

Article

Moderating Effects of Leadership and Innovation Activities on the Technological Innovation, Market Orientation and Corporate Performance Model

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Abstract: This paper aims to examine the relations between market orientation, technological innovation and corporate performance with the moderating roles of leadership, exploitation and exploration by an empirical study targeting 414 Korean responses in diverse industries. The results of the analysis reveal that technological innovation partially mediates the relationship between market orientation and the perceived financial and non-financial performance of a company. Additionally, when technological innovation affects corporate performance, transformational leadership and transactional leadership have a moderating effect on both the perceived financial and non-financial performance, but the exploitation and exploration of innovation activity had a moderating effect only on non-financial performance. Finally, when market orientation affects corporate performance, transformational leadership and exploration of innovative activities have a moderating effect only on non-financial performance. The novelty of this study lies in that it is more effective to carry out market-oriented activities with a focus on the customers rather than to pursue technological innovation alone in order to improve corporate performance. The contribution of this research is to expand the scope of research related to the results of technological innovation academically and to support how to apply corporate management elements in order to improve corporate performance in the field of business.

Keywords: transformational leadership; transactional leadership; exploitation; exploration; technological innovation; market orientation; corporate performance



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1. Introduction

Enterprises of today must adapt to the business environment for survival and growth, thus driving innovation that differentiates them from others in order to remain competitive [1,2]. Companies are carrying out technological innovation activities for newly developed products with differentiation, which lead to continuous growth and improving financial results [3,4]. Those that successfully build and operate innovation process will be able to survive and thrive, while the others are mortal since they do not succeed in such innovation processes [5].

It is therefore of critical relevance to explore the mechanism and boundary conditions under which innovation leads to the better performance of a company. The ongoing research on innovation does not offer a complete understanding of the innovation–performance link, partially due to the fragmented approaches to this topic. Prior studies on the relationship between technological innovation and corporate performance mainly have explained the relationship with product innovation and researched only a part of technological innovation [6,7].

Our study intends to fill the gap in innovation–performance research by taking comprehensive approaches and specifying subtypes of innovations, such as the product, process, organization, and marketing, adding the transactional and transformational leadership perspectives, and differentiating exploitation and exploration by organizational members.

Enterprises need a process that integrates the various organizational subsystems to drive innovation [8]. Gatignon and Xuereb [9] have shown that the better the coordination and cooperation between departments within an organization, the more likely it is to develop a breakthrough new product. Many prior studies that have researched the relationship between market-oriented characteristics within a diverse organizational subsystem, innovation and corporate performance can be explored. There are many variables (except for market orientation) that can influence the relationship between technological innovation and corporate performance.

In particular, it is intriguing to question the roles of leaders and organizational members, the main operators of the infrastructure system, in corporate performance in the market orientation–technological innovation–performance linkage. The definition of leadership and its forms have been studied in various ways, and among its classification forms are transformational leadership and transactional leadership. This is a form classification depending on the difference in the relationship setting with the members and the method of producing results and studying what form of leadership is more effective in relation to market orientation, innovation and corporate outcomes, which can be used as an important reference in the field of actual enterprise operations.

The roles of organizational members are divided into two categories: exploitation and exploration. March [10] defined exploitation as a concept that includes refinement, selection, production, efficiency, selection and execution and exploration as a concept that includes search, variation, risk-taking, experimentation, flexibility, new discoveries and innovation activities. Such exploitation and exploration has been applied to various strategic areas such as organizational learning and innovation, competitive advantage creation and maintenance processes [11–13].

In this research, we would like to study how market orientation plays a role in achieving substantial corporate results through technological innovation, what kind of leadership is effective for leaders who run companies and also how it is desirable to apply the exploitation and exploration of organizational members to organizational management. This technological innovation research from such a complicated point of view has academic significance in taking a step further to seek practical corporate performance factors, and we expect to make a practical contribution in presenting the direction of activities of leaders and members in actual corporate management. The contribution of this research is to expand the scope of research related to the results of technological innovation academically and to support how to apply corporate management elements in order to improve corporate performance in the field of business.

2. Theory and Hypotheses

2.1. Technological Innovation and Corporate Performance

Schumpeter [5] was the first scholar that introduced the concept of innovation in business management. Schumpeter [5] defined innovation as disruptive innovation and described it as a creative change that has disrupted the equilibrium of the market. Innovation is a major factor in the survival of companies and is considered one of the important determinants of long-term organizational performance [14,15].

After Schumpeter used innovation in a comprehensive sense, technological innovation has been studied by various researchers and defined in various ways due to its different ranges and viewpoints.

Drucker [16] said, “Innovation is an activity that creates values that consumers have not realized, and it is a core activity of companies to build new markets”. Knight [17] classified corporate innovation into four categories: product innovation, process innovation, structure innovation and human resource innovation. The OECD classified corporate innovation into product innovation, process innovation, organizational innovation and marketing innovation [18].

Product innovation is defined as it occurs, namely when an existing product changes to a new or improved condition using emerging technologies and knowledge or combin-

ing existing technologies and knowledge in various ways. Process innovation refers to a quite new or significantly improved production process that brings changes in technology, production infrastructure or software in production. Organizational innovation refers to innovation that utilizes new methods related to management performance processes or organizational work routines, information management methods and improved interrelationships with external organizations. Marketing innovation refers to the utilization of marketing techniques that can be differentiated distinctly from existing methods in various marketing activities such as design, packaging, placement, promotion and pricing of new products [18].

Process innovation and product innovation can be categorized as technological innovation, while marketing innovation and organizational innovation can be sub-grouped as management innovation. Among these types of innovation, this study shed lights on the concept of technological innovation, including process innovation and product innovation.

The empirical studies in search for the relation between technological innovation activities and corporate performance showed that companies are continuously developing and increasing their financial performance through technological innovation, such as new product development [3,4]. Innovative companies have a distinction in the market and pursue profits based on successful new product development and continuous technological innovation [19]. Engaging in this may provide a company with measurable market and financial profits if the subject of transfer were to be a strategically valuable technological innovation, especially if derived from the originator [20].

Most of these studies examine economic indicators such as sales, revenue, sales or profit growth rate, market share and productivity for the financial performance indicators of companies [21]. In the case of innovative companies, however, not only financial performance but also non-financial performance, such as market performance, should be examined to consider the critical timing for survival and growth. Subjective performance indicators of companies as well as objective performance indicators can also be important since they can exhibit comparisons with the competitors. Prior studies reported that there is a high correlation between subjective and objective indicators [22].

Effective interorganizational relationships are positively associated with hospital financial health [23]. Although the importance of non-financial performance is acknowledged, it is not easy to objectify, and the measurement range is wide, so it is recognized as inappropriate for indicating short-term performance. However, non-financial performance indicators that represent the long-term performance of a company have the advantage of being able to represent a large part of the overall management performance by measuring performance based on the standards of all stakeholders centered on the organization [24]. Through a study on service companies, it was confirmed that non-financial measures related to customer satisfaction are significantly related to the future financial performance of service companies [25]. Kaplan and Norton [26] completed a balanced performance index consisting of performance metrics from a financial perspective and three operational metrics that affect financial performance: customer perspective, internal process perspective and the learning and growth perspective. The biggest advantage of indicators is that they can measure long-term and short-term corporate performance by balancing financial and non-financial indicators. Although corporate performance should be measured with a comprehensive scale, it shows a negative view on measuring only a financial performance measurement system that is measured and evaluated at a point in time, and non-financial performance measurement is also necessary [27].

Duchesneau and Gartner [28] suggested that technological innovation ability had a great influence on business performance. They also demonstrated that among technological innovations, R&D and patents had an effect on business performance [29].

In this research, we would like to understand the current situation of not only large companies but also small- and medium-sized companies and analyze the data of various companies. However, there is a problem: it is difficult to obtain data on the financial

performance of small- and medium-sized enterprises. Therefore, we used questionnaires rather than objective data on financial results and used perceived financial performance.

Kurtulmuş and Warner's [30] research also points out the limitations of seeking financial data from SMEs and analyzes financial performance as perceived financial performance through questionnaires. Kurtulmuş and Warner [30] cited the work of Neely, Gregory and Platts [31], Neely et al. [32], Neely [33] and Lumpkin and Dess [34] as the basis for perceived financial performance.

Based on the prior studies on how technological innovation affects corporate performance, the following hypotheses are set up:

Hypothesis 1 (H1). *Technological innovation has a positive (+) effect on corporate performance.*

Hypothesis 1.1 (H1.1). *Technological innovation has a positive (+) effect on perceived financial performance.*

Hypothesis 1.2 (H1.2). *Technological innovation has a positive (+) effect on non-financial performance.*

2.2. Market Orientation and Corporate Performance

Although several scholars have conceptualized the definition of market orientation, there are two dimensions commonly accepted: the market information perspective by Kohli and Jaworski [35,36] and the corporate culture perspective by Narver and Slater [37,38].

