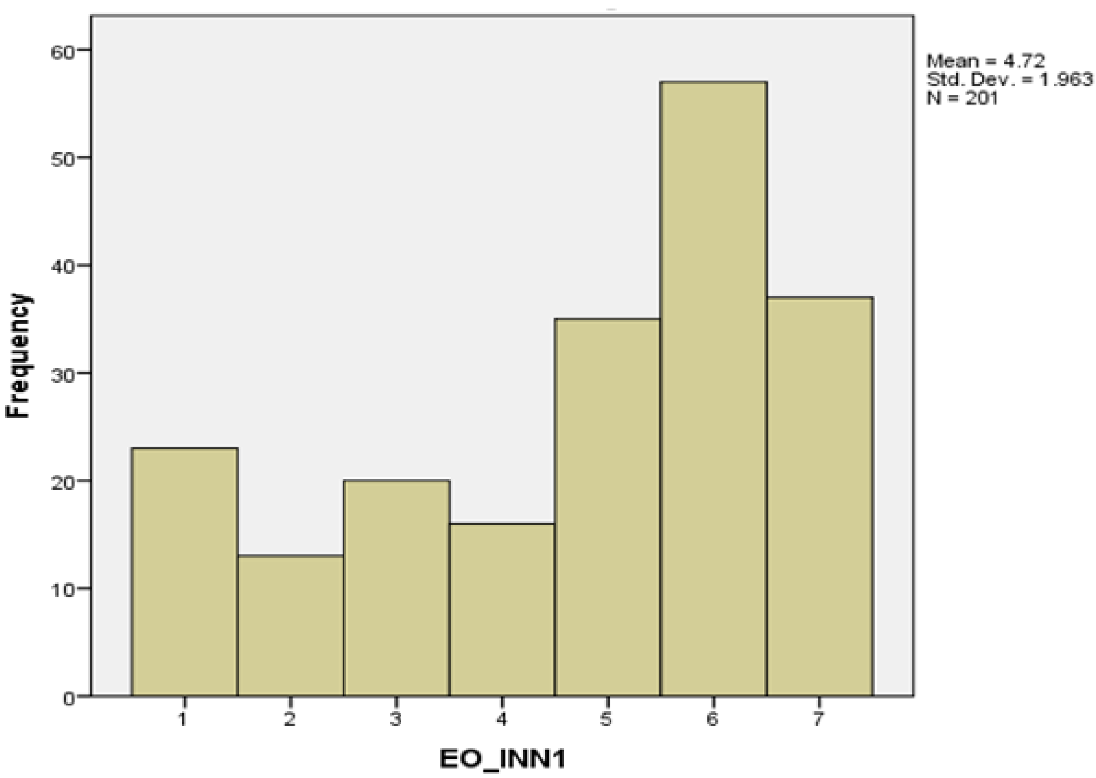


Figure C1. Histogram for Entrepreneurial Orientation innovativeness.

