

Study on Innovation Activities in Taiwan Tourism Factories

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Abstract : This research was conducted from March to April 2017 using 59 effective questionnaires through a questionnaire survey method. Statistical methods were used to analyze the relationship among market orientation, leadership style, information technology involvement, operational strategy, degree of innovation activities and operational performance. Based on research findings, when execution degree of innovation activities is higher, it positively and significantly influences operational performance. Execution of differential strategy helps implementation of innovation activities. When firms have higher information technology involvement and market orientation, it significantly and positively influences execution of innovation activities. Execution degree of leadership style (task orientation, stable & conservative, consideration & support and innovation adaptation) significantly and positively influences execution of innovation activities. This study suggests that in order to reinforce operational performance, tourism factories can adopt appropriate leadership style and differentiation strategy by innovation activities and reinforce market orientation and information technology involvement to enhance operational performance.

Keywords: Innovation Activities, Operational Strategy, Leadership style, Operational Performance

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I. Introduction

The Industrial Development Bureau (IDB) of the Ministry of Economic Affairs (MOEA) in Taiwan defines the tourism factory as a manufacturing factory with tourism education or industrial culture value that provides products that factor in tourism. Because tourism and leisure has attracted more and more attention from the public, the conventional factories have transformed into tourism factories successively in recent years in order to get the preemptive opportunity in this tourism market. The establishment of the tourism factories has allowed the conventional industries to find a thread of hope who have successfully driven forward Taiwan's tourism. The number of tourists and tourism revenues of tourism factories that combine traditional manufacturing industry and tourism service industry have grown significantly in recent years. Many well-known enterprises in Taiwan have established tourism factories, which are new attractions to domestic and foreign visitors. However, people have a high demand on the service quality of tourism factories, Under intense competition, in order to enhance the competitiveness, tourism factories have strived to improve service quality and efficiency. How tourism factories select appropriate operational strategy and leadership style, as well as incorporate information technology involvement and market orientation in their innovative activities, are the key factors in providing better service quality and enhancing service efficiency. According to related studies, the more innovation activities are performed, the more the positive effect on operating performance (Orfila-Sintes&Mattsson, 2009 ; Hult et al., 2004, ; Barney, 2001) ; Market orientation degree significantly and positively influences the degree of execution of innovation activities (Grinstein, 2008; Kirca et. al., 2005; Im et al., 2008) . Different leadership style significantly and differently influence execution of innovation activities. (Bougrain& Haudeville,2002 ; Mayfield & Mayfield, 2004) ; Information technology involvement degree significantly and positively influences the degree of execution of innovation activities(Lee &Runge, 2001; Dibrell et al., 2008) ; Different types of operational strategy significantly and differently influence the execution of innovation activities (Ettlie,2000 ; Zahra &Bogner, 2000) . However, in empirical studies, few of them include market orientation, leadership style, information technology involvement and operational strategy in innovation activities to probe into their effect on operational performance. Hence, this study aims to investigate tourism factories guided by the IDB, MOEA as subjects and explores the relationship among market orientation, leadership style, information technology involvement, operational strategy, degree of innovation activities and operational performance. A questionnaire survey has been conducted on tourism factories guided by the IDB, MOEA. The research purposes are as follows: (1) to explore the market orientation execution effect on innovation activities; (2) to probe the leadership style effect on innovation activities; (3) to explore the information technology involvement effect on innovation activities; (4) to probe the operational strategy effect on innovation activities; (5) to explore the innovation activities' effect on operational performance.