Kohli and Jaworski [35] used the word "market orientation" in terms of realizing the marketing concept. As a practical behavior standard of market orientation, it is composed of such subconcepts as information creation and diffusion and the response to markets and consumers. In market information creation activities, collection, evaluation and creation proceed based on the information about the changes in consumer demand, marketing activities of competitors and market trends using direct contact with consumers or using formal or informal indirect methods. Market information diffusion quickly spreads and shares data on consumer demand as well as competitors' product information and marketing development information with companies and partners. Market information response develops new products and services and creates new value through appropriate marketing activities with the response to the changes in demand of the market and consumers, as well as the product strategies and marketing activities of competitors.

Narver and Slater [37] conceptualized market orientation as a cultural perspective. According to them, market orientation is an organizational culture that creates the most efficient and effective resources required to provide excellent value to consumers. They divided the concept of market orientation into three categories: customer orientation, competitor orientation and interfunctional coordination. First, customer orientation provides the value to identify consumer demands and satisfy them. It requires a deep understanding of consumers to increase the overall value perceived by individual customers [39]. It also explores the value chain of potential customers [40], which creates new consumers of the company and provides value to satisfy them, ultimately enhancing customer satisfaction. Second, competitor orientation refers to the tendency of companies to analyze and respond to the advantages and disadvantages of the technology and products of competitors. Competitor orientation seeks answers to the following questions [38]. First, who are the competitors? Second, what technologies do the competitors provide? Third, can competitors offer value that meets customer expectations? Along with these questions, it analyzes the strengths, weaknesses, and strategies of potential competitors [41,42], and the analysis of competitors enhances the ability to identify and satisfy consumer demand [39]. The final components of market orientation relate to the interfunctional coordination. This includes the adjustment and integration of corporate resources to create value that can satisfy consumer demand [37]. This is closely connected to customer orientation and competitor orientation. A single department cannot independently or efficiently adjust and integrate human and

material resources in a targeted direction, which makes interfunctional coordination critical to the success of any initiatives [43].

Kohli and Jaworski [35] argued that higher market orientation results in greater business performance, employee morale, organizational commitment, job satisfaction as well as customer satisfaction, which brings an increase in repeat purchases from customers. Research results examining the relation between market orientation and major performance-related variables showed that organizational performance (sales, revenue and market share), customer-related outcome variables, innovation-related outcome variables and employee satisfaction-related outcome variables were all found to have positive (+) effects [44–46].

Pelham and Wilson [47] stated that market orientation had a significant positive effect on corporate performance (relative product quality, marketing effectiveness and profit). In addition, Appiah-Adu [48] found that market orientation had a significant positive (+) effect on sales growth, ROI and new product success. Bhuian [49] stated that market orientation had a significant effect on organizational performance in the case of business groups belonging to highly competitive industries, and Subramanian and Gopalakrishna [50] stated that market orientation had a positive (+) effect on performance, such as return on capital, overall revenue growth and success of new products and services.

A market-oriented company can have a competitive advantage in the market [36] and can improve corporate performance by providing higher value to target customers compared with its competitors [35,37]. In other words, a market-oriented company can improve corporate performance by satisfying customers through products or services that can satisfy consumer demand [35].

Based on these previous studies, the following hypotheses are established related to market orientation and corporate performance:

Hypothesis 2 (H2). *Market orientation has a positive (+) effect on corporate performance.*

Hypothesis 2.1 (H2.1). *Market orientation has a positive (+) effect on perceived financial performance.*

Hypothesis 2.2 (H2.2). *Market orientation has a positive (+) effect on non-financial performance.*

2.3. Technological Innovation and Market Orientation

Market orientation is a major factor in improving corporate performance and competitiveness through continuous product and technological innovation. Han, Kim and Srivastava [51] suggested that market orientation (customer orientation, competitor orientation and interfunctional coordination) in the banking industry affects corporate performance through organizational technological innovation and task innovation. In other words, a company continues to provide higher value to customers to create a competitive advantage in the market and will have a positive effect on corporate performance by inducing technological innovation, implementing new improvements and the development of processes or products. Hong-bae Lee [52] proved that market orientation affects corporate performance through innovation and that effective marketing expenditure has a positive (+) effect on the market share and non-financial performance, such as sales and ROI [53]. Lukas and Ferrell [54] found through empirical analysis that customer orientation promotes the new product launches of US manufacturers and reduces the number of products made with the existing technologies. The findings are aligned in the sense that customer orientation seeks out consumer demand and promotes the new product's launch with new technologies that reflect those needs. In a study on beverage manufacturers, Chul-Ho Jung, Duk Hwa Jung and Hyung Jun Kim [55] showed that competitor orientation has a positive (+) effect on developing new products. In a study on Korean manufacturers, Young-Ik Yang [56] found that market orientation has a positive (+) effect on product innovation through cooperative work between the marketing department and the development department.

Market orientation ultimately plays a role in promoting technological innovation implemented by companies [57]. Prior research revealed that market orientation has a fa-

vorable influence on corporate performance, but some studies reported mixed results, such as insignificant or significantly weak effects [58,59]. The reason for the jumbled research results is that corporate performance is multidimensional, so the findings may appear to vary depending on the indicators used for organizational performance [59,60]. Cooper [61] argued that companies can pursue innovation by searching for consumer demand from the market orientation perspective and by setting the direction of an organizational culture that promotes new technological innovation to stay competitive for better performance. Consequently, many companies try to provide high value to contemporary customers through product innovation by identifying and analyzing market changes and consumer demand. Baker and Sinkula [62] asserted that creating an organizational culture in an innovative direction is important not only for a major company but also for small- and medium-sized ones. On the other hand, Subin Im and Workman Jr. [63] derived the research result that the more a company pursues market orientation, the more it observes information related to customers and competitors in detail and executes new product development and marketing activities in a creative way.

The innovation literature showed that customer-oriented corporate activities bring innovation activities to the overall company business system, though not in a specific department. The activities to establish the system for collecting and interpreting market information are important to secure more systematic market information and respond quickly to the market. Deshpande, Farley and Webster [64] examined that the relationship between market orientation and innovation activities is positive (+), thereby being related to achieving remarkable corporate performance. The study by Hurley, Hult and Knight [65] found that companies with high market orientation promoted product innovation by actively responding to new changing technologies and markets. Market orientation ultimately plays a role in promoting technological innovation implemented by companies [57].

Based on these prior studies, the following hypothesis was set for the role of technological innovation between market orientation and corporate performance:

Hypothesis 3 (H3). *Technological innovation plays a mediating role when market orientation influences corporate performance.*

Hypothesis 3.1 (H3.1). *Technological innovation plays a mediating role when market orientation influences perceived financial performance.*

Hypothesis 3.2 (H3.2). *Technological innovation plays a mediating role when market orientation influences non-financial performance.*

2.4. Definition and Role of Leadership

The topics of both transformational leadership and transactional leadership have been widely studied in various fields through diverse methods [66–68]. Burns [69] proposed transformational leadership and transactional leadership as leadership approaches to accomplish tasks. Downton [70] introduced transformational leadership first in 1970, and many scholars have studied it since the 1980s [71]. Burns [69] first defined the idea of transformational leadership, and Bass [72] extended this theory [68].

Transformational leadership provides personal and professional opinions to subordinates who have self-esteem and self-actualization needs [73,74]. It increases intrinsic motivation, which becomes an important driver of employee creativity and innovation [75,76]. Moreover, the intellectual stimulation of transformational leaders fosters innovative thinking and work processes, resulting in new knowledge and skills, which are the foundation for corporate innovation [77]. Bass [73] suggested three factors of transformational leadership: (1) charisma leadership, or a leader who retains enthusiasm, belief, loyalty, pride, trust and goals, (2) individualized consideration, or a leader who maintains a progressive and personal orientation toward his or her subordinates and personally deals with, teaches and advises each worker, and (3) intellectual stimulation, or a leader who strengthens

problem-solving skills with colleagues and promotes knowledge, rationality and problem-solving skills.

Transactional leadership is a form of leadership that seeks to satisfy both parties' contractual obligations by promoting personal interests, setting goals and tracking and managing outcomes [78]. Transactional leaders clarify the role and job requirements of workers to instill confidence so that they can exercise their essential efforts. A transactional leader is concerned with time constraints and efficiency, prefers risk aversion and processing of the essence as a means of management and wants to work within the current system or culture [73,79,80]. In the case of transactional leadership, it includes two behaviors: active management by exception and contingent reward. Active management by exception is monitoring the work performance of workers and taking complementary actions when necessary. Contingent rewards clarify that members who perform their duties will be rewarded for their efforts [81]. Transactional leadership is important in the stability and management of the organization, but organizations tend to prefer transformational leadership because the recent environment around companies requires new changes and continuous innovation [73,82–85]. Transactional leadership, which is based on the exchange of relationships between leaders and subordinates, occurs when a person wants to make mutual relationships with others for the purpose of exchanging what he or she thinks is valuable [83]. This relationship between the leader and subordinates is reciprocal, and the idea that the organizational performance will be higher than planned has a limitation [86].