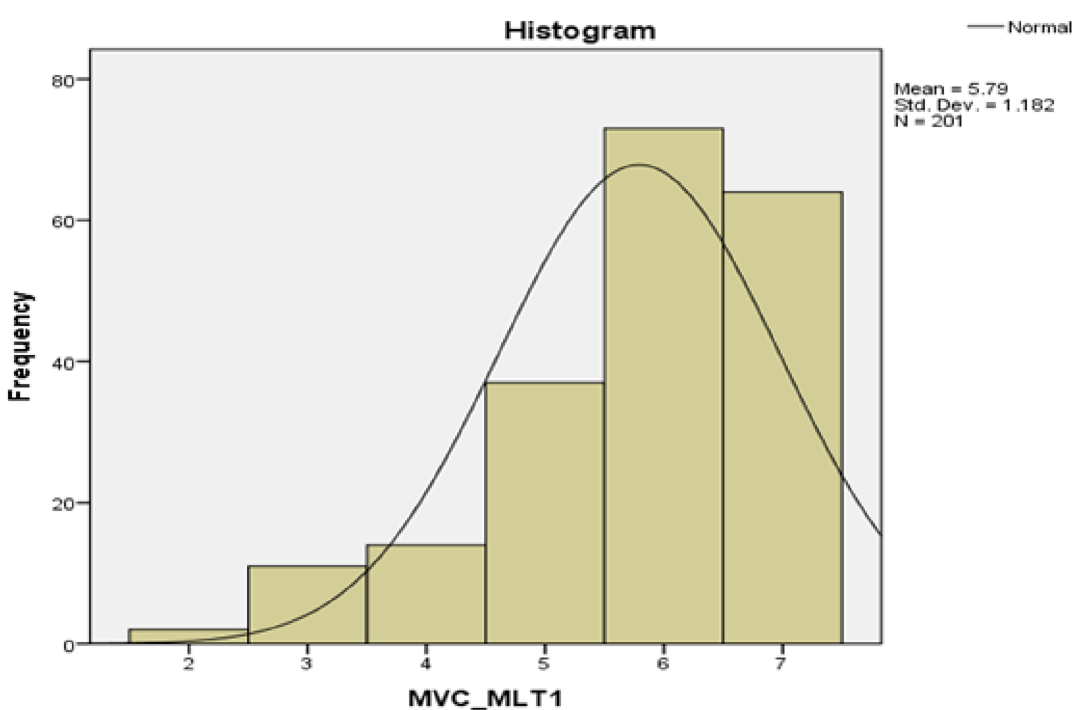


*Figure C*3. Histogram for Market Visioning Competence market-learning tools.

Table C1

High Technology Group Entrepreneurial Orientation (EO) Consistency and Reliability

				Mean interitem correlation		
Item	*M*	*SD*	α[a]	1	2	3
EO innovativeness scale (α = .734)						
1. EO Innovativeness 1	4.920	2.024	.738	—		
2. EO Innovativeness 2	5.240	1.595	.614	.449	—	
3. EO Innovativeness 3	5.110	1.563	.608	.457	.585	—
EO proactivity scale (α = .504)						
1. EO Proactivity 1	5.110	1.703	.469	—		
2. EO Proactivity 2	5.460	1.544	.300	.284	—	
3. EO Proactivity 3	5.140	1.687	.441	.177	.307	—
EO risk taking scale (α = .792)						
1. EO Risk Taking 1	4.890	1.675	.714	—		
2. EO Risk Taking 2	4.910	1.816	.674	.610	—	
3. EO Risk Taking 3	5.130	1.580	.701	.509	.560	—

Note. *N* = 106. There were nine EO items. For the entire EO dimension, α = .841.
[a]Cronbach's alpha of scale if item removed.

Table C2

High Technology Group Market Visioning Competence (MVC) Consistency and Reliability

Item	*M*	*SD*	α[a]	Major interitem correlation 1	2	3	4
MVC networking scale (α = .750)							
1. MVC Networking 1	5.850	1.145	.780	—			
2. MVC Networking 2	6.060	1.050	.574	.644	—		
3. MVC Networking 3	5.870	1.155	.635	.551	.628	—	
MVC idea driving scale (α = .750)							
1. MVC Idea Driving 1	0.585	1.145	.780	—			
2. MVC Idea Driving 2	0.606	1.050	.574	.467	—		
3. MVC Idea Driving 3	0.587	1.155	.685	.402	.642	—	
MVC proactiveness scale (α = .844)							
1. MVC Proactive Market Orientation 1	6.13	1.147	.764	—			
2. MVC Proactive Market Orientation 2	5.87	1.331	.885	.548	—		
3. MVC Proactive Market Orientation 3	6.17	1.175	.703	.789	.623	—	
MVC Market learning tools scale (α = .889)							
1. MVC Market-Learning Tools 1	5.900	1.187	.835	—			
2. MVC Market-Learning Tools 2	5.920	1.228	.888	.693	—		
3. MVC Market-Learning Tools 3	5.610	1.522	.836	.753	.630	—	
4. MVC Market-Learning Tools 4	5.660	1.344	.863	.706	.507	.745	—

Note. *N* = 106. There were 13 MVC items. For the entire MVC dimension, α = .939.
[a]Cronbach's alpha of scale if item removed.