II. Literature Review

2.1 Innovation activities

Robbins & Coulter (2005) defined innovation as the process to transform creativity into useful goods, services or work methods. Innovation activities can be classified by the following: (1) product innovation: product innovation means to introduce new products in the market (Betz, 2003); the measurement of innovation activities is based on specific goods (Kelm et al., 1995; Kochhar& David, 1996); (2) process innovation: Robbins & Coulter (2005), Johannessen&Dolva, (1994), Scott & Bruce, (1994) indicated that process innovation is the method to create or improve production, service or operation. It aims to measure innovation by a series of process; (3) product and process innovation: Kotler(2002), Sandvik&Sandvik, (2003) suggested that innovation activities should be defined by dual perspective, product and process; (4) multiple innovation: Robbins (2005), Moore(2004) suggested that innovation activities should not only focus on technical level and neglected managerial level, and argued that innovation activities should include technical innovation such as goods, process and facilities and managerial innovation such as system, policy, project and service. Tien et al. (2007) explored innovation activities by managerial innovation activities, technological innovation activities, market innovation activities and cultural innovation activities. According to classification of Tien et al. (2007), this study divides innovation activities into managerial innovation activities, technological innovation activities, market innovation activities and cultural innovation activities.

2.2 Market orientation and innovation activities

Narver and Slater (1990) divided market orientation into three dimensions, including customer orientation, competitor orientation and cross-department coordination. Kohli and Jaworski (1990) define market orientation in terms of three dimensions; (1) The generation of market information about needs of customers and external environmental factors; (2) The dissemination of such information among organisational functions and (3) The development and implementation of strategies in response to the information. Kohli and Jaworski (1990) explored market orientation by behavior dimensions. Hurley &Hult (1998) regard that although the market orientation can be explored from many different organizational dimensions, the cultural dimension is the most significant for the market orientation can only perform its functions properly when integrated into the organizational culture. This study treats customer orientation, competitor orientation and cross-department coordination proposed by Narver and Slater (1990) as the main dimensions of market orientation. Grinstein (2008) points out that the market orientation and innovation has a positive relationship. Liu et al. (2003) deem that the innovation activities of a more market-oriented organization has a high implementation degree. Low et al. (2007) indicated that market orientation positively influences innovation activities execution. Kirca et. al. (2005) and Im et al. (2008) point out that there is a positive relationship between the market orientation and innovation activities. Hurley &Hult (1998) point out that the market-oriented organization would adopt new concepts and action patterns in response to the market demands to promote the corporate innovation ability. Based on the literature review, this study proposes H1 : when the degree of market orientation is higher, it significantly and positively influences the degree of execution of innovation activities

2.3 Leadership style and innovation activities

Quinn (1988) classified leadership style into task orientation, stable & conservative, consideration & support and innovation adaptation leadership. Bass &Avolio (1990) classified leadership style into Transactional Leadership and Transformational Leadership. Hersey & Blanchard (1988) divided leadership style into information, promotion, participation and authorization. Leadership framework proposed by Quinn (1988) is based on new leadership theory and it matches the demand of industrial leadership style. Hence, this study treats task orientation, stable & conservative, consideration & support and innovation adaptation leadership proposed by Quinn(1988) as classification of leadership style. Shin & Zhou (2003) treated 290 employees and their supervisors in 46 companies in Korea as samples and demonstrated the positive correlation between Transformational Leadership and subordinates' innovation capacity. Mayfield & Mayfield (2004) indicated significantly positive correlation between leaders' encouragement and employees' innovative activities. By words of encouragement, leaders can effectively trigger employees' innovation capacity and fulfill organizational innovative activities. Based on Bougrain&Haudeville (2002), Transformational Leadership enhances execution of innovative activities. By Transformational Leadership, employees can treat old problems by new perspective in order to change their consciousness. It encourages employees to make more efforts to enhance innovation capacity of enterprises. Based on the previous literature review, this study proposes H2: different leadership style significantly and differently influence execution of innovation activities.