Most of the research on transformational leadership has focused on confirming the effect of traditional leadership and transformational leadership as separate relations [87]. Gumusluoglu and Ilsev [88] stated that transformational leaders promote innovation activities within an organization or ensure successful innovation in the marketplace. Various characteristics of transformational leadership are related to corporate innovation. Transformational leadership shares a vision between leaders and subordinates and is focused on effective communication and value sharing. It also provides and encourages an appropriate environment for the innovation team. Furthermore, it supports the cooperative process of organizational learning and shows an amicable attitude toward active activities and risks based on reciprocal trust between members and leaders. These forms have a positive effect on the relation between collaborative and innovative transformational leadership and organizational innovation [89–91].

Many studies on the effects of transformational leadership tend to admit that transformational leadership has a positive effect on leader satisfaction, leadership effectiveness and organizational performance. The influence of transformational leadership is greater than the effect of transactional leadership [92–96]. Moreover, it has the ability to plan and implement innovation, such as conducting an environmental analysis and developing an innovation execution plan, as well as the ability to completely accept and implement innovation within the company. Additionally, the study shows that the performance of innovation is further enhanced, improving market performance and financial performance when innovation leaders have responsibility and authority [97–99].

Transformational leadership is more productive than transactional leadership or non-transformational leadership, has a lower employee turnover rate and shows high job satisfaction and motivation [100]. Transformational leadership is effective in improving group performance. When expressing relationships with subordinates, transformational leaders link job goals to self-regulatory systems, emphasizing high-level self-relevant language such as personal projects, self-identity and fundamental values [101].

In the study of Zhou et al. [45], organizational culture and the attitude toward a change of corporate leaders had a positive (+) effect on market orientation, and market orientation had a positive effect on confidence in future performance, job satisfaction and organizational commitment. Harris and Ogbonna [102] reported that participative and supportive leadership promotes market orientation. Menguc, Auh and Shih [103] confirmed that transformational leadership influences market orientation, therefore suggesting that fostering or hiring transformational leaders can help to enhance market orientation.

As for technological innovation management capability, Cooper and Kleinschmidt [104], Yoo and Roh [97] and Shin and Ha [98] suggested many variables of technological management ability. This study aims to analyze the moderating effect of transformational and transactional leadership in the relation between technological innovation and corporate performance.

According to the analysis purpose of previous research and this study, the following hypothesis are set as follows;

Hypothesis 4 (H4). *Transformational leadership has a moderating effect on the relationship between technological innovation and corporate performance.*

Hypothesis 4.1 (H4.1). *Transformational leadership has a moderating effect on the relationship between technological innovation and perceived financial performance.*

Hypothesis 4.2 (H4.2). *Transformational leadership has a moderating effect on the relationship between technological innovation and non-financial performance.*

Hypothesis 5 (H5). *Transactional leadership has a moderating effect on the relationship between technological innovation and corporate performance.*

Hypothesis 5.1 (H5.1). *Transactional leadership has a moderating effect on the relationship between technological innovation and perceived financial performance.*

Hypothesis 5.2 (H5.2). *Transactional leadership has a moderating effect on the relationship between technological innovation and non-financial performance.*

Hypothesis 6 (H6). *Transformational leadership has a moderating effect on the relationship between market orientation and corporate performance.*

Hypothesis 6.1 (H6.1). *Transformational leadership has a moderating effect on the relationship between market orientation and perceived financial performance.*

Hypothesis 6.2 (H6.2). *Transformational leadership has a moderating effect on the relationship between market orientation and non-financial performance.*

Hypothesis 7 (H7). *Transactional leadership has a moderating effect on the relationship between market orientation and corporate performance.*

Hypothesis 7.1 (H7.1). *Transactional leadership has a moderating effect on the relationship between market orientation and perceived financial performance.*

Hypothesis 7.2 (H7.2). *Transactional leadership has a moderating effect on the relationship between market orientation and non-financial performance.*

2.5. Exploration and Exploitation as Innovation Activities

March [10] presented exploration and exploitation as innovation activities of organization members. The related definitions and theories have been applied to various strategic fields, such as organizational learning and innovation and the process of creating and maintaining a competitive advantage [11,13,39].

Exploitation is defined as a concept that includes refinement, selection, production, efficiency, selection and execution. Exploration is defined as search, variation, risk-taking, experimentation, flexibility, new discovery and innovative activity. In other words, a practical innovation strategy is defined as an activity that pursues innovation through gradual improvement in the existing product market by utilizing the technological resources that a

company possesses. Exploration strategy is defined as an innovation strategy that advances into a new product market by exploring and securing new external technologies [10].

The definitions of exploration and exploitation can be different depending on the background or context. He and Wong [105] argued that the company should use its own capabilities, resources and processes as criteria to differentiate exploration and exploitation. They also claim that a company's exploration can be an exploitation for another company, and vice versa.

Exploitation and exploration may be contradictory or complementary depending on the perspectives, but March [10] argued that exploitation and exploration have different effects on management performance and compete to secure rare managerial resources for a company. Assuming that all resources are allocated to exploitation and exploration at a fixed rate, the increase in managerial resources used for exploitation improved short-term management performance but reduced the possibility in the long term. On the other hand, if the resources used for exploration increase, short-term management performance becomes difficult to improve, while the possibility of creating long-term management performance increases. Therefore, they argue that companies can respond to environmental pressures and survive for a long time while enjoying short-term management performance through the proper balance of both [106].

The existing empirical research proves that the exploitation strategy and the exploration strategy create different technological innovation performances. Through an empirical study on 206 manufacturing companies in Singapore and Malaysia, He and Wong [105] showed that exploration has a positive effect on product innovation, while exploitation has a positive effect on product innovation and process innovation. Moreover, exploration has a significant effect on both the product innovation performance and process innovation performance of SMEs. Exploration had a significant effect on both product and process innovation in high-tech industries. However, in the case of traditional manufacturing, exploration was found to be significant only for product innovation. In addition, in the case of high-tech industries, it was found that exploration had a positive effect on product innovation performance as well as process innovation performance [107].

According to prior research and the analysis purpose of this study, the following hypothesis are set as follows;

Hypothesis 8 (H8). *Exploration has a moderating effect on the relationship between technological innovation and corporate performance.*

Hypothesis 8.1 (H8.1). *Exploration has a moderating effect on the relationship between technological innovation and perceived financial performance.*

Hypothesis 8.2 (H8.2). *Exploration has a moderating effect on the relationship between technological innovation and non-financial performance.*

Hypothesis 9 (H9). *Exploitation has a moderating effect on the relationship between technological innovation and corporate performance.*

Hypothesis 9.1 (H9.1). *Exploitation has a moderating effect on the relationship between technological innovation and perceived financial performance.*

Hypothesis 9.2 (H9.2). *Exploitation has a moderating effect on the relationship between technological innovation and non-financial performance.*

Hypothesis 10 (H10). *Exploration has a moderating effect on the relationship between market orientation and corporate performance.*

Hypothesis 10.1 (H10.1). *Exploration has a moderating effect on the relationship between market orientation and perceived financial performance.*

Hypothesis 10.2 (H10.2). *Exploration has a moderating effect on the relationship between market orientation and non-financial performance.*

Hypothesis 11 (H11). *Exploitation has a moderating effect on the relationship between market orientation and corporate performance.*

Hypothesis 11.1 (H11.1). *Exploitation has a moderating effect on the relationship between market orientation and perceived financial performance.*

Hypothesis 11.2 (H11.2). *Exploitation has a moderating effect on the relationship between market orientation and non-financial performance.*

Therefore, in this study, we would like to test the above hypotheses through an integrated research model such as that in Figure 1.

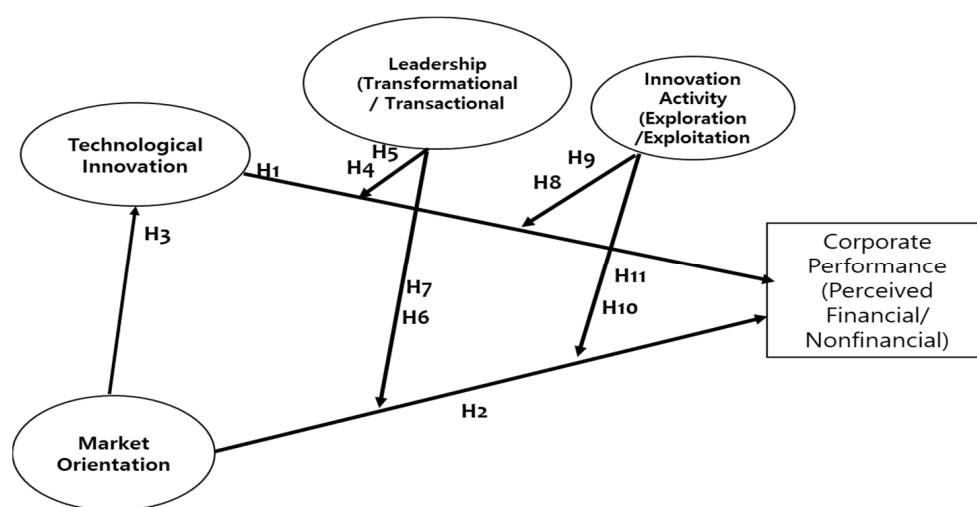


Figure 1. Theoretical model 1.

