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Innovation Activities and the Business Performance of Small and Medium Manufacturing Companies - Moderating Effects of Organizational and Network Characteristics

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Abstract

Background/Objectives: Management innovation in manufacturing companies is becoming more and more important to secure competitiveness in rapidly changing technical environment and the diversifying expectations of customers. The purpose of this study is to empirically examine the relationship between management innovation and business performance, and especially, the moderating effect of organizational and network characteristics between them. **Methods/Statistical Analysis**: This study established a research model through existing literature reviews and empirically verified the research model through a field survey. It explored the relationship between the 4 areas of management innovation-system, product, process, and human resource-and the 2 factors of business performance-customer satisfaction and financial performance. To determine the moderating effect of organizational characteristics which have over the influence of management innovation on business performance, the level of formalization, centralization, and networking characteristics was considered. For the data analysis, a multivariate analysis has been performed using a statistical analysis tool. **Findings:** Management innovation was shown to have a significant positive effect on management performance, while organizational characteristics and network characteristics had a moderating effect. The organization's formalization level especially had a significant moderating effect in the relationship of "system innovation and customer satisfaction", and "product, process innovation and financial performance", while the centralization level had a marginally moderating effect. Furthermore, the level of internal and external network of an organization had a moderating effect on system, process innovation and customer satisfaction performance. This study corresponds to previous research, which has found that management innovation has a positive effect on business performance. In addition to that, this study provides useful findings how each organizational characteristics have over the influence of each innovation activities on business performance. **Application/Improvements:** The findings of this study imply that when a company tries to induce management innovation, it should consider the organization and network characteristics to maximize the result of innovation. On the other hand, a company should try to set up the appropriate organizational and network environment prior to the management innovation.

Keywords: Business Performance, Centralization, Formalization, Management Innovation, Network Characteristics, Organizational Characteristics

1. Introduction

The latest economic environment is becoming more complex due to globalization and is fueled by intense competition among companies. Due to the rapid development of technology, the desires and expectations of customers are increasing and diversifying. Therefore, management innovation has become an important factor for small and medium manufacturing companies to secure competitiveness in the rapidly changing economic environment.

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Management Innovation involves the application of new or improved ideas in quality management activities to the system, product, and process, which can then be traced in a company's performance[1].

Although the management innovation is known to have positive effects on business performance, it varies by the moderating factors such as organizational characteristics, type of leadership, internal resource, and environmental characteristics. For example, management innovation activity increased a company's performance when product innovation and process innovation are continuously carried out in accordance with a company's characteristics and through voluntary innovation acceptance and participation[2]. The purpose of this study is to investigate and analyze how the influence of management innovation on business performance differs depending on the type or degree of an organization's formalizations, centralization, and networking activation. It is anticipated that such a study can help companies innovate successfully by considering such environmental factors as organizational characteristics.

2. Theoretical Background

2.1 Management Innovation

The term "management innovation," which is an important factor for the continuous growth of a company and securing competitiveness, was first used by Schumpeter. According to his employment of the term, innovation occurs as product, technology, and organization newly changed[3]. Management innovation refers to the activities that people plan and implement by applying new ideas or methods to existing plans to achieve an organization's purpose[4]. They are activities that occur in managerial components that influence the social system of the organization[5].

Types of management innovation include new management systems, management process, human resource development, and technology innovation[6]. System innovation, which falls under management innovation, refers to showing key company performance – including cost, quality, and service – by discarding the conventional methods and thought on management systems and changing enterprise-wide management systems[7]. Product innovation is defined as development of a new product or service in accordance with consumer requests for securing continuous competitive advantages or the significant improvement of existing products or services[8]. Process innovation, in turn, refers to improving existing processes by changing a system that produces the product, or accepting a new technique that can improve the equivalent process[9]. Human resources innovation denotes introducing and carrying out new ideas in order to affect changes needed for the improvement of how organizations think, take action, value assets, and increase job performance[10].