2.4 Information technology involvement and innovation activities

Roberts (1996) suggested that information technology means all kinds of software and hardware to acquire, apply, exhibit, save and communicate information. According to literature review, Li (2006) defined

information technology involvement as “resources and efforts of organizations to accomplish management function of information technology”. Upon the literature review (Miller & Doyle, 1987; Sohal et al., 2001; Sakaguchi & Dibrell, 1998; Li, 2006), this study divides information technology involvement into personnel cognition, investment in software and hardware and personnel training. Turban et al. (2001) indicated that information technology involvement can improve productivity and reinforce innovation capacity. Lee & Runge (2001) suggested that information technology involvement positively influences innovation activities. Based on Dibrell et al. (2008), there is positive correlation between information technology involvement and manufacturing innovation. Through literature review, this study proposes H3: when the degree of information technology involvement is higher, it significantly and positively influences the degree of execution of innovation activities.

2.5 Operational strategy and innovation activities

Croteau & Bergeron (2001) defined operational strategy as organizational action to accomplish the goals. Porter (1980) suggested that in order to obtain or maintain competitive advantages, enterprises can adopt cost leadership, differentiation strategy and focus strategy. Miles & Snow (1978) classified operational strategy into Prospector Strategy, Analyzer Strategy, Defender Strategy and Reactor Strategy. Durand & Coeurderoy (2001) divided operational strategy into cost leadership, marketing differentiation strategy and innovation differentiation strategy. This study treats cost leadership, marketing differentiation strategy and innovation differentiation strategy proposed by Durand & Coeurderoy (2001) as classification of operational strategy of tourism factories. Ettlé (2000) suggested that execution degree of innovative activities is associated with type of corporate strategies. According to Zahra & Bogner (2000), enterprises adopt different strategies and innovation performance is different. Veugelers & Cassiman (1999) indicated that when competitors have innovative activities, enterprise managers must construct appropriate operational strategy in order to enhance execution degree of innovative activities and respond to competitors' threats. Based on the previous literature review, this study proposes H4: different types of operational strategy significantly and differently influence execution of innovation activities.

2.6 Innovation activities and operational performance

Kirca et al. (2005) measured performance by total business performance, profit margin, sales volume and market share. Croteau & Bergeron (2001) measured performance by profit margin and growth of sales. Slater & Naver (2000) treated Return on Investment as index to measure performance. Shrader (2001) measured operational performance by profit margin and growth of sales. Farrell (2000) suggested that operational performance is relative performance of customer retention rate, new product success rate, growth of sales, Return on Investment and total performance, in comparison to colleagues. Based on related literature review and business characteristics of tourism factories, this study measures operational performance by accomplishment rate of operational goals, satisfaction with service quality, growth of incomes, old customers' revisit rate, reinforcement of service business efficiency, growth of number of tourists and competitive advantages of tourism factories. This study classifies innovation activities into managerial innovation activities, technological innovation activities, market innovation activities and cultural innovation activities. Orfila-Sintes & Mattsson (2009) and Hult et al. (2004) suggested that when execution degree of innovation activities is higher, it positively influences operational performance. From perspective of strategy, Barney (2001) explored sources for firms to maintain competitive advantages and suggested that firms can develop long-term and continuous competitive advantages by accumulation and cultivation of their resources. The key is their innovation activities. According to Tatikonda & Stock (2003), market innovation activities accomplish market goals and influence operational performance of enterprises. Cooper & Kleinschmidt (1996) found that completeness of pre-business directly influences effectiveness of innovation activities. Pre-business includes managerial innovation activities such as assessment, analysis and operation of techniques. Execution degree of managerial innovation activities influences operational performance of enterprises. Woodman et al. (1993) suggested that corporate culture and environmental factors will affect execution degree of cultural innovation activities which influences operational performance of enterprises. Based on the previous literature review, this study proposes H5: when the degree of execution of innovation activities is higher, it significantly and positively influences operational performance.

III. Research Method

3.1 Research hypotheses

According to literature review, this study develops hypotheses as follows:

H1: when the degree of market orientation is higher, it significantly and positively influences the degree of execution of innovation activities.

H2: different leadership style significantly and differently influence execution of innovation activities.

H3: when the degree of information technology involvement is higher, it significantly and positively influences the degree of execution of innovation activities.

