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Product innovation and process innovation in the hotel industry in Vietnam

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Abstract

The aim of this research is to establish an integrated model which links knowledge-based green products to innovations in green processes, green product innovation, process innovations and hotel performance of Vietnam and tests this model in Vietnam. First, to assess reliability and validity measures reliability and factor analysis were used. Secondly, bivariate correlations were made to investigate bivariate relationships between variables. Third, the relations between variables have been estimated by several regressions. This study helps show the difference between product innovation and innovation in processes. In addition to sharing and accessing new knowledge streams, managers must concentrate on improving the absorption capacity of their organization in order to create innovation, in compliance with modern knowledge. Finally, for industry authorities, it is recommended.

1. Introduction

Innovation is not an expression of human creativity and lateral thought, but rather the source of sustainable economic and social development (Collins & Fahy, 2011). Stopford & Baden-Fuller (1994) indicates that innovation is even the way to preserve competitive benefit and rejuvenate mature enterprises. Tourism is one of the economic sectors in which innovation has contributed in particular. In fact, tourism has shown immense innovation throughout history (Hjalager, 2010). The hotel industry is an especially open sector of the tourism value chain for innovation (Tigu et al., 2013). Competitive activities in the hotel industry were fierce in an era of globalization, technological change and stagnating tourist demand (Tseng et al., 2008). Innovation is one of the main competitive determinants. Towards improvement of services and products, environmental issues, interaction of information and communications technologies, the tourist industry is dependent on innovation (Ottenbacher and Gnoth 2005; Chadee & Mattsson, 1996). Although research into tourism innovation in general and hotel innovation in particular has taken a great deal of effort in the past, it is a young field of research in which hotel products are only available during the early 1970s. In the meantime, research into service innovation is also relatively young. Hotels are the principal reception units for tourism and one of the most important segments in the tourist offer; until now, three limitations remain in the hotel innovation study: Firstly, innovation research is not systematic and restricts empirical research. The number of empirical studies is minimal to significantly influence management practices and is not extensive compared to innovation research in other industries; hotel innovation is mainly examined (Williams & Hall, 2008; Hall, 2009; Hjalager, 2010; Tigu et al., 2013). Much of the research content still needs to be reached (Tigu et al., 2013). Secondly, research into product and process innovation is lacking. Third, through the consumption of natural resources, greenhouse gas generation and waste production, the hotel industry has been linked to adverse consequences on the environment

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(Alzboun et al., 2016). With the social and players' pressure, hotel managers are finding solutions that could satisfy a growing segment of the market that wants to pay for the green hotel are difficult. They also seek to manage their hotel operating costs (Rodríguez-Antón et al., 2012). The current hotel's trend therefore is innovation for protecting the environment and sustainability, but very few studies mention this content. Furthermore, Vietnam is increasingly focused on environmental protection activities, consumers are increasing in awareness and the trend in green consumption of the community is spreading. The tourism and hotel industry in Vietnam has undergone significant global integration changes.

2. Literature review

2.1. Hotel innovation

2.1.1. Features of hotel innovation

According to Allegro & de Graaf(2008), the more innovative ideas in the hotel industry come from people who look at the operation from a non-governmental perspective and do not limit existing practices. (Konovalova & Jatuliavicienne 2015) indicate that the innovations of hotels are more affected than by internal impact by environmental external movements. The growth of innovation therefore requires interaction with actors who are not directly linked to the tourism industry (Hjalager, 2002).

Service is a product of the hotel. In innovative activities, all attributes of hotel products are considered. The immaterial and tangible components of products are highly correlated services in the hospitality sector. This means that when integrated into the service delivery, both properties depend on each other and affect the way hotels provide services.

2.1.2. Product innovation in hotel

Innovative product refers to two aspects of introduction and improvement of existing products (Chang et al., 2012; Polder et al., 2010). Design changes which lead to major changes to product characteristics can include product innovation (OECD, 2005). They offer low-cost service without compromising basic standards of the hotel like accessibility and cleanliness (Hall & Williams, 2008). Reiwoldt (2006) has pointed out that the household sector has been diversified mainly by the design and niche hotels to create a sensual atmosphere, illusions and esthetics, which are important functional ingredients in the product. Some of the hotel research studies refer to individual qualities of services provided by the hotel, including gastronomy (Jacob et al., 2003; Pikkemaat, 2008), comfort and environmental measures (Enz & Siguaw 2003) and (Le et al., 2006).