2.2 Effect of Management Innovation on Business Performance

According to previous studies, management innovation experienced positive results such as improved competitiveness, customer satisfaction, and financial performance[11,12]. In the quantitative study from 44 articles, the results indicated that management innovation positively affects firm performance, the direction and strength of the effect of management innovation on performance does not differ from that of technological innovation, and industrial sector moderates the management innovation-performance relationship[13].

When a company simplifies manpower and organizational characteristics and innovates business procedures with a focus on the system, it can increase business performance[14]. Park showed that performance of management innovation, which secures competitiveness through the improvement of differentiated product and service quality as well as production efficiency through system innovation, contributes to business performance in case of a small and medium sized[15]. Process innovation contributed to business performance from a perspective that it increases efficiency through active process innovation[16]. Human resources innovation affects financial performance according to the degree of the organization's training, information sharing, and job security[17]. The performance of product innovation affects the performance of system innovation, and this is an important factor that affects performance of market competition[18].

2.3 Moderating Factors of Management Innovation and Business Performance

The effects of management innovation vary by the internal and external factors. In order to carry out management innovation efficiently, the level of the CEO's innovation should be high; the CEO's leadership should be transactional; the management strategy should be of an innovation leading-type; management innovation should

be conducted efficiently as competition crises caused by the internal environment increase; and technology innovation and product innovation should be carried out actively as competition crises caused by the external environment increase[19].

While a number of studies exist on organizational characteristics and business performance[20,21], not many investigate the moderating effects of management innovation and business performance in organizational characteristics. In general, the organizational characteristics are defined as the level of formalization, centralization, complexity, and the governance structure[22,23]. Other variables were also applied for the purpose of specific study such as management-level support or change capacity24, strategic direction and HRM system characteristics25, organization culture26, and network dynamics[27,28].

Although organizational characteristics are not reflected directly in business performance, the management environment affects organizational characteristics, and organizational characteristics and management control systems affect performance[21]. Moreover, management innovation affects a company's performance, and network organization has a moderating effect when it leads from management innovation to management performance29. Financial performance by technology innovation and technology performance has more positive effects on a company that has a lower degree of internal network organization activity than a company that has a higher degree thereof[30].

3. Research Model and Hypothesis

3.1 Research Model

Through empirical analysis, the present study examined the effects of management innovation on business performance as a moderating effect of organizational characteristics by targeting small and medium manufacturing. It explores the relationship between the factors of management innovation – system innovation, product innovation, process innovation, and human resources innovation. It also explores their relationship with financial performance, quality performance, and customer satisfaction, as well as the relationship between business performance and moderating variables, such as centralization and decentralization in organizational characteristics. This is shown in the form of the research model in Figure 1.

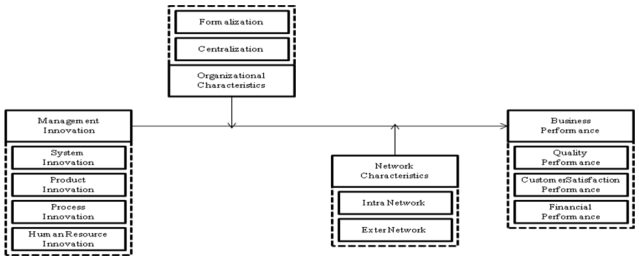

Figure 1. Research model.

3.2 Hypothesis Setting

3.2.1 Hypothesis for Management Innovation and Business Performance

Previous research shows that management innovation has a positive effect on the business performance. Management innovation influences positive results on the profitability of a company, the enhancement of the image of an organization, and symbolic profits[11–13].

Management innovation, which secures competitiveness through the improvement of differentiated product and service quality as well as production efficiency through system innovation, contributes to business performance[15]. Process innovation contributed to business performance from a perspective that it increases efficiency through active process innovation[16]. The performance of product innovation affects the performance of market competition[10]. Human resources innovation affects financial performance according to the degree of the organization's training, information sharing, and job security[14,17]. Accordingly, the present study established the hypothesis for each reciprocal relationship for the effects of management innovation and business performance.