H4: different types of operational strategy significantly and differently influence execution of innovation activities.

H5: when the degree of execution of innovation activities is higher, it significantly and positively influences operational performance.

3.2 Questionnaire collection and data analysis

The questionnaire in this study includes 6 sections. Sections 1–6 are measured using a Likert 5-point scale. Section 1 is degree of market orientation, including (1) customer orientation, (2) competitor orientation, (3) cross-department coordination. Section 2 includes leadership style, including (1) task orientation; (2) stable & conservative; (3) consideration & support; (4) innovation adaptation. Section 3 is degree of information technology involvement, including (1) personnel training; (2) investment in software and hardware; (3) personnel cognition. Section 4 includes types of operational strategy, including (1) cost leadership, (2) marketing differentiation and (3) innovation differentiation; Section 5 is the execution degree of innovation activities, including (1) technological innovation activities; (2) market innovation activities; (3) managerial innovation activities; (4) cultural innovation activities. Section 6 is operational performance. This study treats the accomplishment rate of operational goals, service quality satisfaction, growth of incomes, ratio of old customer revisits, enhancement of service business efficiency, growth of number of tourists and competitiveness of tourism factories as the indicators to measure operational performance. Research samples were 135 tourism factories evaluated and guided by the IDB, MOEA and data were collected using questionnaires. The respondents were supervisors in charge of tourism factory operations. From March to April, 2017, this study obtained 59 valid questionnaires by questionnaire survey. Cronbach's alpha was used for assessing the reliability of the questionnaire. Nunnally (1978) indicated that in an exploratory study, reliability reaching 0.7 is acceptable. Reliability of variables in this study is higher than 0.7. Hence, they are reliable. Reliability of variables in this study is shown in Table 1. This study analyses data by SPSS. The data analysis method was analysis of the variance (ANOVA).

3.3 Measurement of variables

Variables measured include market orientation, leadership style, information technology involvement, types of operational strategy, degree of execution of innovation activities and operational performance. Measurement of variables is shown as follows:

According to review of the related literature and with regard to business types of tourism factories, this study generalizes the market orientation execution items as follows: (1) Customer orientation: (a) systematically measure the customer satisfaction; (b) would take the customer satisfaction as the primary objective; (c) provide complete services; (d) keep the commitments to customers; (e) collect relevant information to master customer needs; (f) continuously provide services that can create value for customers. (2) Competitor orientation: (a) supervisors would discuss competitors' strengths and weaknesses on a regular basis; (b) utilize various channels to collect relevant information of competitors for the reference by all units; (c) make quick response to the activities of competitors; (d) continuously look for the target market (3) Cross-department coordination: (a) units exchange the relevant customer information with each other; (b) conduct interdepartmental integration based on the company's overall strategy; (c) supervisors would visit the important customers regularly; (d) resources could be shared among departments; (e) units play critical roles in the creation of customer value.

The measurement is based on a Likert 5-point scale, ranging from 5 (strongly agree) to 1 (strongly disagree).

3.4 Measurement of leadership style

This study treats task orientation, stable & conservative, consideration & support and innovation adaptation leadership style proposed by Quinn (1988) as classification of leadership style. Leadership style scale of this study is based on scale developed by Chou (2009) and is modified according to business characteristics of tourism factories. Items include the follows:

1. Task oriented leadership: (a) tourism factory supervisors clearly inform the employees of the corporate goals; (b) supervisors clearly designate specific jobs to employees; (c) supervisors instruct the employees by standardized procedure and properly correct them; (d) supervisors are certain about the priority and future direction; (e) supervisors are work performance oriented; (f) supervisors actively accomplish the expected corporate goals; (g) supervisors allow employees to pursue higher work results.

2. Stable & conservative: (a) supervisors pay attention to details in the documents; (b) supervisors usually examine the progress of the projects; (c) supervisors often analyze the situations of tourism factories and thus employees will know how to improve; (d) supervisors construct the measures to examine the performance; (e) supervisors maintain normal and stable corporate operation; (f) supervisors coordinate the projects by budgeting; (g) supervisors construct cross-departmental task team for important items.