Table C3

Stable Technology Group Entrepreneurial Orientation (EO) Consistency and Reliability

				Mean interitem correlation		
Item	*M*	*SD*	α[a]	1	2	3
EO innovativeness scale (α = .801)						
1. EO Innovativeness 1	4.680	1.823	.688	—		
2. EO Innovativeness 2	4.790	1.472	.786	.550	—	
3. EO Innovativeness 3	4.490	1.630	.699	.651	.527	—
EO proactivity scale (α = .660)						
1. EO Proactivity 1	4.680	1.709	.512	—		
2. EO Proactivity 2	4.980	1.509	.427	.554	—	
3. EO Proactivity 3	4.940	1.450	.710	.275	.345	—
EO risk taking scale (α = .700)						
1. EO Risk Taking 1	4.420	1.470	.528	—		
2. EO Risk Taking 2	4.380	1.696	.583	.545	—	
3. EO Risk Taking 3	4.760	1.507	.701	.411	.361	—

Note. *N* = 95. There were nine EO items. For the entire EO dimension, α = .877.
[a]Cronbach's alpha of scale if item removed.

Table C4

Stable Technology Group Market Visioning Competence (MVC) Consistency and Reliability

Item	*M*	*SD*	α[a]	Major interitem correlation 1	2	3	4
MVC networking scale (α = .697)							
1. MVC Networking 1	5.270	1.292	.580	—			
2. MVC Networking 1	5.460	1.278	.552	.444	—		
3. MVC Networking 1	5.070	1.298	.615	.381	.409	—	
MVC idea driving scale (α = .810)							
1. MVC Idea Driving 1	5.740	1.408	.609	—			
2. MVC Idea Driving 2	6.020	1.271	.769	.698	—		
3. MVC Idea Driving 3	5.620	1.385	.820	.625	.439	—	
MVC proactiveness scale (α = .832)							
1. MVC Proactive Market Orientation 1	5.800	1.456	.801	—			
2. MVC Proactive Market Orientation 2	5.360	1.304	.735	.627	—		
3. MVC Proactive Market Orientation 3	5.920	1.318	.768	.584	.668	—	
MVC market learning tools scale (α = .844)							
1. MVC Market-Learning Tools 1	5.740	1.160	.839	—			
2. MVC Market-Learning Tools 2	5.530	1.328	.780	.575	—		
3. MVC Market-Learning Tools 3	5.610	1.386	.806	.518	.540	—	
4. MVC Market-Learning Tools 4	5.390	1.424	.778	.456	.712	.649	—

Note. *N* = 95. There were 13 MVC items. For the entire MVC dimension, α = .913.
[a]Cronbach’s alpha of scale if item removed.

Appendix D

Correlations

Table D1

Total Sample Correlations

Group (n=201)	1	2	3	4	5	6	7	8
1. EO innovativeness	—							
2. EO proactivity	.627**	—						
3. EO risk taking	.587**	.602**	—					
4. MVC networking	.521**	.498**	.369*	—				
5. MVC idea driving	.467**	.485**	.323**	.646**	—			
6. MVC proactive market orientation	.543**	.559**	.404**	.662**	.619**	—		
7. MVC market-learning tools	.517**	.571**	.469**	.719**	.614*	.750**	—	
8. Product innovativeness	.232**	.345**	.278**	.303**	.282**	.294**	.340**	—
9. R & D intensity	.286**	.291*	.278**	.267**	.172*	.393**	.346**	.235**

***Correlation is significant at 0.01 level (two tailed). *Correlation is significant at .05 level (two tailed)*

Table D2

High Technology Group Correlations

Group (n=106)	1	2	3	4	5	6	7	8
1. EO innovativeness	—							
2. EO proactivity	.584**	—						
3. EO risk taking	.581**	.596**	—					
4. MVC networking	.495**	.516**	.437**	—				
5. MVC idea driving	.502**	.480**	.404**	.732**	—			
6. MVC proactive market orientation	.514**	.553**	.429**	.724**	.652**	—		
7. MVC market-learning tools	.538**	.574**	.554**	.781**	.706**	.774**	—	
8. Product innovativeness	.275**	.303**	.226**	.330**	.317**	.315**	.343**	—
9. R & D intensity	.344**	.320**	.344**	.383**	.329**	.458**	.402**	.221*

***Correlation is significant at 0.01 level (two tailed). *Correlation is significant at .05 level (two tailed)*

Table D3

Stable Technology Group Correlations

Group (n=95)	1	2	3	4	5	6	7	8
1. EO innovativeness	—							
2. EO proactivity	.667**	—						
3. EO risk taking	.551**	.582**	—					
4. MVC networking	.501**	.434**	.209*	—				
5. MVC idea driving	.438**	.519**	.248**	.586**	—			
6. MVC proactive market orientation	.524**	.548**	.288**	.518**	.595**	—		
7. MVC market-learning tools	.454**	.551**	.325**	.610**	.497*	.662**	—	
8. Product innovativeness	.159	.386**	.319**	.269**	.248**	.259*	.309**	—
9. R & D intensity	.190	.233*	.170	.066	.019	.269**	.245**	.264**