H1: Management innovation will have a significant positive (+) effect on business performance.

1-1 System innovation will have a significant positive (+) effect on business performance.

1-2 Product innovation will have a significant positive (+) effect on business performance.

1-3 Process innovation will have a significant positive (+) effect on business performance.

1-4 Human resources innovation will have a significant positive (+) effect on business performance.

In previous study, organizational characteristics were found to add meaning to human business performance. Regarding successful management innovation for small and medium sized companies, business performance is expected to vary according to the organizational

characteristics. For example, the highly formalized and centralized companies can lead their management innovation very officially and intensively, and as a result, they may enjoy higher business performance than those of low level of formalization and centralization.

The organization characteristics are categorized by formalization and centralization, and the following hypotheses were established for the relationship of management innovation and business performance as a moderating relationship regarding organizational characteristics.

H2: The organization characteristics will play a moderating role in the relationship between management innovation and business performance.

2-1 In the system innovation and business performance, the organization characteristics will play a moderating role.

2-2 In the product innovation and business performance, the organization characteristics will play a moderating role.

2-3 In the process innovation and business performance, the organization characteristics will play a moderating role.

2-4 In the Human resources innovation and business performance, the organization characteristics will play a moderating role.

Additionally, organizational network characteristic was found to add meaning to business performance. Smith et al. showed that the network characteristics have meaningful effects on the business performance[31]. The establishment of internal and external relationship may promote the management innovation. For example, the companies which have an active relationship between internal and external relationship can expand their progress and result of innovation very rapidly, and as a result, they may enjoy speedy business performance than those of low level of networking.

The network characteristics are categorized by internal networking and external networking, and the following hypotheses were established for the relationship of management innovation and business performance as a moderating relationship regarding networking characteristics.

H3: The networking characteristics will play a moderating role in the relationship between management innovation and business performance.

3-1 In the system innovation and business performance, the networking characteristics will play a moderating role.

3-2 In the product innovation and business performance, the networking characteristics will play a moderating role.

3-3 In the process innovation and business performance, the networking characteristics will play a moderating role.

3-4 In the Human resources innovation and business performance, the networking characteristics will play a moderating role.

4. Empirical Analysis

4.1 Data Collection and Sample Characteristics

The survey was conducted up to June 27, 2015, targeting domestic small and medium sized companies. To improve the collection rate, the survey was carried out by visits, emails and telephone, and a total of 1,500 cases were collected. Of these cases, there were 343 responses and the response rate was 22.8. Among respondents, companies with sales less than KRW1 billion accounted for 9.0%, those with less than KRW3 billion accounted for 19.5%, those with less than KRW5 billion accounted for 27.7%, those with less than KRW10 billion accounted for 14.6%, and those with more than KRW10 billion accounted for 29.2%. Companies with less than 20 employees accounted for 31.5%, those with 20~50 employees accounted for 25.0%, those with 51~100 accounted for 22.2%, those with 101~300 accounted for 13.7%, and those with more than 301 accounted for 7.6%.

Questionnaires on management innovation were measured using a 5-point scale. The organization characteristics, which have a moderating effect on business performance, were classified by formalization and subdivision. The 5-point scale was used to find out whether the internal network characteristics and external network characteristics have a moderating effect on business performance. The factors affecting the business performance were categorized into financial performance, quality performance, and customer satisfaction performance, which were measured using a 5-point scale.