2.1.3. Process innovation in hotel

This type of innovation refers to the use of new or significantly improved methodologies in manufacturing, supplying products and services; the introduction of new, and much-enhanced approaches to the logistics or distribution of materials and products; (e.g. maintenance systems, procurement, accounting). Process innovation can be the basis for improving services, attracting new consumers, increasing customer loyalty and helping to increase product value. Restaurant kitchens provide many examples of intensive process innovation. Applications for food service are rapid and better preparation methods, saved energy and saved labour, cutting waste, improved sanitation, service speed and increased flexibility (Rogers, 2007).

2.1.4. The relationship between product and process innovation in the hotels

In the specialized literature two opposing views (Damanpour, 2010) show the link between product and process innovation within a company: the unparalleled view that both kinds of innovation are independent and the inclusive view, which assumes that two kinds of innovation are complementary to each other. The two kinds of innovation (Guisado-Gonzalez et al., 2014) are separate.

2.1.5. Green product and process innovation in hotel

The term "green" for product and process innovation refers to products and process innovations, which contribute to the reduction of adverse environmental effects through consumption, the creation of greenhouse gasses and waste production. Such innovations create various environmental initiatives to positively protect the hotel environment by reducing energy consumption, water and waste.

2.1.6. Innovative trends in the hotel industry

According to the literature review, hotel innovation often focuses on the following aspects at the development stages of the hospitality industry: (1) use of IT technology to innovate hotel products, processes and marketing, (2) innovation in organization and emergence of commercial models, new types of heating, (3) other

innovations, like the tailoring service for guests, design of themed products and adapting to environmental protection activities, etc.

2.1.7. Empirical studies on hotel innovation to date

First, several studies identify important procedures for development of hotel innovation, such as work (Ottenbacher & Harrington, 2007). Secondly, research focuses on the development of one or more types of hotel technology such as projects (OrflaSintes & Mattsson, 2009; Ottenbacher, 2007). Thirdly, test factors can create innovation in hotels (Hjalager, 2002; Ottenbacher & Gnoth, 2005; Ottenbacher, 2007). The impact of innovation on the performance of organizations is also studied separately or integrated in the above fields of research. The theme of this research will be the third line of research.

2.2. Conceptual Framework

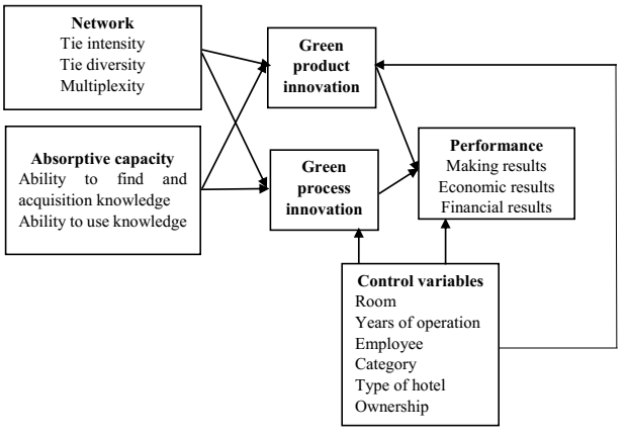

Figure 1. Conceptual model

Source: Author

A network cooperation with external organisations plays an essential part in analyzing the characteristics and innovation process in the hotel and literature review on tourism innovation. It holds a special position in other industries than companies. Research is vital in the hospitality sector on green product and process innovation. Green innovation is one of the leading directions of the industry today, but very few scholars are interested in this area. In many studies, innovation was not seen under a certain theoretical angle. The search for a background theory to explore the content of the study is essential both for increasing reliability and for adding the scientific gap above. The study therefore proposes to study the impact of these two factors on green product and process innovation based on the two theories of mesh and absorption capacity and tests the effects of green product and process innovation on hotel performance.

2.3. Hypotheses

The different parties involved in a (social) network from the stakeholder perspective are considered those that affect the actions of the entire company or who suffer from them (Philips et al., 2003). There are a relatively wide variety of parties involved in interactive business relations within the network: buyers, providers, competitors, governments, business organizations, religious affiliates, colleges and consultants (Smeltzer et al., 1988; Fann & Smeltzer, 1989; Tidd & Trewhella, 1997).