***Correlation is significant at 0.01 level (two tailed). *Correlation is significant at .05 level (two tailed)*

Appendix E

Glossary of Terms

Term	Definition	Source
Early stage new product process	Not explicitly defined in literature, this is the first one to two stages of new product development processes, which include idea generation and first selection.	Synthesis of literature
Entrepreneurial Orientation	This involves a strategic decision-making bias toward new entry or new products. Dimensions include innovativeness, risk taking, and proactiveness.	Avlonitis and Salavou (2007) Covin and Slevin (1989) Lumpkin and Dess (1996)
Fuzzy front end	The new product ideation and first selection point of the process to develop the idea or not. Tends to be the most ambiguous phase, hence the term *fuzzy*.	Koen et al. (2001)
Low innovativeness	Also known as *incremental new product*. This focus upon new ideas for adaptation, refinement and improvement of existing products.” Such products are typically low on technological discontinuity and low on incremental benefits. An example is low-sugar cereal as a line extension.	Garcia and Calantone (2002) Song and Montoya-Weiss (1998)
Market Visioning Competence	It is the ability of individuals in organizations to link advanced technologies to market opportunities of the future. Dimensions include networking, idea driving, proactive market orientation, and market learning tools.	O’Connor and Veryzer (2001) Reid and de Brentani (2010)
Moderate innovativeness	Also known as *new-to-the-company new product*. The terms describe new products to the firm that are near parity with or modestly better than the competition. They typically have moderate technological discontinuity and moderate incremental user benefits. An example is version 10 of a smartphone. The initial, first time to the market smartphone was high innovativeness.	Booz, Allen & Hamilton (1982)
High innovativeness	Also known as *new-to-the-world new product*. New-to-the-world products are new both to the market and the firm. They typically have high technological discontinuity and a high level of incremental user benefits. Examples are the smartphone, the first jet-engine powered commercial aircraft.	Garcia and Calantone (2002) Lukas and Ferrell (2000)
Radical innovation	Also known as *breakthrough innovation*. It is 5 to 10 times the benefit or 30% or greater cost savings. his phrase is very similar in meaning to *new-to-the world* (if successful) and *disruptive innovation*. For purposes of this study, radical innovation is joined with high innovativeness.	Leifer et al., 2000

Appendix F

Designing Engaged Scholarship: From Real World Problems to Research Publications

Component	Description	Source
Problem	Firms in high technology to stable technology (midlevel) industries need to continue to develop innovative new products to create differentiation and maintain competitive differentiation. Market dynamism (fast pace of launches, ambiguity) makes new product development and decision-making challenges for both high and stable tech, especially high tech that needs cutting edge competencies to develop advanced technologies for differentiation.	Olson et al. (1995) Thornhill (2006)
Area	New product development capabilities for higher levels of innovativeness in high technology to stable technology firms.	Garcia and Calantone (2002) Kile and Phillips (2009)
Framing	The primary theories to explain the new innovation development challenges were: Entrepreneurial Orientation (EO); Market Visioning Competence (MVC) and product innovativeness (PI)	Covin & Slevin (1986); Rauch et al (2009); Reid and de Brentani (2015) and Garcia and Callantone (2002)
Method	Data was collected via a survey panel of 201 innovation executives. Quantitative analysis was used with descriptive statistics, correlations and PLS-SEM. Industry classifications were into High Technology, Stable Technology and Low Technology (excluded).	Hair et al. (2012) Kile and Phillips (2009)
Research questions	There were three research questions. First, is there a relationship between EO and product innovativeness? Second, to what extent, if any, does MVC mediate or moderate the relationship between EO and product innovativeness? Finally, how does the relationship and mediation or moderation based upon firms' technology level group (i.e. aggregation of the high- and stable- technology groups, high technology group, and stable technology group)?	
Contributions	First, for both the high- and stable- technology groups there was a positive, significant relationship between EO and product innovativeness. This confirmed existing literature and further illustrated the strategic orientation of EO to pursue innovation. Second, MVC mediated the relationship between EO and product innovativeness in high technology firms. This was a new finding and partially addressed the literature gap around organizational mediators and moderators of EO for higher levels of firm performance, in this case product innovativeness.	