4.2 Reliability and Validity Verification

The sub-factors of Management Innovation were measured by various questions. To measure the reliability of each question, Cronbach's alpha coefficient test was conducted, and internal consistency was verified. Regarding the results of analysis as shown in Table 2, Management

Table 1. Operational definition and variables

Factor		Variables		Source
Management Innovation	System Innovation	1	Customer complaint handling time	4–10, 29,30
		2	Customer demand coping time	
		3	Innovation of cost reduction	
		4	System improvement	
		5	Workflow system improvement	
	Product Innovation	6	Customer required product	
		7	New product	
		8	Improved product	
		9	Product innovation activity	
	Process Innovation	10	Handling customer suggestions	
		11	Improvement of production workflow	
		12	Reduction of defect cost	
		13	Workflow improvement activity	
	Human Resource Innovation	14	Company wide educational training	
		15	Application of new technology	
		16	Problem solving	
		17	Accepting customer complaints	
		18	Suggestion of activities	
Organizational Characteristics	Formalization	19	Documentation of rights and responsibilities	22,23
		20	Observance of rules	
		21	Division of work	
		22	Documentation	
		23	Standardization of work handling method	
	Centralization	24	Decision-making of the management team	
		25	Decision-making of the organization members	
		26	Decision-making of supervisor	
		27	Specialization of work	
		28	Business directive in advance	
Network Characteristics	Intra N/W Characteristics	29	Cooperation among organizations	27–30
		30	Information sharing among organizations	
		31	Problem solving among organizations	
		32	Consideration among organizations	
	External N/W Characteristics	33	Transfer of technology and exchange of information	
		34	Work transfer status	
		35	Cooperative relationship	
		36	Long-term business agreement	
Business Performance	Quality Performance	37	Improvement of quality standard	11–13,32,33
		38	Reduction of work flow defect rate	
		39	Reduction of rework	
		40	Shortening of production lead time	
	Customer Satisfaction Performance	41	Improvement of external reliability	
		42	Improvement of repurchase rate	
		43	Reduction of customer complaint	
		44	Increase of customers	
	Financial Performance	45	Improvement of sales	
		46	Improvement of profit	
		47	Extended market share	
		48	Improvement on the flow of funds	

Table 2. Reliability analysis of measured variables

Construct	Scales	Items	Cronbach's α
Management Innovation	System Innovation	5	0.926
	Product Innovation	3	0.902
	Workflow Innovation	4	0.912
	Human Resource Innovation	5	0.922
Organizational Characteristics	Formalization	5	0.867
	Centralization	5	0.918
N/W Characteristics	Internal N/W Characteristics	4	0.940
	External N/W Characteristics	7	0.917
Company Performance	Quality Performance	4	0.938
	Customer Satisfaction Performance	4	0.931
	Financial Performance	4	0.927

(*Product innovation's 6th customer request product was excluded after reliability test)

Innovation was found to be 0.926 as a factor of system innovation, product innovation was found to be 0.902, process innovation was 0.912, and Human Resources innovation was 0.922. As the factor of organization characteristics, the formalization was found to be 0.867 and centralization was 0.918. As the factor of network characteristics, the internal organization was found to be 0.940 and the external organization was 0.917. As the factor of business performance, the Financial Performance was found to be 0.927, the Quality performance was 0.938, and the customer satisfaction performance was 0.931. All satisfied the Cronbach's criteria of α>0.6 and as a result, the reliability of the measurement items was confirmed to be very high.

Moreover, Tables 3, 4, 5 illustrates the results of the analysis on validity of the measurement item. Factor loadings of all items in each construct are 0.646 (systems 5) or above. To be detail, among the factors of management innovation, factors of product innovation and process innovation were found to be tied. Internal networking and external networking were also found to be tied. Quality performance and customer satisfaction performance in terms of business performance were classified into the same property. The results demonstrate a convergent validity of the measurement items. Thus, it is appropriate to use the results of the survey as the research model.

4.3 Research Hypothesis Test and Research Results

4.3.1 Test of Hypothesis 1

The regression model was used to review <H1>: Management innovation will have a positive (+) effect on business performance.