3. Consideration & support: (a) supervisors are thoughtful for employees; (b) supervisors assist with employees' career planning; (c) supervisors deal with employees' questions by support; (d) supervisors allow employees to fully express their views and lead to common consensus; (e) supervisors encourage employees to participate in

decision making; (f) supervisors reinforce employees' cohesion to the company; (g) supervisors actively avoid employees' conflict.

4. Innovation adaptation: (a) supervisors solve the problems by creative methods; (b) supervisors clearly describe the corporate vision and continuously emphasize it; (c) supervisors have new attempt by new concept and procedure; (d) supervisors encourage employees to continuously improve their working methods; (e) supervisors try to maintain positive relationship with the management; (f) supervisors make efforts to express and promote the ideas to external world; (g) supervisors often interact with other companies and customers to maintain positive relationship.

The measurement is based on a Likert 5-point scale, ranging from 5 (strongly agree) to 1 (strongly disagree).

3.5 Measurement of information technology involvement

In this study, as to information technology involvement, according to literature review (Miller & Doyle, 1987; Sohal et al., 2001; Sakaguchi & Dibrell, 1998; Li, 2006), information technology involvement is classified into personnel cognition, investment in software and hardware and personnel training

1. Personnel training: employees receive sufficient information technology educational training, employees are familiar with information technology, sufficient professional information technology personnel and complete teaching materials of information system and manuals.

2. Investment in software and hardware: sufficient funds of information technology, sufficient software of information technology and sufficient hardware of information technology.

3. Personnel cognition: support for information technology involvement, common consensus of importance of information technology and employees' high acceptance of information technology.

The measurement is based on a Likert 5-point scale, ranging from 5 (strongly agree) to 1 (strongly disagree).

3.6 Measurement of operational strategy

This study treats cost leadership, marketing differentiation strategy and innovation differentiation strategy proposed by Durand & Coeurderoy (2001) as classification of operational strategy. Based on questionnaires of empirical studies of related scholars (Durand & Coeurderoy, 2001; Prajogo & Sohal, 2006; Lynch et al., 2000) and the business of tourism factories, we classify operational strategy as follows. (1) Cost leadership: (a) tourism factories invest in techniques or facilities which save cost; (b) service cost of tourism factories is controlled; (c) to lower cost by improved business; (d) to lower the cost in order to provide tourism service with lower prices, in comparison to other competitors. (2) Marketing differentiation strategy: (a) tourism factories provide more valuable services, in comparison to other competitors; (b) tourism factories provide service needed according to customers' different needs; (c) they provide services with higher quality and more features than competitors. (3) Innovation differentiation strategy: (a) it is difficult for competitors (colleagues) to imitate service provided by the tourism factory; (b) to provide better service than other competitors by re-designing tourism service; (c) to provide better service than other competitors by new techniques or methods. The measurement is based on a Likert 5-point scale, ranging from 5 (strongly agree) to 1 (strongly disagree).

3.7 Measurement of innovation activities

This study adopts classification of Tien et al. (2007) on innovation activities and according to related literature review, it divides innovative activities into 4 dimensions: managerial innovation activities, market innovation activities, technological innovation activities and cultural innovation activities. Items are as follows:

1. Managerial innovation activities: tourism factories train employees to use new technology or facility. Tourism factories improve business process to respond to customers' needs, tourism factories train employees to accept new business concept, tourism factories introduce new management system or business to enhance customer service.

2. Market innovation activities: according to customers' needs, tourism factories use new business method to enhance customer's satisfaction. Tourism factories change business process according to customers' needs to reinforce customer's satisfaction and tourism factories develop different kinds of services according to customers' needs to enhance customer's satisfaction.