Note. This table documents the process described by Mathiassen (2017). EO = Entrepreneurial Orientation; MVC = Market Visioning Competence.

Appendix G

Survey Instrument

Q3 Georgia State University
Informed Consent of Survey
Title: Entrepreneurship, Marketing and Innovation Principal Investigator: Dr Pam Ellen Student Principal Investigator: John Stowell (Student)
Procedures Hi, you are being asked to take part in a research study. If you decide to participate in the study, then you will take an on-line survey that will take approximately 15 minutes of your time to complete. You can only take the survey one time. The research study is about the business practices of entrepreneurship, marketing and innovation.
V**oluntary Participation and Withdrawal**: You do not have to be in this study. You may stop taking the study at any time by clicking out of it or closing your computer search browser.

Survey Purpose: Thank you for agreeing to participate in this research study about innovation and new product development. This is an academic study and you will be asked your opinion about your firm and its work around innovation. The results of this study will help both business executives and academics. If you would like a copy of the study results then please email the study investigator, John Stowell, at jstowell4@student.gsu.edu.

Confidentiality: We respect your privacy. Because it's an online survey, your URL, email address and survey panel number will be temporarily captured. However, this data will be eliminated once data collection is complete. Your answers will be combined with those of others and used only in an aggregated form for our study. Please also do not list any names or share information that could identify other people. **Selection Criteria, Compensation and Time to Complete the Study:** Given the objectives of this study, there will be a short set of selection criteria questions at the beginning of the survey. The criteria focus upon the type of firm that you work for and your role with innovation. In the event that you or your firm do not meet our study's objectives, the survey will be stopped. Respondents who fit the criteria will be guided through the full survey. The respondents who pass the selection criteria and complete the full survey will qualify for their normal compensation from their survey panel provider <u>plus a Tango e-gift card valued at $X in rewards. Please note that you need to enter your email address for payment purposes.</u> The respondents who pass the survey selection criteria and elect to not finish the study (e.g. click-out before completion) will receive a token of appreciation. The study is estimated to take about 15 minutes to complete. **Contact Information:** If you have questions or comments about the study, please contact the study investigator, John Stowell, at email: jstowell4@student.gsu.edu

Start of Block: Respondent Qualifiers

Q62 Do you commit to thoughtfully provide your best answers to each question in this survey?

- ○ I will provide my best answers (1)
- ○ I will not provide my best answers (4)
- ○ I can’t promise either way (5)

Skip To: End of Block If Do you commit to thoughtfully provide your best answers to each question in this survey? != I will provide my best answers

Email Please provide your e-mail address below for compensation purposes. Respondents who provide their address will be compensated. After compensation the email address data will be destroyed to protect your privacy.
____

SCR 1 How long have you been employed by your firm?

- Less than 3 years (1)
- 3 years or longer (2)

Skip To: End of Block If How long have you been employed by your firm? = Less than 3 years

SCR 2 What is your primary responsibility at your firm? You may select more than one responsibility.

- Research and Development (1)
- Marketing (2)
- Innovation (3)
- Technical and/or Product Development (4)
- Sales (5)
- New Product Project Management (6)
- Other "Please describe" (7) ____

Skip To: End of Block If What is your primary responsibility at your firm? You may select more than one responsibility. = Marketing
Skip To: End of Block If What is your primary responsibility at your firm? You may select more than one responsibility. = Sales

SCR 3 What best describes your title?

- Specialist or Coordinator (1)
- Manager (2)
- Sr Manager or Assistant Director (3)
- Director (4)
- VP or Assistant VP (5)
- President and/or General Manager (6)
- Other: Please List.... (7) ____

Skip To: End of Block If What best describes your title? = Specialist or Coordinator
Skip To: End of Block If What best describes your title? = Manager

Page Break

Q64 Please write the word "business" below with NO caps

____

Skip To: End of Block If Please write the word "business" below with NO caps Is Does Not Contain

Page Break

SCR 4 What is the approximate size of your firm?