System innovation and product and process innovation had a significant effect on quality and customer satisfaction performance. Product process innovation and human resources innovation were found to have a significant effect on financial performance. Both quality performance and customer satisfaction performance were found to have a significant effect on financial performance. This implies that system innovation and product process innovation among management innovation affect financial performance indirectly, although it has a direct effect on quality and customer satisfaction performance in terms of the company's business performance. We can, therefore, accept hypothesis 1.

4.3.2 Test of Hypothesis 2

To examine the <H2>, moderating effects of organizational characteristics, stepwise hierarchical regression analysis was conducted. In systems innovation, quality and customer satisfaction performance were affected by

Table 3. Validity analysis results-management innovation

	Component		
	1	2	3
Systems 1		0.838	
Systems 2		0.788	
Systems 3		0.754	
Systems 4		0.794	
Systems 5		0.646	
Product 2			0.849
Product 3			0.763
Product 4			0.709
Process 1			0.625
Process 2			0.824
Process 3			0.767
Process 4			0.772
Human Resources 1	0.760		
Human Resources 2	0.822		
Human Resources 3	0.840		
Human Resources 4	0.693		
Human Resources 5	0.841		
Eigenvalue	7.415	1.557	1.460
% of Variance	52.965	11.122	10.431

Extraction method: principal component analysis, Rotation method: Varimax with Kaiser Normalization
(Table displays rotated factor loadings, with values <0.5 suppressed)

Table 4. Validity analysis results-organizational and network characteristics

	Component		
	1	2	3
Formalization 1		0.792	
Formalization 2		0.764	
Formalization 3		0.818	
Formalization 4		0.797	
Formalization 5		0.787	
Centralization 1	0.863		
Centralization 2	0.795		
Centralization 3	0.885		
Centralization 4	0.867		
Centralization 5	0.845		
Internal organization 1			0.855
Internal organization 2			0.863
Internal organization 3			0.873
Internal organization 4			0.847
External organization 2			0.820
External organization 3			0.822
External organization 5			0.838
External organization 6			0.812
Eigenvalue	6.865	4.007	2.501
% of Variance	38.139	22.264	13.896

Table 5. Validity analysis results-business performance

	Component	
	1	2
Financial Performance 1		0.856
Financial Performance 2		0.911
Financial Performance 3		0.810
Financial Performance 4		0.848
Quality Performance 1	0.840	
Quality Performance 2	0.857	
Quality Performance 3	0.819	
Quality Performance 4	0.857	
Customer satisfaction 1	0.872	
Customer satisfaction 2	0.773	
Customer satisfaction 3	0.846	
Customer satisfaction 4	0.705	
Eigenvalue	5.216	1.380
% of Variance	65.206	17.253

Table 6. Results of regression analysis between management innovations and business performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Probability
		B	Standard Error	B		
Quality, Customer Satisfaction Performance	Systems	.237	.053	.237	4.487	.000
	Product, Process	.556	.050	.556	11.210	.000
	Human Resources	.067	.049	.067	1.368	.172
Financial Performance	Systems	-.040	.071	-.040	-.563	.574
	Product Process	.328	.067	.328	4.900	.000
	Human Resources	.312	.066	.312	4.715	.000

the degree of formalization and centralization. In product and process innovation, quality and customer satisfaction performance were significantly affected by the level of centralization. Furthermore, in product process innovation, the level of formalization had a significant effect on financial performance. However, it did not play any moderating role in human resources innovation. This implies that when the authority of the executive is strengthened and work manual and procedure are documented, quality and customer satisfaction performance improve in case of system innovation. It also indicates that when work is carried out by manual and procedure along with documentation, financial performance increases, and when the authority of the executive is strengthened, quality and customer satisfaction performance improve in case of product process innovation. We can, therefore, accept hypothesis 2 marginally.