3. Methods

3.1. Data Survey and Measuremet Method

This study was further analyzed using the data from Shin and Kim [108]. The survey was conducted from June to July 2021 through a specialized research institution in Korea. A preliminary survey was conducted with 100 people to revise the questionnaire prior to this survey. Through the preliminary survey, the validity of the sample design research was examined, and the questions that were difficult to understand or inappropriate were revised for the final questionnaire. To maintain the representativeness of Korean companies, the proportions of major companies and small- and medium-sized enterprises (SMEs), the proportion of industrial sectors and the proportion of employees by level of management were selected to not bias one side. The online survey was used and sent to a total of 3173 people, and 414 responses were finally analyzed, excluding closed surveys and faithless responses from allocations setting for proper distribution of industries and positions.

The operational definitions and measurements for the variables of this study were based on prior studies for each variable.

Market orientation consisted of customer orientation, competitor orientation and interfunctional coordination. The questionnaire items for measuring customer orientation were based on the definitions of Narver and Slater [37], Im and Workman [63] and Yongpil Park [109]. First, a company tries to understand the customers' needs. Second, it actively reflects the requests of customers. Third, a company can continue to provide the quality that customers want. Fourth, a company tries to satisfy customers. Fifth, a company tries to increase customer loyalty.

Competitive orientation was measured with four items based on the definitions of Narver and Slater [37], Im and Workman [63] and Yongpil Park [109]. First, a company has a prompt response to competitors' changes. Second, a company shares information about competitors quickly within the company. Third, a company makes an effort to prevent competitors from imitating their products. Fourth, a company discusses the strengths and weaknesses of competitors regularly.

Interfunctional coordination consists of four measuring items, according to the definitions of Duchesneau and Gartner [28], Kohli and Jaworski [36], Narver and Slater [37] and Inwoo Lee [110].

First, the delegation of authority in the customer approach is performed well to manage customers. Second, a company is organized for flexible response to consumer demand. Third, market-related information is actively distributed between departments. Fourth, the market-, technology- and product-related information data owned by each department are systematically integrated and managed.

Technological innovation consists of product innovation and process innovation. Product innovation was measured with four items based on the definitions of Langerak, Hultink and Robben [57] and Yongpil Park [109]. First, the development speed of the new product is faster than that of competitors. Second, the number of new products is higher than that of competitors. Third, a company actively strives to diversify its products. Fourth, a company actively innovates products to develop new customers.

The questionnaire items for measuring process innovation were based on the definition of Zahra and Bonger [111] and Yongpil Park [109]. First, a company is active in process innovation activities to increase productivity. Second, a company actively introduces high-production technology or facilities. Third, a company tries to reduce product production and delivery times compared with their competitors. Fourth, a company makes more efforts to improve the product quality than their competitors. Fifth, a company makes more efforts to reduce production costs than their competitors.

Transformational leadership consists of charismatic leadership, individualized consideration and intellectual stimulation. Charismatic leadership was measured with three items according to the definitions of Bass [73], Bass and Avolio [112], Gumuslouglu and Ilsey [88] and JaeSung Park [113]. First, executives suggest a specific vision and goal. Second, executives actively support the resources needed to achieve these goals. Third, executives actively support the creativity and innovation activities of the members.

Individualized consideration was measured with three items based on the definitions of Bass [73], Bass and Avolio [112], Gumuslouglu and Ilsey [88] and JaeSung Park [113]. First, executives perform much empowerment of their employees. Second, executives respect the diversity of members. Third, executives tolerate the mistakes and risks of members.

The questionnaire items for measuring intellectual stimulation were based on the definitions of Bass [73], Bass and Avolio [112], Gumuslouglu and Ilsey [88] and JaeSung Park [113]. First, a member can acquire the knowledge or information necessary for creative activities in the company. Second, communication within the organization is actively carried out to create creative ideas. Third, the company encourages and highly evaluates new ideas and methods.

Transactional leadership consists of contingent reward and management by exception. The contingent reward was measured by four items according to the definitions of Bass [83] and Sangkwon Lee [114]. First, executives are well-informed about the benefits or rewards that workers will receive according to the achievement of the goal. Second, executives are able to get what the workers want as compensation for the effort. Third, executives give workers the reward that they want if they work as agreed in advance. Fourth, executives use compensation and punishment properly to achieve a goal.

Management by exception was measured by four items according to the definitions of Bass [83] and SangKwon Lee [114]. First, executives do not mind having subordinates do things the way they usually do. Second, executives do not change the current method

unless there is a special problem. Third, executives strive to keep workers from deviating from the standards presented by the company. Fourth, executives take necessary measures only if a worker does not achieve the set goals properly.

Innovation activities consist of exploration and exploitation. Exploration was measured with four items according to the definitions of Lubatkin, Simsek, Ling and Veiga [115], He and Wong [105], Jansen, Van den Bosch and Volberda [116] and ChanHyeong Lee [117]. First, our company actively accepts the demand of new customers that are different from existing products. Second, our company performs a big investment in new product development. Third, when new demands arise in the market, our company actively applies them. Fourth, our company is active in introducing new products for new distribution channel development.

Exploitation was measured with four items according to the definitions of Lubatkin et al. [115], He and Wong [105], Jansen et al. [116] and ChanHyeong Lee [117]. First, our company focuses more on improving existing products than on new product development. Second, our company focuses more on improving existing technologies than on introducing new technologies in production processes. Third, our company focuses more on existing markets than new markets to increase profits. Fourth, our company focuses more on existing customers than new customers when developing new services.

Corporate performance was composed of non-financial performance recognition and perceived financial performance in consideration of the difficulties of SME financial performance investigation. The reason for using the perception of performance of participants instead of using objective data as corporate performance indicators for SMEs was that the corporate performance objective data of some of the SMEs surveyed appeared sluggish, and it is difficult to evaluate the performance objective data of SMEs and those of large companies, such as through ROI and net profit, equally. However, in order to reduce the common method bias that may appear in the process of responding to the perception of performance using the questionnaire, we paid attention to the preparation of the questionnaire based on the prior research.

Non-financial performance recognition was measured with five items according to the definitions of Henri [118], Widener [119] and Jung and Kim [15]. First, the market share has expanded over the last 3 years. Second, customer satisfaction has continuously increased for the last 3 years. Third, the efficiency of work processing has continuously improved for the last 3 years. Fourth, the patents and intellectual property rights have continuously increased for the last 3 years. Fifth, the satisfaction of employees has continuously increased for the last 3 years.

The measurement of perceived performance was based on the definitions of Henri [118] and Widener [119], and the measurement questions were as follows. First, the sales growth rate in the last 3 years is higher than the industry average. Second, the operating profit rate in the last 3 years is higher than the industry average. Third, the investment return rate (ROI) in the last 3 years is higher than the industry average. Fourth, the net profit growth rate in the last 3 years is higher than the industry average.

Each questionnaire item for the measurement variables of the latent variables was measured on a five-point Likert scale, where one meant “not at all”, three meant “average” and five meant “strongly agree”.

This paper aims to examine the relations between market orientation, technological innovation and corporate performance with the moderating roles of leadership and exploitation and exploration. To maintain the representativeness of Korean companies, the participants were recruited in proportions of large and small- and medium-sized enterprises (SMEs), industrial sectors and the employees’ management levels at their respective companies. The online survey with 56 questions was used and sent to a total of 3173 people, and 414 responses were finally analyzed, excluding closed surveys and faithless responses from allocations set for proper distribution of industries and positions.

Table 1 shows the demographic data of the samples, which are the subjects of this study. First, in the case of gender, the distribution was 59.7% for males and 40.3% for females. In

the case of age, those in their 30s accounted for 37.7%, and those in their 40s accounted for 32.4%, which were the highest proportions. In the case of levels of management, the distribution was even, with section managers at 34.8%, assistant managers at 31.4% and employees at 30.2%. The work field consisted of 17.9% R&D, 17.6% marketing sales and 15.5% of production. Information and communication had the highest percentage in the industry at 28%, followed by 24.6% in manufacturing, 15.9% in service and 15.9% in finance. In the case of company size, SMEs accounted for 43.7%, followed by 29.7% large enterprises and 22.9% medium-sized enterprises.

Table 1. Overview of sample ($n = 414$).

Respondent Profile		Numbers	Percentage
Gender	Male	247	59.7
	Female	167	40.3
Age	20~29 years old	55	13.3
	30~39 years old	156	37.7
	40~49 years old	134	32.4
	>50 years old	69	16.7
Levels of Management	CEO, Executives	15	3.6
	Manager	130	31.4
	Assistant Manager	144	34.8
	Team Member	125	30.2
Business	Personnel Management	34	8.2
	Strategic Planning	60	14.5
	Marketing and Sales	73	17.6
	Research & Development	74	17.9
	Financial Accounting	55	13.3
	Production	64	15.5
	Others	54	13.0
Industry	Manufacturing	102	24.6
	Telecommunications	116	28.0
	Finance	52	12.6
	Distribution	25	6.0
	Construction	33	8.0
	Service	66	15.9
	Others	20	4.8
	Start-up	15	3.6
Enterprise-scale	Small- and Medium-Sized	181	43.7
	Mid-Sized	95	22.9
	Large	123	29.7
Sum		414	100.0

3.2. Common Method Bias Solution

When a researcher measures the dependent as well as independent variables of the model with a common method such as a survey, common method bias happens, which hampers the validity of the study. Common method bias is referred to as the error that is attributable to respondents' psychological intention of being consistent and being socially good when answering the questionnaire, which uses the same measurement tools and respondents to measure dependent variables and independent variables. This bias may lead to distorting the results of the study in such a way that the levels of the relationships among variables increase or decrease, driven by the lower validity of the constructs [120].