2.3.1. Network and green product innovation, green process innovation

Tie diversity

Previous studies have shown that the interaction with diverse partners can bring different advantages (Becker and Dietz 2004; Nieto and Santamaria 2007). Various knowledge sources enable the company to create a new combination of technology and knowledge that offers the company the opportunity to choose from different possible paths (Metcalfe, 1994). Partners can provide various resources and capacities to improve the innovation capacity of the company (Becker & Dietz, 2004). In addition, different network partners can attract more heterogeneity of knowledge (in March 1991, Nieto and Santamaria, 2007) and risk-taking and research, as well as support innovation (Laursen & Salter, 2006). In particular, cooperation with diverse partners improves the opportunity to achieve product innovation (Becker & Dietz, 2004; Nieto & Santamaria, 2007). Therefore, in this context:

H1a: The tie diversity is positively associated with green product innovation

H1b: The tie diversity is positively associated with green process innovation

Tie intensity

As mentioned, the main reason behind network capacity to disseminate and diffuse knowledge among their members is repeated, enduring and structured relationships (Inkpen & Tsang, 2005). Social interactions are expressed in the amount of time that players have shared in each event to increase the number of interactions between actors, contributing to more information sharing between other people (Molina-Morales & Martinez-Fernandez, 2010; Tsai & Ghoshal, 1998; Yue-Ming, 2005). Increased ties, particularly so-called strong linkages (Granovetter, 1973), are likely to improve the quality of knowledge exchange and allow for greater knowledge sharing and research (learning) so that hypotheses are proposed.

H2a: Intense ties are positively associated with green product innovation

H2b: Intense ties are positively associated with green process innovation Multiplexity

The quality of the interaction with the various partners cannot be captured by the linkage diversity and intensity. The variety of tie indicates the number of network partners and the intensity of tie indicates the interactions frequency. The concept of multiplexity (indarti & postma 2012) is introduced to indicate the quantity and variety of knowledge transferred during interaction to complement these concepts. Multiplex means that a single line or channel can carry various messages simultaneously. It refers to the complexity of relations, the diversity of relations, or various relationships (Tuli et al., 2010). The problem is the number of knowledge fields that the interactive links to, ranging from design to production to market (Indarti & Postma, 2013). The amount and variety of knowledge that can be shared by collaboration with different partners enhances the innovation of the company (Becker & Dietz, 2004). The more different knowledge in relationships is exchanged, the more likely this knowledge will have a positive effect on the innovation of an enterprise, therefore:

H3a: The number of various knowledge domains to which an interactive relationship is positively associated with green product innovation

H3b: The number of various knowledge domains to which an interactive relationship is positively associated with green process innovation

2.3.2.Absorptive capacity and green product, process innovation

Absorptive capacity

The absorber is capable for commercial purposes of recognizing, assimilating and using the value of new external information (Cohen & Levinthal, 1990). The multi-component structure is organizational absorption. Thomas & Wood (2014) stressed that tourism businesses rely, in particular, on external innovation knowledge and argued that two-pronged model, that is the capacity to find and acquire expertise – ACQUISITION and the capacity to use knowledge – is more appropriate than Zahra & George's four-pronged model (2002). This study uses Thomas & Wood's model (2014).

Absorptive capacity and green product, green process innovation

(Cohen & Levinthal, 1989, 1990) have identified absorption capacity as a strong capacity for the acquisition, assimilation and application of external knowledge for commercial purposes. With the greater availability of external sources of knowledge in modern economies, the absorptive capacity is vital and necessary because it influences the ability to achieve goals, acquire and deploy external knowledge. It is essential to promote the internal innovation process to bring a competitive advantage (Fosfuri & Tribó, 2008). The absorption capacity may be one of several capability-based capacity factors influencing innovation, as argued by Lichtenthaler and Lichtenthaler (2009). When appropriately conceptualized, a priori is essential to assume that absorption is a valuable tool to look at an aspect of innovation in tourism businesses.

H4a: The ability to find and acquire knowledge is positively associated with green product innovation

H4b: The ability to find and acquire knowledge is positively associated with green process innovation

H5a: The ability to use knowledge is positively associated with green product innovation

H5b: The ability to use knowledge is positively associated with green process innovation

2.3.3. Green product, green process innovation, and hotel's performance

Improving performance and increasing organizational value requires innovation (Llore'ns Montes et al., 2005; Bowen et al., 2010). Operational performance measures such as cost, quality, delivery and flexibility are achieved by organizations through their resources and efforts to concentrate on product and process improvements and innovations (Tan et al., 2007). The level of innovation was positively associated with productivity and results (Kafetzopoulos & Psomas 2015). The level of innovation (Saunila et al., 2014) showed that organizations with higher operational and financial performance in innovation than others had had higher success. In environmental practice, according to some researchers, hotels should be innovative (Best & Thapa, 2013; Le et al., 2006; Smerecnik & Andersen, 2011). The application of green practice for hotels and the tourism sector is very beneficial (Chou, 2014). Therefore, the hypothesis H6 is:

H6a: Green product innovation is positively associated with hotel's performance

H6b: Green process innovation is positively associated with hotel's performance

2.3.4. Green product, green process innovation, its antecedents, and hotel's performance

For example, empire-based evidence can be found to stress that the use of employees' skills and comportements does not favor business performance directly if that connection is not mediated by innovative output (De Jong & Den Hartog's, 2010). In other words, only if the idea and creativity of employees in the job become concrete innovative goods and services will business results increase (Marques & Ferreira, 2009). Thus, this study proposes testing the median level of product innovation and green processes in the relationship between knowledge absorption capacity and relationship network with hotel performance, whether wholly or partially mediated.

H7a: Green product innovation mediates the relationship between green product innovation antecedents and the hotel's performance.

H7b: Green process innovation mediates the relationship between green product innovation antecedents and the hotel's performance.

3. Methodology

3.1. Qualitative research

The study interviewed and discussed with fifteen managers, including threedirectors, two deputy directors, five business managers, and five professional managers of six hotels, to find out the meaning and necessity of the green innovation in the hotel; find out the factors affecting green product innovation and green process in the hotels; explore outstanding factors in a practical context. Combine with the preliminary survey to screen and adjust the scales, giving an official research model.

3.2. Empirical survey

3.2.1. Data collection and sample

The survey population was defined as all three to five-star hotels rated by the Vietnam National Administration of Tourism. Data were collected from February to June 2020. Each hotel surveyed three subjects: management, head of the department, head of profession department. Two channels of survey implementation were selected. The first channel, 19 tourism departments of 19 provinces and cities, supported sending 987 letters with paper questionnaires to each survey object of their hotels. The second channel, the Vietnam Tourism Association, the Quang Ninh Tourism Association, the Danang Hotel Association, the Hotel CEO Club, and two travel companies, support email surveys to hotels of 37 provinces remaining.

3.2.2. Variables and measures

All latent variables were measured by multiple Likert-type items (1 = strongly disagree to 5 = strongly agree) with the exception of product innovation, process innovation variables. Several item measures were used to enhance the reliability of the measures (Neuran, 2000). Due to the power and simplicity of the Likert scale was used (Alreck & Settle, 1995). Over the last three years, the measure of hotel performance was taken from (Snoj et al., 2007). It includes three statements that address the hotel's achievement of target marketing results, economic results, financial results with ten items: (1) customers' degree of satisfaction, (2) percentage of customers who use hotel more than once, (3) service quality, (4) image of the hotel in the market, (5) development of scales, (6) development of market share, (7) development occupation rate, (8) gross profit, (9) return on investment, (10) return on equity.

The measure of green product innovation and green process innovation was adapted (Salmones et al., 2005; Smerecnik & Andersen, 2011; Jeou-Shyan et al., 2017), Maria del Rosario et al. (2017). The measures include items assessing them by 'yes' or 'no' answers. Green product innovation comprises five items in the following areas: (1) there are more and more reusable components, (2) there are products, materials, or packages which do not contain hazardous substances that can reduce the environmental impact, (3) inclusion of organic products, (4) use resources effectively, (5) modification of spaces ensuring the preservation of the natural environment. Green process innovation's consisted of seven items: (1) adopt new or improved methods to be recycled in the process of providing products and services, (2) invest in new purchases equipment, purchases with energy-saving/water-saving marks or green-label items, (3) collect hazardous waste by categories, (4) adopt new or improved methods to uses environmentally friendly building materials, (5) adopt new or improved methods devices for water reutilization, (6) Use of more eco-friendly cleaning supplies, (7) use of conditioning of areas using natural and/or local materials. The measure of tie intensity adopted from (Zeng et al., 2010). Tie intensity indicates the intensity of interaction between the focal firm and the external parties. Tie diversity is the number of different external parties involved in the interaction with the central enterprise: (1) institution customers, (2) individual customers, (3) suppliers, (4) competitors, (5) government institutions, (6) tourism associations, (7) tourism forums, (8) university research institutions. A company with more external interactions has a greater variety of relationships. The interviewees were asked which external parties interact. The profile of the knowledge domains absorbed by focus companies from different outside parties is multiplexity. The action has been taken (Indarti & Postma, 2013). Increased multiplexity is the more profound and more diverse fields of knowledge absorbed by the third countries. Respondents were asked to indicate and show the depth of knowledge obtained from the eight above-mentioned external sources. The measure of absorptive capacity in the hotel industry was taken from Thomas & Wood (2014). The researchers developed the scale from four research works (Camisón & Forés, 2010; Delmas et al., 2011; Flatten et al., 2011; Barrionuevo et al., 2001), including 15 items. The common control variables in the hotel innovation study found through the literature review include six variables: (1) years of operation, (2) category, (3) number of employees, (4) number of rooms, (5) type of hotel, (6) ownership.