4.3.2 Test of Hypothesis 3

To examine the <H3>, moderating effects of network characteristics, stepwise hierarchical regression analysis was conducted. In systems innovation, quality and customer satisfaction performance were affected by the degree of internal and external networking. In product and process innovation, quality and customer satisfaction

Table 7. Results of regression analysis considering organization characteristics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Probability
		B	Standard Error	B		
Quality, Customer satisfaction Performance	Systems	.563	.052	.563	10.782	.000
	Formalization	.236	.050	.236	4.668	.000
	Systems*Formalization	.047	.024	.090	1.961	.050
	Systems	.643	.042	.643	15.439	.000
	Centralization	-.164	0.43	-.164	-3.836	.000
	Systems*Centralization	.118	.045	.115	2.661	.008
	Product Process	.677	.044	.677	15.466	.000
	Formalization	.145	.045	.145	3.236	.001
	Product Process*Formalization	.006	.029	.008	.203	.839
	Product Process	.747	.036	.747	20.880	.000
	Centralization	-.116	.037	-.116	-3.109	.002
	Product Process*Centralization	.126	.034	.135	3.643	.000
Financial Performance	Product Process	.264	.054	.264	4.896	.000
	Formalization	.445	.055	.445	8.084	.000
	Product Process*Formalization	.097	.035	.127	2.746	.006
	Product Process	.489	.049	.489	10.012	.000
	Centralization	-.018	.051	-.018	-.361	.718
	Product Process*Centralization	.077	.047	.082	1.629	.104
	Human Resources	.229	.058	.229	3.956	.000
	Formalization	.443	.060	.443	7.422	.000
	Human Resources*Formalization	.050	.031	.077	1.608	.109
	Human Resources	.483	.050	.483	9.617	.000
	Centralization	-.022	.052	-.022	-.432	.666
	Human Resources*Centralization	.016	.051	.017	.317	.751

performance were significantly affected by the level of external networking. This means that in case of system innovation and product process innovation, quality and customer satisfaction performance can improve through cooperation between external and internal organization and information sharing. We can, therefore, accept hypothesis 3 marginally.

5. Conclusion

5.1 Summary and Implications

The present study examined the effect of system innovation, product innovation, process innovation, and human resource innovation on business performance, including quality performance, financial performance and customer satisfaction performance. Moreover, it explored whether formalization and centralization of organization characteristics along with internal and external network have a moderating effect. The results show that management innovation has a direct positive effect on business performance, and the organizational and network characteristics have a partially moderating effect between management innovation and business performance. The model depicting the results of research on the components of each construct is shown in Figure 2.

Table 8. Results of regression analysis considering network characteristics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Probability
		B	Standard Error	B		
Quality, Customer Satisfaction Performance	Systems	.393	.054	.393	7.338	.000
	Internal N/W	.452	.050	.452	.8958	.000
	Systems*Internal N/W	.046	.024	.082	1.956	.050
	Systems	.467	.048	.467	9.809	.000
	External N/W	.418	.045	.418	9.283	.000
	Systems*External N/W	.062	.022	.111	2.751	.006
	Product Process	.536	.043	.536	12.533	.000
	Internal N/W	.359	.043	.359	8.331	.000
	Product Process*Internal N/W	.037	.029	.043	1.279	.202
	Product process	.581	.045	.581	12.925	.000
	External N/W	.291	.045	.291	6.482	.000
	Product process*External N/W	.066	.027	.084	2.429	.016
Financial Performance	Product Process	.328	.061	.328	5.376	.000
	Internal N/W	.250	.062	.250	4.060	.000
	Product Process*Internal N/W	-.053	.041	-.063	-1.299	.195
	Product process	.340	.063	.340	5.430	.000
	External N/W	.220	.063	.220	3.517	.000
	Systems*External N/W	-.054	.038	-.068	-1.416	.158
	Human Resources	.320	.065	.320	4.947	.000
	Internal N/W	.272	.066	.272	4.111	.000
	Human Resources*Internal N/W	.040	.035	.059	1.156	.249
	Human Resources	.347	.057	.347	6.050	.000
	External N/W	.272	.058	.278	4.662	.000
	Human Resources*External N/W	.039	.033	.058	1.165	.245