It is not desirable, however, to avoid self-reporting surveys considering the merits of such self-reporting tools. The best option to solve common method bias can be to apply different measurement methods for each variable as well as different respondents, which can be impractical in the real world. More practically, the next alternatives lie in

the processes of research design, questionnaire design and statistical analysis to manage common method bias [120].

Despite the risk of bias from self-reporting tools, there exist circumstances where self-reporting questionnaires should be inevitably accepted. The first such case comes from the lines of sight from a particular respondent following one's past actions and one's future intents as well. Second, we should ask the respondents to answer self-reporting surveys when measuring one's psychological status, such as attitudes toward jobs, motivation and tensions. Lastly, we can rely on self-reporting tools to check respondents' awareness of variables related to external environments [120,121].

Such scholars as Campbell and Spector [122,123] have raised fundamental questions about the validity of self-reporting tools, but others are in favor in the sense that the validity of constructs from self-reporting questionnaires is superior to other methods [120,124–128].

With an aim to reduce the common method bias from the self-reporting survey, we took ex ante remedies in the research design, questionnaire development and data collection to minimize the common method bias. In order to reduce the likelihood of the consistency motive according to Peterson [129], we improved the brevity, relevance, clarity, specificity and objectivity of questions to the level possible.

4. Results

4.1. Verification of Validity and Reliability of Measurement Model

Prior to hypothesis testing, factor analysis and correlation analysis were performed on the key variables of the study model for variable measurement validity analysis.

In reliability verification, all variables except for management by exception showed a Cronbach's alpha value of 0.8 or higher, indicating high reliability. Factor analysis was conducted to verify the validity of the main variables used in hypothesis verification. The validity of the measurement items of the variables was verified as follows.

First, as a result Table 2 of factor analysis of market orientation, competitor orientation was categorized into two factors from the first four measurement items. That is, the first item, "a company has a prompt response to competitors' changes", and the second item, "a company shares information about competitors quickly within the company", were classified as the first factor. The third item, "a company makes an effort to prevent competitors from imitating their products", and the fourth item, "a company discusses the strengths and weaknesses of competitors regularly", were classified as the second factor.

Table 2. Market orientation exploratory analysis and Cronbach's alpha.

Latent Variable	Observed Variable	Factor Loading	Cronbach's Alpha
Customer Orientation	Customer Orientation 1	0.774	0.874
	Customer Orientation 2	0.767	
	Customer Orientation 3	0.668	
	Customer Orientation 4	0.824	
	Customer Orientation 5	0.718	
Competitor Orientation	Competitor Orientation 3	0.856	0.802
	Competitor Orientation 4	0.638	
Interfunctional Coordination	Interfunctional Coordination 1	0.725	0.866
	Interfunctional Coordination 2	0.775	
	Interfunctional Coordination 3	0.684	
	Interfunctional Coordination 4	0.740	

For the purpose of this study, the second factor was defined as a strategic factor at the time of competition, and the competitive orientation was measured only by the latter two items.

Furthermore, the interfunctional coordination was well-bound as a single factor, and the content validity of the overall market orientation variable was secured.

The following is the factor analysis of technological innovation. As it is shown in Table 3, the analysis results present that product innovation and process innovation had the validity of the contents clearly divided into the measurement items.

Table 3. Technological innovation exploratory analysis and Cronbach's alpha.

Latent Variable	Observed Variable	Factor Loading	Cronbach's Alpha
Product Innovation	Production Innovation 1	0.819	0.863
	Production Innovation 2	0.822	
	Production Innovation 3	0.719	
	Production Innovation 4	0.636	
Process Innovation	Process Innovation 1	0.726	0.883
	Process Innovation 2	0.562	
	Process Innovation 3	0.832	
	Process Innovation 4	0.779	
	Process Innovation 5	0.697	

For leadership, as described in Table 4, all sub-variables except for caring of transformational leadership and all sub-variables of transactional leadership were well-bound by each variable. For caring, described in Table 5, two items were well-linked, but the remaining one item was bound by another factor. Therefore, this study used the average value of caring with the two items, except the one bound by another factor.

Table 4. Leadership exploratory analysis and Cronbach's alpha.

Latent Variable	Observed Variable	Factor Loading	Cronbach's Alpha
Charisma	Charisma 1	0.801	0.863
	Charisma 2	0.757	
	Charisma 3	0.713	
Consideration Inspiration	Consideration 1	0.635	0.815
	Consideration 2	0.338	
	Consideration 3	0.870	
Intellectual Stimulation	Intellectual Stimulation 1	0.765	0.869
	Intellectual Stimulation 2	0.721	
	Intellectual Stimulation 3	0.752	
Contingent Reward	Contingent Reward 1	0.879	0.905
	Contingent Reward 2	0.862	
	Contingent Reward 3	0.830	
	Contingent Reward 4	0.842	
Management by Exception	Management by Exception 1	0.727	0.767
	Management by Exception 2	0.879	
	Management by Exception 3	0.588	
	Management by Exception 4	0.600	

Exploration and exploitation were found to be combined well with each of the four measurement items, as shown in Table 5. In the case of Cronbach's alpha, which indicates reliability, all items showed high reliabilities of 0.8 or higher.

Next, correlation analysis was performed for all variables. Table 6 shows the result of analysis. Most of the variables showed positive correlations of 0.6 or higher. The correlation between each variable was not a problem because the regression model for hypothesis verification in this study analyzed only one independent variable.

Table 5. Innovation activity exploratory analysis and Cronbach's alpha.

Latent Variable	Observed Variable	Factor Loading	Cronbach's Alpha
Exploration	Exploration 1	0.763	0.839
	Exploration 2	0.759	
	Exploration 3	0.796	
	Exploration 4	0.796	
Exploitation	Exploitation 1	0.691	0.840
	Exploitation 2	0.785	
	Exploitation 3	0.825	
	Exploitation 4	0.793	

Table 6. Correlation analysis.

	Market Orientation	Technical Innovation	Transformational Leadership	Transactional Leadership	Exploratory Activity	Exploitation Activity	Perceived Financial Performance
Market Orientation	1						
Technical Innovation	0.745 **	1					
Transformational Leadership	0.741 **	0.706 **	1				
Transactional Leadership	0.674 **	0.666 **	0.826 **	1			
Exploration	0.734 **	0.792 **	0.759 **	0.715 **	1		
Exploitation	0.567 **	0.618 **	0.642 **	0.698 **	0.615 **	1	
Perceived Financial Performance	0.566 **	0.694 **	0.636 **	0.640 **	0.695 **	0.584 **	1
Non-Financial Performance	0.685 **	0.751 **	0.776 **	0.759 **	0.776 **	0.651 **	0.835 **

** $p < 0.01$.

Looking at the results in Table 6 above, all correlations were positive. The reason for this is that even if the management variables of a company conflict with each other, the two variables coexist within the company and act in the same direction. That is why the correlation coefficient in Table 6 was positive. In the studies of Avolio, Waldman and Einstein [94], Howell and Avolio [130] and Humphreys [131], regarding transformational leadership and transactional leadership, transactional leadership such as conditional reward behavior appears to have a positive correlation with transformation leadership. This is consistent with the results of this study. In the correlation between exploitation and exploration innovative activities, Lubatkin et al. [115] and Schulze and Heinemann [132] also showed their coexistence. Exploitation and exploration conflict with each other, but the two activities have to coexist within the company, and if they coexist, the results will increase further [115,132].

4.2. Hypothesis Verification

4.2.1. Mediating Effects of Technological Innovation

The mediating effect of technological innovation was first performed on perceived financial performance. The mediating effect consists of a four-step hierarchical regression analysis process based on Baron and Kenny's mediating effect verification method [133], as shown in Table 7. The first step is an analysis of the impact of market orientation, an independent variable, on perceived financial performance. The second step analyzes the market orientation effects, an independent variable, on technological innovation, a parameter. The third step is an analysis of the technological innovation impact, a parameter, on perceived financial performance. The fourth step analyzes the effects of independent variables and parameters on perceived financial performance at the same time. First, market orientation had a positive effect on perceived financial performance in the first stage ($\beta = 0.566, p < 0.001$). In the second stage, market orientation had a positive effect on technological innovation ($\beta = 0.732, p < 0.001$). In the third stage, technological innovation had a positive effect on perceived financial performance ($\beta = 0.694, p < 0.001$). In the fourth stage, technological innovation had a positive effect on perceived financial performance and no significant change ($\beta = 0.613, p < 0.001$). Market orientation had a positive effect on perceived financial performance, but its standardized coefficient decreased ($\beta = 0.109, p < 0.05$). These results show that technological innovation plays a partial mediating role in the process where market orientation affects perceived financial performance.