4. Results and discussion

4.1.Qualitative research results

The qualitative research results show a picture of green product innovation and green processes innovation in Vietnamese hotels. According to the hotel managerial staffs' assessment of the impact of these factors on the activities, the most mentioned and influential elements for hotels to conduct innovation as well as be able to implement this type of innovation are the customers (institution and individual), suppliers, competitors, horizontal and vertical sectoral authorities, unofficial social organizations in the industry where hotel businesses find ideas for innovation, methods implemented through interaction relationships between hotel with external organizations. To put new ideas into practice at the hotel, internal factors are also critical, such as capacity, staff qualifications, culture of sharing and cooperation, dynamism, and willingness to change. These two factors of relationship with external organizations and this internal capacity are also consistent with previous studies (Rice, 2009; Teece et al., 1997; Zander & Kogut, 1995; Zott, 2003; Meeus et al., 2001; Vinding, 2006; Chesbrough et al., 2006; Morone & Taylor, 2012). The qualitative research results for the 15 hotel managerial staffs show that the theoretical model is consistent with the industry's research context. However, the measure of the network has an item that predicts is not valid in model analysis and verification. It is a measure of "the number of related external organizations". According to the research theory in chapter 3, there are eight types of external organizations specific to the industry in which a hotel may have a relationship. The result of in-depth interviews did not discover a new organization type compared to the literature but pointed out a common feature that the hotels were related to all eight types of organizations mentioned above.

4.2. Prelimitary survey result

The questionnaires were sent to 55 people (director, vice director, head of the business department, head of the profession department) of 22 three to five-star hotels. The returned questionnaire indicated that informants had no difficulties understanding the questions, and Cronbach alpha analysis results show that all of the scales meet reliability requirements with values greater than 0.70 (Nunnally & Bernstein, 1994). The researcher's 'suspect' element was also clarified. The 55 survey questionnaires show that all hotels have relationships with the eight types of external organizations included in the research model. Therefore the item of "the number of external parties" is removed from the network scale. Along with removing this measure, the initial hypotheses H1a and H1b are also excluded from the content of testing. The official research model and the proposed hypotheses are as follows:

H1a: Intense ties are positively associated with green product innovation

H1b: Intense ties are positively associated with green process innovation

H2a: The number of various knowledge domains to which an interactive relationship is positively associated with green product innovation

H2a: The number of various knowledge domains to which an interactive relationship is positively associated with green process innovation

H3a: The ability to find and acquire knowledge is positively associated with green product innovation

H3b: The ability to use knowledge is positively associated with green process innovation

H5a: Green product innovation is positively relationship with the hotel's performance

H5b: Green process innovation is positively relationship with the hotel's performance H6a: Green product innovation mediates the relationship between green product innovation antecedents and the hotel's performance.

H6b: Green process innovation mediates the relationship between green product innovation antecedents and the hotel's performance.