3. Technological innovation activities: tourism factories develop new technique or service to enhance service quality or lower cost, tourism factories improve current technology or service to enhance service quality or lower cost, tourism factories introduce new technology or service to enhance service quality or lower cost.

4. Cultural innovation activities: tourism factories encourage employees to have innovative activities, they encourage employees to express opinions or propose suggestions, tourism factory supervisors discuss the method or technique to improve work with employees, tourism factory employees exchange learning and obtain the assistance needed.

The measurement is based on a Likert 5-point scale, ranging from 5 (strongly agree) to 1 (strongly disagree).

3.8 Measurement of operational performance

Based on related literature review and business characteristics of tourism factories, this study measures operational performance by accomplishment rate of operational goals, service quality satisfaction, growth of incomes, old customers' revisit rate, enhancement of service efficiency, growth of number of tourists and competitiveness of tourism factories. The measurement is based on a Likert 5-point scale, ranging from 5 (strongly agree) to 1 (strongly disagree).

IV. Results Analysis

4.1 Relationship between market orientation and innovation activities

This study divides market orientation degree (customer orientation, competitor orientation and cross-department coordination) into two groups (high and low). According to the means of innovation activities (managerial innovation, market innovation, technological innovative and cultural innovation) in two groups, the researcher tries to find if there is a significant difference ($P < .05$). ANOVA in the influence of market orientation on innovation activities is shown in Table 2. Research finding supports H1. The execution degrees of customer orientation, competitor orientation and cross-department coordination will significantly influence the degree of innovation activities.

4.2 Relationship between leadership style and innovative activities

This study divides the style of leadership (task orientation, stable & conservative, consideration & support and innovation adaptation.) into two groups (high and low executive degrees). According to the means of innovation activities (managerial innovation, market innovation, technological innovative and cultural innovation) in two groups, the researcher tries to find if there is a significant difference ($P < .05$). ANOVA in the influence of leadership style on innovation activities is shown in Table 3. The result supports H2. Based on figures, task orientation, stable & conservative, consideration & support and innovation adaptation leadership style significantly positively and differently influence execution of innovation activities.

4.3 Relationship between information technology involvement and innovation activities

This study divides information technology involvement degree (personnel training, investment in software and hardware and personnel cognition) into two groups (high and low). According to the means of innovation activities (managerial innovation, market innovation, technological innovative and cultural innovation) in two groups, the researcher tries to find if there is a significant difference ($P < .05$). ANOVA in the influence of information technology involvement on innovation activities is shown in Table 4. Research finding supports H3. The execution degrees of information technology involvement will significantly and positively influence the degree of innovation activities.

4.4 Relationship between operational strategy and degree of execution of innovation activities

This study classifies the types of operational strategies (cost leadership, marketing differentiation and innovation differentiation) into two groups (high and low executive degrees). According to the means of innovation activities (managerial innovation, market innovation, technological innovative and cultural innovation) in two groups, the researcher tries to find if there is a significant difference ($P < .05$). ANOVA in the influence of operational strategy on innovation activities is shown in Table 5. The result supports H4: different types of operational strategy significantly and differently influence execution of innovation activities. Marketing differentiation and innovation differentiation strategies significantly influence the degree of execution of innovation activities.

4.5 Relationship between innovation activities and operational performance

This study divides the implementation level of innovation activities (managerial innovation, market innovation, technological innovative and cultural innovation) into two groups (high and low). According to the means of operational performance in the two groups, the researcher tries to find if there is a significant difference ($P < .05$). ANOVA in the influence of innovation activities on operational performance is shown in Table 6. The result supports H5: when execution degree of innovation activities is higher, it significantly and positively influences operational performance.