- Fewer than 20 Employees (1)
- 20-49 Employees (2)
- 50-249 Employees (3)
- Greater than 250 Employees (4)

End of Block: Respondent Qualifiers

Start of Block: Industry & Tech Level Identification

SCR 5 Please select your firm's industry.

- Accounting (1)
- Advertising (2)
- Agriculture (3)
- Banking/Financial (4)
- Biotechnology (5)
- Brokerage (6)
- Chemicals (7)
- Communications/Information (8)
- Computer Hardware (9)
- Computer Software (10)
- Computer Reseller (11)
- Consumer Packaged Goods (12)
- Construction (13)
- Engineering (14)
- Food & Beverage Manufacturing (15)
- Hospitality Or Foodservice (16)
- Information Technology/IT (17)
- Insurance (18)
- Internet Service (19)

- ◯ Manufacturing (Non High-Tech) (20)
- ◯ Market Research (21)
- ◯ Pharmaceuticals/Drugs (22)
- ◯ Printing & Publishing (23)
- ◯ Real Estate (24)
- ◯ Retail (Grocery, Convenience, Apparel, Big Box) (25)
- ◯ Telecommunications (26)
- ◯ Transportation (Scheduled Air, Bus or Truck) (27)
- ◯ Wholesale (28)
- ◯ Other. Please list.... (29) ____

Page Break

End of Block: Industry & Tech Level Identification

Start of Block: R & D Spend Level

SCR 6 When it comes to innovation, approximately what percentage of annual revenue does your firm spend on Research and Development?

- ○ 0% to 1.0% (1)
- ○ 1.1% to 2.0% (2)
- ○ 2.1% to 3.0% (3)
- ○ 3.1% to 4.0% (4)
- ○ 4.1% to 5.0% (5)
- ○ 5.1 to 6.0% (6)
- ○ 6.1% to 7.0% (7)
- ○ 7.1% to 8.0% (8)
- ○ 8.1% to 9.0% (9)
- ○ 9.1% to 10.0% (10)
- ○ Greater than 10.0% (11)

Page Break

End of Block: R & D Spend Level

Start of Block: You Are Qualified!

AC 1 Your firm has the profile that is needed for this study. The next set of questions is about how top management of your firm approaches innovation and new products. For each question, please choose an answer along the continuum of answers that reflects your belief.

End of Block: You Are Qualified!

Start of Block: Block 10

Start of Block: EO MVC

X→ X→

EO INN1 In general, the top managers of my firm....

- ○ Strongly emphasize the marketing of tried and true products or services (1)
- ○ (2)
- ○ (3)
- ○ (4)
- ○ (5)
- ○ (6)
- ○ Strongly emphasize R & D technological leadership and innovation (7)

X→ X→

EO INN2 In the past three years, your firm has marketed......

- ○ No new lines of products or services (1)
- ○ (2)
- ○ (3)
- ○ (4)
- ○ (5)
- ○ 7 (6) ____
- ○ Very many new lines of products or services (7)

EO INN3 In the past three years, our products and/or service lines have had...

- ○ Relatively minor changes (1)
- ○ (2)
- ○ (3)
- ○ (4)
- ○ (5)
- ○ 7 (6)
- ○ Quite dramatic changes (7)

Page Break

The following questions are about your firm's approach to competition.

EO PRO1 In dealing with its competitors, my firm typically......

- ◯ Responds to actions which competitors initiate. (1)
- ◯ (2)
- ◯ (3)
- ◯ (4)
- ◯ (5)
- ◯ (6)
- ◯ Initiates actions that competitors respond to. (7)

EO PRO2 Think about how your firm compares when it comes to new products/services, administrative techniques, operating technologies, etc.
Our firm is very......

- ◯ Seldom the "first mover" business (1)
- ◯ (2)
- ◯ (3)
- ◯ (4)
- ◯ (5)
- ◯ (6)
- ◯ Often the "first mover" business (7)

EO PRO3 Our firm adopts a.....

- ◯ "Live and let live" posture to avoid competitive clashes (1)

- (2)
- (3)
- (4)
- (5)
- (6)
- Very competitive "undo the competition" posture (7)

Page Break

Q59 The next set of questions is about how the senior management of your firm approaches risk

EO RT1 In general, the top management of my firm has a strong preference for....