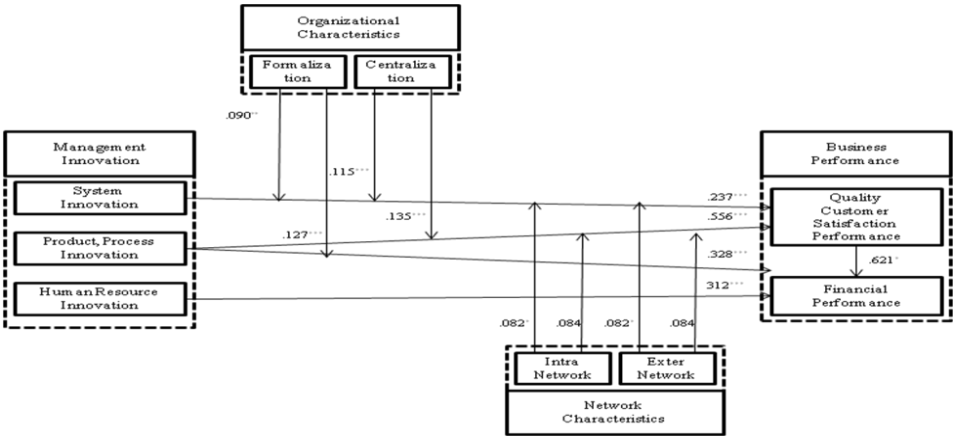

Figure 2. Results of the structural equation model.
***: P<0.01, **: p<0.05, *:p<0.1

First, the system innovation and product process innovation were found to have a direct effect on the quality and customer satisfaction performance. Human resources innovation was found to directly affect customer satisfaction performance. This means that when the manufacturing, service system, and production processes improve, the response time to customer needs is shortened and the customer proposition is quickly accepted and addressed. The level of product quality and service increases while the process defect rate and production lead time decrease. Furthermore, when the level of product quality and service increases with decreasing process failure rate, the revenue and profits will improve and the market share will constantly expand. This is because customer complaints reduce in number while re-purchase rate and foreign reliability increase. In an environment of international competition, rapid change of technology and increasing customers needs, small and medium manufacturing companies should continue management innovation to secure competitiveness and survival.

Second, the organizational and network characteristics were found to have a moderating effect on the business innovation. When the executive authority is strengthened, the responsibility and the authority of organization members are clarified and documented, and also the work procedure is standardized in the process of system innovation. The quality and customer satisfaction performance will therefore increase. Additionally, when the executive leads product process innovation with strong authority, the quality and customer satisfaction performance will increase. When the responsibility and authority of organization members are clarified and the corresponding manual procedure is fulfilled, documented and standardized, financial performance will increase. Furthermore, when the companies have an open and vivid intra- and external network environment, they can enjoy higher level of business performance than those of close and low level of networking. This means that when a company tries to induce management innovation, it should consider the organization and network status to maximize the result of innovation. On the other hand, a company should try to set up the organizational and network environment prior to the management innovation.

5.2 Limitations of Research and Directions for Future Research

Although this study provides meaningful implications for management innovation and business performance, it has some limitations and thus there should be further research. Firstly, although we considered the organizational and network characteristics as moderating values, others factors may also play an important role in explaining management innovation. Examples of such factors include the regulation environment[34], business model, company size, type of CEO leadership, organizational culture, and the dynamic capabilities or creativity of employees[35]. Secondly, the generalization of the results is limited by the context of small to medium manufacturing companies in Korea. The fact that all the data were from Korea presents a limitation on the external validity of our findings, since the companies in other countries or other business type may not necessarily resemble those in this study. These limitations and research issues remain for further exploration in future studies.

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