V. Conclusion

How tourism factories make proper decisions to enhance their competitiveness is of great concern to

current enterprises. Few studies have included market orientation, information technology involvement, operational strategy and leadership style in innovation activities in the exploration of their effects on operational performance. This study used tourism factories in Taiwan as subjects to probe into the relationship among market orientation, information technology involvement, leadership style, types of operational strategies, degree of execution of innovation activities and operational performance. The first hypothesis stated that when the degree of market orientation is higher, it significantly and positively influences the degree of execution of innovation activities. Based on the results of the first hypothesis analysis, the execution degrees of customer orientation, competitor orientation and cross-department coordination will significantly influence the degree of innovation activities. This is consistent with the findings of Kirca et al. (2005) and Im et al. (2008). This study demonstrates that when market orientation is higher, the execution degree of innovation activities is positively influenced. The second hypothesis stated that different leadership style significantly and differently influence the execution of innovation activities. Based on the results of the second hypothesis analysis, task orientation, stable & conservative, consideration & support and innovation adaptation leadership style all significantly positively and differently influence execution degree of innovation activities. The third hypothesis stated that when the degree of information technology involvement is higher, it significantly and positively influences the degree of execution of innovation activities. Based on the results of the second hypothesis analysis, the degree of personnel training, investment in software and hardware and personnel cognition will significantly influence the degree of innovation activities. This is consistent with the findings of Dibrell et al. (2008) and Lee & Runge (2001). The fourth hypothesis stated that different types of operational strategy significantly and differently influence execution of innovation activities. Based on the results of the fourth hypothesis analysis, marketing differentiation and innovation differentiation strategies significantly influence the degree of execution of innovation activities. This is consistent with the findings of Veugelers & Cassiman (1999) and Zahra & Bogner (2000). Strategies to adopt marketing differentiation and innovation differentiation will significantly influence the degree of execution of innovation activities. Tourism factories must have strong themes and product attraction to strengthen competitiveness. The five hypothesis stated that there is a positive relationship between the level of innovation activities and operational performance. Based on the results of the five hypothesis analysis, when the degree of execution of innovation activities is higher, it significantly and positively influences operational performance. This is consistent with the findings of Orfila-Sintes & Mattsson (2009) and Hult et al. (2004). When the degree of execution of innovation activities is higher, tourism factory operational performance is influenced. Tourism factories can adopt appropriate leadership style and differentiation strategy by innovation activities and reinforce market orientation and information technology involvement to enhance operational performance. This study only explored tourism factories and future researchers can conduct empirical analysis on other industries, in order to explore correlation between innovation activities and operational performance and acquire more complete research findings.

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Table 1 The Cronbach's coefficients for all variables in this study

Questionnaire dimensions		Cronbach's α
Market orientation	Customer orientation	0.845
	Competitor orientation	0.812
	Cross-department coordination	0.831
Leadership style	Task oriented	0.875
	Stable & conservative	0.888
	Consideration & support	0.899
	Innovation adaptation	0.869
Information technology involvement	Personnel training	0.871
	Investment in software and hardware	0.820
	Personnel cognition	0.865
Operational strategy	Cost leadership	0.829
	Marketing differentiation	0.832
	Innovation differentiation	0.846
Innovation activities	Managerial innovation	0.874
	Market innovation	0.869
	Technological innovation	0.894
	Cultural innovation	0.835
Operational performance		0.901

Table 2 ANOVA of market orientation on innovation activities

		Managerial innovation	Market innovation	Technological innovation	Cultural innovation
Customer orientation	Low [#]	3.250	3.042	3.125	3.375
	High [#]	4.083	4.137	4.103	4.127
	F-value	14.631	24.301	12.175	10.862
	P-value	0.000*	0.000*	0.001*	0.002*
Competitor orientation	Low [#]	3.579	3.697	3.485	3.739
	High [#]	4.203	4.162	4.135	4.196
	F-value	16.823	6.866	13.221	7.622
	P-value	0.000*	0.011*	0.001*	0.008*
Cross-department coordination	Low [#]	3.375	3.433	3.267	3.575
	High [#]	4.092	4.102	4.020	4.117
	F-value	12.641	8.800	10.238	6.324
	P-value	0.001*	0.004*	0.002*	0.015*

Note: Low[#]: the average score lower than 3.50;
High[#]: the average score higher than 3.50; * p < 0.05.