- Low risk projects (with normal and certain rates of return) (1)
- (2)
- (3)
- (4)
- (5)
- 7 (6)
- High risk projects (with chances of very high returns) (7)

EO RT2 In general, the top management of my firm's response to the nature of the macro-environment is to..

- Explore it gradually via cautious, incremental behavior (1)
- (2)
- (3)
- (4)
- (5)
- 7 (6)
- Take bold, wide ranging acts to achieve the firm's objectives (7)

EO RT3 When confronting decision-making situations involving uncertainty, what approach does your firm typically adopt?

- A "wait and see" posture in order to minimize the probability of making costly decisions. (1)
- (2)

- ○ (3)
- ○ 4 (4)
- ○ (5)
- ○ (6)
- ○ A bold, aggressive posture in order to maximize the probability of exploring potential opportunities. (7)

Page Break

End of Block: EO MVC

Start of Block: EO MVC part 2

BR 2 The following questions are about finding innovative ideas and developing them.

Think about a time when someone in your firm championed a key technology or a key new product/service idea for your firm (not an operating process). Keep this person in mind as you answer the following questions.

(For each item, please choose an answer that best describes how this person championed the key technology or new product/service idea.)

MVC NW 1-3 & ID 1-3 The person who first championed a key technology or key new product/service idea in our firm had a.....

	Doesn't describe (1)	(2)	(3)	(4)	(5)	(6)	Perfectly Describes (7)
Broad network of relationships outside the firm. (1)	○	○	○	○	○	○	○
Network of people with a variety of backgrounds (e.g. different industries, disciplines, functions, etc.) (2)	○	○	○	○	○	○	○
Was at the center of the network growing up around the technology. (3)	○	○	○	○	○	○	○
Got decision makers involved (4)	○	○	○	○	○	○	○
Georgia State University Informed Consent of Survey Title: Entrepreneurship, Marketing and Innovat... Is Displayed	○	○	○	○	○	○	○

Please select the **button left of** "Perfectly Describes" (8)							
Secured the required senior management support (5)	○	○	○	○	○	○	○
Shared information and campaigned for support very quickly with senior management (6)	○	○	○	○	○	○	○

Page Break

The following set of questions is about how your firm approaches customer needs. Please indicate how much you agree or disagree with each statement.

MVC PRO 1 My firm continuously tries to discover our customers' additional needs of which they may be unaware.

- ○ Strongly Disagree (1)
- ○ (2)
- ○ (3)
- ○ Neither agree or disagree (4)
- ○ (5)
- ○ (6)
- ○ Strongly Agree (7)

MVC PRO2 My firm incorporates solutions to un-articulated customer needs in our new products and services.

- ○ Strongly Disagree (1)
- ○ (2)
- ○ (3)
- ○ Neither agree or disagree (4)
- ○ (5)
- ○ (6)
- ○ Strongly Agree (7)

MVC PRO3 My firm brainstorms on how customers use our products and services.

- ○ Strongly Disagree (1)
- ○ (2)

- (3)
- Neither agree or disagree (4)
- 6 (5)
- 7 (6)
- Strongly Agree (7)

Page Break

The next set of questions is about how your firm estimates the market and forecasting.

MVC MLT1 My firm tries to keep our market opportunity options open as long as possible for key new technologies or key new product/service ideas.

- Strongly Disagree (1)
- (2)
- (3)
- Neither agree nor disagree (4)
- (5)
- (6)
- Strongly Agree (7)

MVC MLT2 My firm tries to develop several potential technology scenarios or multiple solution approaches before choosing market(s) to pursue.

- Strongly Disagree (1)
- (2)
- (3)
- Neither agree nor disagree (4)
- (5)
- (6)
- Strongly Agree (7)

MVC MLT3 My firm uses forecasting and market estimation techniques to make a market selection.

- Strongly Disagree (1)

- ○ (2)
- ○ (3)
- ○ Neither agree nor disagree (4)
- ○ (5)
- ○ (6)
- ○ Strongly Agree (7)

MVC MLT4 My firm uses several forecasting and market estimation techniques in combination before market selection.

- ○ Strongly Disagree (1)
- ○ (2)
- ○ (3)
- ○ Neither agree nor disagree (4)
- ○ (5)
- ○ (6)
- ○ Strongly Agree (7)

End of Block: EO MVC part 2

Start of Block: MVC

Start of Block: Dv Product Innovativeness

Q40
The following is one of many ways that academics have proposed to classify innovative products or services. As you read, please think about how your firm's new products or services over the past three years might be classified.