Table 7. Mediating effects on the relationship between technological innovation and perceived financial performance.

Step	Variable		Unstandardized Coefficient		Standardized Coefficient	t	Significant Probability	Collinearity Statistics		R ²
			B	Standard Error	β			Tolerance	VIF	
1	Perceived Financial Performance	(Constant)	0.418	0.200		2.088	0.037			0.32
		Market Orientation	0.761	0.055	0.566	13.924	0.000	1.000	1.000	
2	Technological Innovation	(Constant)	0.230	0.237		0.972	0.332			0.536
		Market Orientation	0.894	0.064	0.732	13.984	0.000	1.000	1.000	
3	Perceived Financial Performance	(Constant)	0.474	0.141		3.366	0.001			0.482
		Technological Innovation	0.794	0.041	0.694	19.582	0.000	1.000	1.000	
4	Perceived Financial Performance	(Constant)	0.260	0.175		1.487	0.138			0.487
		Market Orientation	0.147	0.071	0.109	2.061	0.040	0.445	2.246	
		Technological Innovation	0.701	0.061	0.613	11.583	0.000	0.445	2.246	

Hypothesis 1.1, presenting technological innovation would have a significant positive (+) effect on perceived financial performance, was supported. Hypothesis 2.1 was also supported, stating that market orientation would have a significant positive (+) effect on perceived financial performance. Hypothesis 3.1, stating that technological innovation would play a mediating role in the process of market orientation affecting perceived financial performance, was partially supported.

Next, a four-step hierarchical regression analysis was performed to analyze the mediating effect of technological innovation on non-financial performance. According to Table 8, market orientation had a positive effect on non-financial performance in the first stage ($\beta = 0.685, p < 0.001$). In the second stage, market orientation had a positive effect on technological innovation ($\beta = 0.732, p < 0.001$). In the third stage, technological innovation

had a positive effect on non-financial performance ($\beta = 0.751, p < 0.001$). In the fourth stage, technological innovation had a positive effect on non-financial performance and no change in significance ($\beta = 0.542, p < 0.001$). Market orientation had a positive effect on non-financial performance, and its standardized coefficient decreased ($\beta = 0.281, p < 0.01$). These results show that technological innovation plays a partial mediating role in the process where market orientation affects non-financial performance. Hypothesis 1.2, stating that technological innovation would have a significant positive effect on non-financial performance, was supported. Additionally, Hypothesis 2.2, stating that market orientation would have a significant positive effect on non-financial performance, was supported. Hypothesis 3.2, stating that technological innovation plays a mediating role in the process of market orientation affecting non-financial performance, was partially supported.

Table 8. Mediating effects on the relationship between technological innovation and non-financial performance.

Step	Variable		Unstandardized Coefficient		Standardized Coefficient	t	Significant Probability	Collinearity Statistics		R ²
			B	Standard Error	β			Tolerance	VIF	
1	Non-Financial Performance	(Constant)	0.113	0.167		0.675	0.500			0.469
		Market Orientation	0.871	0.046	0.685	19.061	0.000	1.000	1.000	
2	Technological Innovation	(Constant)	0.230	0.237		0.972	0.332			0.536
		Market Orientation	0.894	0.064	0.732	13.984	0.000	1.000	1.000	
3	Non-Financial Performance	(Constant)	0.503	0.122		4.118	0.000			0.564
		Technological Innovation	0.812	0.035	0.751	23.088	0.000	1.000	1.000	
4	Non-Financial Performance	(Constant)	−0.019	0.146		−0.133	0.894			0.599
		Market Orientation	0.358	0.060	0.281	6.007	0.000	0.445	2.246	
		Technological Innovation	0.586	0.051	0.542	11.574	0.000	0.445	2.246	

This study analyzes the relation between market orientation, technological innovation and corporate performance. It also examines the mediating effect of technological innovation between market orientation and corporate performance. As a result of the analysis, it was found that technological innovation had a partial mediating effect in the process of market orientation, affecting the perceived financial and non-financial performance. Compared with the studies of Han et al. [51] and Hong-Bae Lee [52], this study had the same results in technological innovation mediating the perceived financial and non-financial performance.

These results show that technological innovation has a positive effect on corporate financial performance. It also empirically presents that an increase in market orientation can strengthen technological innovation and raise the positive effect of corporate performance.

4.2.2. The Moderating Effect of Leadership

This research analyzes the moderating effect of leadership when market orientation and technological innovation affect corporate performance. First, this study examined the moderating effect of leadership on technological innovation by analysis of variance (ANOVA) to analyze the significance of the interaction between technological innovation and leadership. If the interaction term is significant in the analysis results, it can be interpreted that there is a moderating effect from leadership on technological innovation.

As for the leadership type, a total of 8 models of $2 \times 2 \times 2$ were analyzed, including transformational leadership and transactional leadership, technological innovation and market orientation and perceived financial performance and non-financial performance.

Table 9 shows the result of analyzing the moderating effects of transformational leadership on the relationship between technological innovation and perceived financial performance. The moderating effect of transformational leadership ($F = 1.923$, $p < 0.05$) was significant when technological innovation affected the perceived financial performance.

Table 10 shows the result of analyzing the moderating effects of transformational leadership on the relationship between technological innovation and non-financial performance. The moderating effect of transformational leadership ($F = 2.997$, $p < 0.001$) was significant when technological innovation affected non-financial performance.

Table 9. Moderating effects of transformational leadership on the relationship between technological innovation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1372.562	1	1372.562	987.13	0.000
	Error	65.416	47.047	1.390 a		
Transformational leadership_group	Hypothesis	2.813	1	2.813	4.405	0.044
	Error	19.944	31.224	0.639 b		
Technological innovation	Hypothesis	76.596	35	2.188	2.983	0.005
	Error	15.535	21.178	0.734 c		
Transformational leadership_group * Technological innovation	Hypothesis	14.618	19	0.769	1.923	0.012
	Error	143.252	358	0.400 d		

(*: the interaction effect between variables).

Table 10. Moderating effects of transformational leadership on the relationship between technological innovation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1520.648	1	1520.648	1442.061	0.000
	Error	48.361	45.861	1.054 a		
Transformational leadership_group	Hypothesis	12.596	1	12.596	21.073	0.000
	Error	15.857	26.527	0.598 b		
Technological innovation	Hypothesis	58.835	35	1.681	2.298	0.025
	Error	14.913	20.384	0.732 c		
Transformational leadership_group * Technological innovation	Hypothesis	14.860	19	0.782	2.997	0.000
	Error	93.428	358	0.261 d		

(*: the interaction effect between variables).

Table 11 shows the result of analyzing the moderating effects of transactional leadership on the relationship between technological innovation and perceived financial performance.

In the case of transactional leadership, the moderating effect of transactional leadership ($F = 1.629$, $p < 0.05$) was significant when technological innovation affected the perceived financial performance.

Table 11. Moderating effects of transactional leadership on the relationship between technological innovation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1411.549	1	1411.549	1028.167	0.000
	Error	64.543	47.013	1.373 a		
Transactional leadership_group	Hypothesis	6.030	1	6.030	11.055	0.002
	Error	20.828	38.187	0.545 b		
Technological innovation	Hypothesis	76.259	35	2.179	3.661	0.000
	Error	15.642	26.283	0.595 c		
Transactional leadership_group * Technological innovation	Hypothesis	13.336	21	0.635	1.629	0.041
	Error	138.763	356	0.390 d		

(*: the interaction effect between variables).

Table 12 shows the results of analyzing the moderating effects of transactional leadership on the relationship between technological innovation and non-financial performance. The moderating effect of transactional leadership ($F = 1.912$, $p < 0.05$) was also significant when technological innovation affected the non-financial performance.

Table 12. Moderating effects of transactional leadership on the relationship between technological innovation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1555.053	1	1555.053	1363.979	0.000
	Error	51.000	44.734	1.140 a		
Transactional leadership_group	Hypothesis	13.017	1	13.017	31.146	0.000
	Error	14.782	35.368	0.418 b		
Technological innovation	Hypothesis	64.947	35	1.856	3.974	0.000
	Error	11.891	25.468	0.467 c		
Transactional leadership_group * Technological innovation	Hypothesis	10.629	21	0.506	1.912	0.010
	Error	94.260	356	0.265 d		

(*: the interaction effect between variables).

As a result of this analysis, Hypotheses 4.1, 4.2, 5.1 and 5.2, stating that transformational or transactional leadership would control the effect of technological innovation on perceived financial or non-financial performance, were all supported.

The following is the analysis of the moderating effect of leadership on market orientation. This study examined the moderating effect of leadership on market orientation to analyze the significance of the interaction between market orientation and leadership.

Table 13 shows the result of analyzing the moderating effects of transformational leadership on the relationship between market orientation and perceived financial performance. The moderating effect of transformational leadership ($F = 1.433$, $p > 0.05$) was not significant when market orientation affected the perceived financial performance.