Table 3 ANOVA of leadership style on innovation activities

		Managerial innovation	Market innovation	Technological innovation	Cultural innovation
Task oriented	Low [#]	3.107	3.048	2.953	3.321
	High [#]	4.087	4.115	4.019	4.120
	F-value	19.174	19.335	16.701	10.931
	P-value	0.000*	0.000*	0.000*	0.002*
Stable&conservative	Low [#]	3.409	3.393	3.152	3.523
	High [#]	4.099	4.125	4.063	4.141
	F-value	12.610	11.860	17.968	9.254
	P-value	0.001*	0.001*	0.000*	0.004*
Consideration & support	Low [#]	3.308	3.462	3.333	3.269
	High [#]	4.158	4.138	4.051	4.239
	F-value	25.778	11.416	11.538	36.408
	P-value	0.000*	0.001*	0.001*	0.000*
Innovation adaptation	Low [#]	3.359	3.375	3.271	4.438
	High [#]	4.198	4.217	4.124	4.243
	F-value	30.498	24.166	21.506	25.634
	P-value	0.000*	0.000*	0.000*	0.000*

Note: Low[#]: the average score lower than 3.50;
High[#]: the average score higher than 3.50; * p < 0.05.

Table 4 ANOVA of Information technology involvement on innovation activity

		Managerial innovation	Market innovation	Technological innovation	Cultural innovation
Personnel training	Low [#]	3.587	3.638	3.551	3.707
	High [#]	4.125	4.213	4.111	4.229
	F-value	17.574	11.448	9.451	10.593
	P-value	0.000*	0.001*	0.003*	0.002*
Investment in software and hardware	Low [#]	3.750	3.758	3.655	3.767
	High [#]	4.183	4.156	4.122	4.167
	F-value	7.609	5.154	6.602	5.330
	P-value	0.008	0.027*	0.013*	0.025*
Personnel cognition	Low [#]	3.426	3.588	3.353	3.588
	High [#]	4.191	4.151	4.111	4.202
	F-value	24.481	9.119	16.500	13.076
	P-value	0.000*	0.004*	0.000*	0.001*

Note: Low[#]: the average score lower than 3.50;
High[#]: the average score higher than 3.50; * p < 0.05.

Table 5 ANOVA of operational strategy on innovation activities

		Managerial innovation	Market innovation	Technological innovation	Cultural innovation
Cost leadership	Low [#]	3.852	3.938	3.753	3.926
	High [#]	4.070	4.031	4.010	4.109
	F-value	1.746	0.261	1.841	1.172
	P-value	0.192	0.611	0.180	0.284
Marketing differentiation	Low [#]	3.229	3.194	3.139	3.354
	High [#]	4.159	4.192	4.085	4.197
	F-value	30.959	29.652	21.752	21.890
	P-value	0.000*	0.000*	0.000*	0.000*
Innovation differentiation	Low [#]	3.375	3.238	3.262	3.501
	High [#]	4.156	4.222	4.089	4.189
	F-value	21.807	33.822	17.575	14.893
	P-value	0.000*	0.000*	0.000*	0.000*

Note: Low[#]: the average score lower than 3.50;
High[#]: the average score higher than 3.50; * p < 0.05.

Table 6 ANOVA of Innovation activities on operational performance

		Operational performance
Managerial innovation	Low [#]	2.814
	High [#]	3.738
	F-value	12.475
	P-value	0.000*
Market innovation	Low [#]	2.870
	High [#]	3.741
	F-value	23.993
	P-value	0.000*
Technological innovation	Low [#]	3.107
	High [#]	3.754
	F-value	15.429
	P-value	0.000*
Cultural innovation	Low [#]	3.000
	High [#]	3.759
	F-value	20.895
	P-value	0.000*

Note: Low[#]: the average score lower than 3.50;
High[#]: the average score higher than 3.50; * p < 0.05.

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