-**Highly Innovative** (aka New-to-the-World). Examples: the first laser jet printer, the first smartphone, or world-wide-web. These products have the highest level of technological discontinuity and a new or dramatically expanded set of user benefits.

-**Moderately Innovative** (aka New-to-the-Market). Examples: Vanilla flavored Coke, Smartphone Version 8, or the Toyota Prius IV. These products have a higher level of technological discontinuity versus the launching firm's portfolio of existing products and some of the market. The products provide a higher level of benefits to the end users than existing products from the producing firm.
-**Low Innovativeness** (aka New-to-the-Firm). Examples: lower sugar version of an existing cereal, improved taste of an existing yogurt, or the taking of cost out of an existing degreaser while maintaining quality. These products

offer a slight technological improvement and a marginal benefit increase over the existing products from the producing firm. Alternatively, they lower the producing firm's costs without affecting quality.

Q41 Please think about all the new products or services your firm has offered in the past three years.

Approximately how many new products or services were launched from your firm over the last three years (a cumulative total). Please enter the figure in the box below.
____

Q42 Over the last three years, approximately what percentage of your firm's new products or services launched were:
Highly Innovative : ________ (1)
Moderately Innovative : ____ (2)
Low Innovativeness : ________(3)
Total : _________

Page Break

End of Block: Dv Product Innovativeness

Start of Block: Close & Feedback

Q42 If you have any comments or questions you wish to share, please share them in the space below.

This is the end of the survey. Thank you for your time and expertise.

____
____
____
____
____

End of Block: Close & Feedback

Appendix H

IRB Approval of Study

INSTITUTIONAL REVIEW BOARD

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March 01, 2019

Principal Investigator: Pamela Ellen

Key Personnel: Ellen, Pamela; Stowell, John S

Study Department: 000000000, J. Mack Robinson-College of Business

Study Title: To What Degree Does The Market Visioning Competency Mediate or Moderate Entrepreneurial Orientation for Higher Product Innovation? J. Stowell Dissertation, EDB Candidate, 2019, GSU Robinson College of Business

Submission Type: Exempt Protocol Category 2

IRB Number: H19391

Reference Number: 353317

Approval Date: 02/26/2019

Status Check Due By: 02/25/2022

The above referenced study has been determined by the Institutional Review Board (IRB) to be exempt form federal regulations as defined in 45 CFR 46 and has evaluated for the following:

1. Determination that it falls within one or more of the eight exempt categories allowed by the institution; and
2. Determination that the research meets the organization's ethical standards

If there is a change to your study, you should notify the IRB through an Amendment Application before the change is implemented. The IRB will determine whether you research protocol continues to qualify for exemption or if a new submission of an expedited or full board application is required.

A Status Check must be submitted three years from the approval date indicated above. When the study is complete, a Study Closure Form must be submitted to the IRB.

Any unanticipated/adverse events or problems resulting from this investigation must be reported

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VITA

John Stowell was born in Merced, California and has lived in 12 US states and traveled extensively. He holds a Bachelor of Science in Business Economics from the University of Oklahoma and a Master of Business Administration from the University of North Carolina at Chapel Hill. He also served as a US Army officer, resigning as a Captain, earning the Army Achievement and Army Commendation medals. His recently published research is "Will Automated Trucks Trigger the Blame Game and Socially Amplify Risks?" The study included an experiment to understand how autonomous truck accidents in the future might be interpreted and communicated via social media based upon the technological adoption propensity of the subjects and environmental factors. John has spent approximately one-half of his practitioner career developing new products and innovation and enjoys studying change management and the formation and adoption of new technologies and brands. John spent fifteen years with Coca-Cola and four years with Zep Inc., primarily developing new products and innovation creation systems. He developed and launched two brands for Coca-Cola N. America, Gold Peak® Iced Tea and Enviga®. Gold Peak® succeeded for Coke and later topped $1B in revenue globally; Enviga® was withdrawn after eighteen months in the market. John has learned as much from his innovation and brand failures as he has from his successes. John enjoys instructing college students and is now instructing Marketing, Global Business and Market Research to students in the Atlanta area. He also consults on innovation and messaging. He serves the community through his church and related charitable activities, especially assisting the homeless and families in difficult transitions.