Table 14 shows the results of analyzing the moderating effects of transformational leadership on the relationship between market orientation and non-financial performance. The moderating effect of transformational leadership ($F = 1.797$, $p < 0.05$) was significant when market orientation affected the non-financial performance.

Table 13. Moderating effects of transformational leadership on the relationship between market orientation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1440.556	1	1440.556	1520.094	0.000
	Error	66.377	70.042	0.948 a		
Transformational leadership_group	Hypothesis	14.760	1	14.760	23.717	0.000
	Error	27.919	44.860	0.622 b		
Market Orientaton	Hypothesis	54.361	42	1.294	1.913	0.038
	Error	18.572	27.448	0.677 c		
Transformational leadership_group * Market Orientation	Hypothesis	16.696	24	0.696	1.433	0.088
	Error	167.969	346	0.485 d		

(*: the interaction effect between variables).

Table 14. Moderating effects of transformational leadership on the relationship between market orientation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1572.796	1	1572.796	1778.503	0.000
	Error	52.890	59.807	0.884 a		
Transformational leadership_group	Hypothesis	21.272	1	21.272	44.294	0.000
	Error	19.302	40.193	0.480 b		
Market Orientaton	Hypothesis	55.052	42	1.311	2.404	0.009
	Error	14.576	26.733	0.545 c		
Transformational leadership_group * Market Orientation	Hypothesis	13.635	24	0.568	1.797	0.013
	Error	109.392	346	0.316 d		

(*: the interaction effect between variables).

Table 15 shows the results of analyzing the moderating effects of transactional leadership on the relationship between market orientation and perceived financial performance. The moderating effect of transactional leadership ($F = 1.020$, $p > 0.05$) was not significant when market orientation affected the perceived financial performance.

Table 15. Moderating effects of transactional leadership on the relationship between market orientation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1518.982	1	1518.982	1610.649	0.000
	Error	64.456	68.346	0.943 a		
Transactional leadership_group	Hypothesis	17.836	1	17.836	36.595	0.000
	Error	28.004	57.457	0.487 b		
Market Orientation	Hypothesis	54.204	42	1.291	2.638	0.002
	Error	17.717	36.222	0.489 c		
Transactional leadership_group * Market Orientation	Hypothesis	13.242	27	0.490	1.020	0.441
	Error	164.998	343	0.481 d		

(*: the interaction effect between variables).

Table 16 shows the results of analyzing the moderating effects of transactional leadership on the relationship between market orientation and non-financial performance. The moderating effect of transactional leadership ($F = 1.422$, $p > 0.05$) was not significant when market orientation affected the non-financial performance.

In Tables 9–16, where a, b, c and d in the “Mean Square” column represent the error delimiter provided after analysis by the Statistical Package for Social Science (SPSS). The delimiter mark is for each model classification.

As a result of this analysis, only Hypothesis 6.2, stating that transformational leadership would control the effect of market orientation on perceived financial and non-financial performance, was supported, while the remaining Hypotheses (6.1, 7.1 and 7.2) were rejected.

Table 16. Moderating effects of transactional leadership on the relationship between market orientation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1589.871	1	1589.871	1632.817	0.000
	Error	55.738	57.243	0.974 a		
Transactional leadership_group	Hypothesis	15.136	1	15.136	37.394	0.000
	Error	19.394	47.912	0.405 b		
Market Orientation	Hypothesis	61.322	42	1.460	3.401	0.000
	Error	14.379	33.491	0.429 c		
Transactional leadership_group * Market Orientation	Hypothesis	12.094	27	0.448	1.422	0.083
	Error	108.054	343	0.315 d		

(*: the interaction effect between variables).

This research analyzes the moderating effects of transformational leadership and transactional leadership between market orientation and technological innovation and corporate perceived financial and non-financial performance. In the relation between technological innovation and corporate performance, both transformational leadership and transactional leadership had positive effects on the perceived financial and non-financial performance. For market orientation and corporate performance, only transformational leadership had moderating effects between market orientation and non-financial performance.

In order for technological innovation to achieve corporate performance, the result indicates that not only did transactional leadership give clear compensation for performance, but transformational leadership focusing on creating creativity for members also had a moderating effect. However, when market orientation affected corporate performance, only transformational leadership had a positive effect on the moderating effect with non-financial performance. Therefore, the moderating effect of leadership is weaker than that of technological innovation. These results suggest that leadership plays a greater role in technological innovation than market orientation and that transformational leadership can exert a greater effect than transactional leadership. Transformational leadership has a moderating effect on the process of market orientation affecting non-financial performance. It depicts the importance of transformational leadership in determining non-financial performance.

Transformational leadership has a positive effect on the satisfaction level of the leader, the effectiveness of leadership and organizational performance. These influences tend to acknowledge that it is greater than the effect of transactional leadership [92–96,134]. These studies have also demonstrated the moderating effects between technological innovation, market orientation and corporate performance.

4.2.3. The Moderating Effect of Innovation Activities

This research analyzes the moderating effect of innovation activities when market orientation and technological innovation affect corporate performance.

As for the innovation activity types, a total of 8 models of $2 \times 2 \times 2$ were analyzed, including exploration and exploitation, technological innovation and market orientation and perceived financial performance and non-financial performance.

Table 17 shows the result of analyzing the moderating effects of exploration on the relationship between technological innovation and perceived financial performance. When technological innovation affected perceived financial performance, the moderating effect of exploration ($F = 1.6023$, $p > 0.05$) was insignificant.

Table 17. Moderating effects of exploration on the relationship between technological innovation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1310.781	1	1310.781	1059.944	0.000
	Error	61.126	49.429	1.237 a		
Exploration_group	Hypothesis	2.854	1	2.854	5.196	0.029
	Error	18.325	33.364	0.549 b		
Technological innovation	Hypothesis	69.050	35	1.973	3.180	0.004
	Error	12.066	19.449	0.620 c		
Exploration_group * Technological innovation	Hypothesis	10.960	17	0.645	1.602	0.061
	Error	144.924	360	0.403 d		

(*: the interaction effect between variables).

Table 18 shows the results of analyzing the moderating effects of exploration on the relationship between technological innovation and non-financial performance. The moderating effect of exploration activity when technological innovation affected non-financial performance ($F = 2.005$, $p < 0.01$) was found to be significant.

Table 18. Moderating effects of exploration on the relationship between technological innovation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1453.689	1	1453.689	1375.153	0.000
	Error	49.133	46.479	1.057 a		
Exploration_group	Hypothesis	7.297	1	7.297	16.212	0.000
	Error	13.358	29.678	0.450 b		
Technological innovation	Hypothesis	60.903	35	1.740	3.266	0.004
	Error	10.091	18.943	0.533 c		
Exploration_group * Technological innovation	Hypothesis	9.536	17	0.561	2.005	0.010
	Error	100.704	360	0.280 d		

(*: the interaction effect between variables).

Table 19 shows the result of analyzing the moderating effects of exploitation on the relationship between technological innovation and perceived financial performance. When technological innovation affected perceived financial performance, the moderating effect of exploitation ($F = 1.012$, $p > 0.05$) was insignificant.

Table 19. Moderating effects of exploitation on the relationship between technological innovation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1248.607	1	1248.607	778.906	0.000
	Error	72.363	45.141	1.603 a		
Exploitation_group	Hypothesis	6.754	1	6.754	16.550	0.000
	Error	29.811	73.047	0.408 b		
Technological innovation	Hypothesis	94.052	35	2.687	6.562	0.000
	Error	14.425	35.227	0.409 c		
Exploitation_group * Technological innovation	Hypothesis	11.073	27	0.410	1.012	0.451
	Error	141.808	350	0.405 d		

(*: the interaction effect between variables).

Table 20 shows the results of analyzing the moderating effects of exploitation on the relationship between technological innovation and non-financial performance. When technological innovation affected non-financial performance, the moderating effect of exploitation ($F = 1.664$, $p < 0.05$) was significant.

Table 20. Moderating effects of exploitation on the relationship between technological innovation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1393.565	1	1393.565	901.744	0.000
	Error	65.597	42.447	1.545 a		
Exploitation_group	Hypothesis	7.457	1	7.457	18.812	0.000
	Error	20.999	52.971	0.396 b		
Technological innovation	Hypothesis	93.539	35	2.673	5.952	0.000
	Error	14.318	31.889	0.449 c		
Exploitation_group * Technological innovation	Hypothesis	12.767	27	0.473	1.664	0.022
	Error	99.489	350	0.284 d		

(*: the interaction effect between variables).

Therefore, when technological innovation affects corporate performance, the moderating effect of innovation activities on corporate performance was found only for non-financial performance, regardless of the type. As a result of this analysis, among the hypotheses that exploration and exploitation has a moderating effect on the relationship between technological innovation and perceived financial and non-financial performance, Hypotheses 8.2 and 9.2, stating that exploration and exploitation has a moderating effect on the relationship between technological innovation and non-financial performance, are supported, and the rest (Hypotheses 8.1 and 9.1) are rejected.

The following is the analysis of the moderating effect of innovation activity on market orientation. If the interaction term is significant in the analysis results, it can be interpreted that there is a moderating effect of innovation activity on market orientation.

Table 21 shows the results of analyzing the moderating effects of exploration on the relationship between market orientation and perceived financial performance. When market orientation affected the perceived financial performance, the moderating effect of exploration ($F = 1.118$, $p > 0.05$) was not significant.

Table 21. Moderating effects of exploration on the relationship between market orientation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1484.226	1	1484.226	1729.406	0.000
	Error	64.858	75.572	0.858 a		
Exploration_group	Hypothesis	19.926	1	19.926	38.700	0.000
	Error	29.142	56.601	0.515 b		
Market Orientation	Hypothesis	49.507	42	1.179	2.219	0.014
	Error	15.193	28.599	0.531 c		
Exploration_group * Market Orientation	Hypothesis	12.876	24	0.537	1.118	0.321
	Error	166.014	346	0.480 d		

(*: the interaction effect between variables).

Table 22 shows the results of analyzing the moderating effects of exploration on the relationship between market orientation and non-financial performance. When market orientation affected non-financial performance, the moderating effect of exploration ($F = 2.057$, $p < 0.05$) was significant.

Table 22. Moderating effects of exploration on the relationship between market orientation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1577.389	1	1577.389	1954.743	0.000
	Error	51.418	63.719	0.807 a		
Exploration_group	Hypothesis	19.413	1	19.413	37.528	0.000
	Error	20.852	40.310	0.517 b		
Market Orientation	Hypothesis	50.877	42	1.211	1.977	0.033
	Error	16.207	26.455	0.613 c		
Exploration_group * Market Orientation	Hypothesis	15.443	24	0.643	2.057	0.003
	Error	108.250	346	0.313 d		

(*: the interaction effect between variables).

Table 23 shows the results of analyzing the moderating effects of exploitation on the relationship between market orientation and perceived financial performance. When market orientation affected perceived financial performance, the moderating effect of exploitation ($F = 1.446$, $p > 0.05$) was not significant.

Table 24 shows the results of analyzing the moderating effects of exploitation on the relationship between market orientation and non-financial performance. When market orientation affected non-financial performance, the moderating effect of exploitation ($F = 1.255$, $p > 0.05$) was not significant. In Tables 17–24, a, b, c and d in the Mean Square column are the error delimiters provided after analysis by SPSS. The delimiter mark is for each model classification.

Table 23. Moderating effects of exploitation on the relationship between market orientation and perceived financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1541.930	1	1541.930	1134.644	0.000
	Error	82.267	60.537	1.359 a		
Exploitation_group	Hypothesis	7.346	1	7.346	12.088	0.001
	Error	32.739	53.874	0.608 b		
Market Orientation	Hypothesis	89.682	42	2.135	3.221	0.000
	Error	21.592	32.571	0.663 c		
Exploitation_group * Market Orientation	Hypothesis	19.166	28	0.684	1.446	0.071
	Error	161.944	342	0.474 d		

(*: the interaction effect between variables).

The moderating effect of the exploitation on both the perceived financial and non-financial performance was not significant. As a result of this analysis, only Hypothesis 10.2, stating that exploration has a moderating effect on the relationship between market orientation and non-financial performance, were supported, while the remaining hypotheses (10.1, 11.1 and 11.2) are rejected.

Table 24. Moderating effects of exploitation on the relationship between market orientation and non-financial performance.

Source		Third Type Sum of Squares	Degree of Freedom	Mean Square	F	Significant Probability
Intercept	Hypothesis	1662.486	1	1662.486	1233.597	0.000
	Error	73.361	54.435	1.348 a		
Exploitation_group	Hypothesis	7.673	1	7.673	19.149	0.000
	Error	23.393	58.382	0.401 b		
Market Orientation	Hypothesis	93.906	42	2.236	5.277	0.000
	Error	14.106	33.293	0.424 c		
Exploitation_group * Market Orientation	Hypothesis	12.115	28	0.433	1.255	0.179
	Error	117.936	342	0.345 d		

(*: the interaction effect between variables).

Through these experiments, this study analyzed the moderating effect of exploitation and exploration between market orientation and technological innovation and corporate perceived financial and non-financial performance. Therefore, when technological innovation affects corporate performance, the moderating effect of innovation activity on corporate performance was only moderated for non-financial performance in both exploitation and exploration. Additionally, when market orientation affects corporate performance, the moderating effect of exploration was only on non-financial performance, and the moderating effect of exploitation was not significant for either perceived financial performance or non-financial performance.

One of the prior pieces of research argues that exploration has a positive (+) effect on product innovation and exploitation on product and process innovation [105]. The other study demonstrates that there is a significant and positive relation between ambivalence and organizational performance, and both exploration and exploitation have a positive effect on organizational performance [132]. Compared with the previous research, this study

expanded the range of research on the role of exploitation and exploration as a moderating effect between technological innovation, market orientation and corporate performance.

5. Discussion

In a rapidly changing global competitive environment, technological innovation becomes an essential business strategy. Technological innovation is indispensable to success in various business fields such as finance, service, IoT and pharmaceuticals. Although numerous research works on technological innovation have been conducted, many of them are limited to specific industries and mainly consist of fragmentary studies separated from other factors aside from technological innovation. Some studies analyzed each influence within process innovation, product innovation, organizational innovation and marketing innovation as defined by Oslo Manual [18], but it is difficult to find a study analyzing other factors for corporate management together.

This study attempts to expand the range of analysis to identify whether technological innovation succeeds in any industries and which factors in a company can increase the level of success. Accordingly, this study analyzes the relation between market orientation and technological innovation to determine whether customers and markets are properly understood and reflected. Then, it analyzes how the leadership of entrepreneurs and exploitation and exploration have a moderating effect when market orientation and technological innovation affect corporate performance.

The analysis results are as follows.

Both technological innovation and market orientation have a positive (+) effect on corporate performance (perceived financial performance and non-financial performance), and in this case, technological innovation has a partial mediating effect when market orientation affects corporate perceived financial and non-financial performance. When technological innovation affects corporate performance, transformational leadership and transactional leadership have a moderating effect on both perceived financial and non-financial performance, but the exploitation and exploration of innovation activity has a moderating effect only on non-financial performance. When market orientation affects corporate performance, transformational leadership and exploration of innovative activities have a moderating effect only on non-financial performance.

This study has the following significance for the introduction of technological innovation in actual companies.

From the academic perspective, first, this study is of significance in proving the mediating effect of technological innovation on market orientation, and corporate performance appears in diverse industries, ranging from manufacturing to information communication and finance, in comparison with prior studies that examined the effects in the companies in a specific industry. Second, the novelty of our study lies in bringing in leadership in the market orientation–innovation–performance model in order to explore the practical success factors of technological innovation.

The practical implications of the study findings are as follows. First, the corporate leaders and policy makers should consider the role of customer-based marketing activities or the market orientation in successful technological innovation. Companies practicing market orientation prove more effective in technological innovation than those pursuing technological innovation only. By discovering the way to increase the performance of a company, this study provides the direction of the government toward corporate support as well as the direction of company operation. Second, corporate leaders should exercise both transformational leadership and transactional leadership for successful introduction of technological innovation. Our findings examined how leaders exercising their leadership impacts technological innovation and found that transactional as well as transformational leadership contribute to the perceived financial performance of the company. Transactional leadership is effective in presenting specific performance goals and rewarding those who achieved them. Concurrently, transformational leadership serves boosting creativity by understanding and motivating individual members. Furthermore, transformational lead-

ership was found to have a moderating effect even when market orientation influenced non-financial performance, proving the significance of the application of transformational leadership in companies once again. The final contribution of our study to the practice is that decision makers should invest both in exploitation and exploration, since these two types of activities moderate the relationship between market orientation and corporate performance. Specifically, these two types of activities moderate the impact of technological innovation on the non-financial performance of the companies. When examining the link between market orientation and corporate performance, exploration activities were found to be significant in their moderating effects. Exploitation, however, showed insignificance in their moderating roles in the relationship between market orientation and perceived financial and non-financial performance. We concluded that both exploitation and exploration are essential but exploration, having risk-taking and being experimental in nature, becomes more critical to corporate performance.

Despite the academic and practical implications of our study, we also recognize the following limitations and future research agenda as follows. First, this study is a cross-sectional study that analyzed the state of a company at one point in time. If longitudinal research is conducted, more practical approaches are feasible, considering the time when variables such as market orientation and leadership affect business performance. Second, this research reviewed leadership and exploitation and exploration as a moderating effect among various company operation strategies available for our consideration. By analyzing the relation between these strategies and corporate innovation, effective measures that contribute to the corporate performance of technological innovation can be discovered. Third, this study analyzed variables across all industries. If future research analyzes whether there are any differences by industry, such as ICT vs. healthcare, it will help to find areas that need to be focused on in the business operation in a particular industry.

We call for scholars' attention to overcome these limitations in future research, which is expected to contribute to the mechanism and boundary conditions under which technological innovation leads to corporate performance in the business field.

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