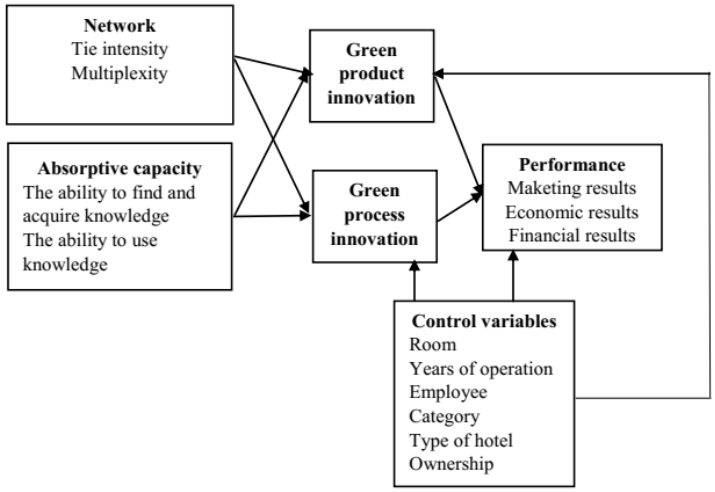

Figure 2. Official research model

Source: Author

4.3. Quantitative research result

4.3.1. Data collection and sample

The survey results obtained 609 questionnaires from 268 hotels, including 172 online questionnaires and 438 paper questionnaires. Twenty-seven paper questionnaires had "missing data", and 151 had no guarantee of reliability during data collection. After eliminating the unsatisfactory questionnaires, the data included in the analysis included 432 questionnaires of 206 hotels, accounting for 22% of the total number of hotels nationwide, accounting for 31% of total non-chain hotels.

4.3.2.Analysis of multiple-item measurement

Cronbach Alpha analysis results show that all the scales meet reliabilityrequirements with values greater than 0.7 (Nunnally và Bernstein, 1994). The first factor analysis results extracted seven factors. Absorptive capacity has the lowest loading factor (.416) in item A1, and the load is inconsistent with two factors. Item A4 has a high loading factor (.713) that loads individually into a factor. If item A4 is omitted, item A1's loading factor is very low. If both items are excluded, the Cronbach Alpha increases from 0.94 to 0.952, and the KMO index also increases from 0.883 to 0.887. Evaluation of "face validity", these two items can also be removed from the model without affecting the content of the variable. A new measure of absorptive capacity after removing these two items is included in the second EFA analysis. The result shows six components extracted with the total variance extracted of 72.763 at eigen-value of 1.01. Moreover, all variables have a high loading weight (> = 0.556) on the concept they measure and low on the concept they do not measure. Multiplexity variable is

extracted by two factors that were renamed level of relationship with customers and businesses in the industry including 4 items N1, N2, N3, N4 and level of relationship with state management agencies and supporting organizations including 4 items N5, N6, N7, N8. The absorption capacity variable is extracted by a renamed factor to find and use knowledge, including 13 items A2, A3, A5, A6, A7, A8, A9, A10, A11 A12, A13, A14, A15. The performance variable is extracted by two factors, namely, the market result including items from P1 to P4 and the financial and operational results consist of items from P5 to P8. These groups of newly formed factors were put into the Cronbach Alpha test once again, and the results achieved reliability > 0.07. Therefore, the scales of these six research concepts ensure reliability, convergence and discriminant validity.

4.3.3. Normality diagnosis, descriptive analysis, and correlations

To check the sample distribution of a variable, I observed (1) the skewness statistic, which measured the symmetry of the sample distribution, (2) the kurtosis statistic, which measured the sample distribution's peakedness, and (3) the histogram with normal curves. (West et al., 1996) suggested that the absolute value of kurtosis >7 or skewness > 2 was acceptable. (Kim, 2013) also confirmed West's point of view and added suitable factors for samples larger than 300. In comparison with the data analysis results, the variables in the research model ensure normal distribution. Examining the correlation coefficients among the variables in the model shows that there is a strong correlation between these variables.

4.3.4. Hypothesis testing

Innovation model

(a) Green product innovation model

Table 1. Multiple regression results for green product innovation

Variables	Model 1 β	Model 2 β	Model 3 β	Model 4 β
Control variables				
Years of operation	.110	.113^{+}	.105	.109^{+}
Category[a]	.136	.159^{+}	.115	.142^{+}
Employee	.025	-.019	.061	.016
Room	.017	.029	-.035	-.005
Type of hotel[a]	-.181**	-.107	-.185**	-.133^{+}
Ownership[a]	-.105	-.104	-.151*	-.133^{+}
Main variables				
Level of relationship with customers and businesses in the industry		-.065		-.065
Level of relationship with state management agencies and supporting organizations		.131		.081
Multiplexity		.260**		.185*
Ability to find and use knowledge			.301***	.189*
Adjusted R Square	.043	.125	.127	.145
F	2.525*	4.257*	5.246*	4.473*
N = 209; P^{+}<0.1; P*<0.05; P**<0.01; P***<0.001 [a] Category, type of hotel and owership are dummy variables All coefficients are standardized				

Source: Author

Looking at the overall four models, years of operation of the hotel, 4 - 5 star hotels have a slightly significant at ($p < 0.1$), the number of employees, the size and ownership of foreign aren't significantly associated with green product innovation. The city hotel type is inversely significantly associated at different levels with green product innovation. Among the independent variables, only the group factors of multiplexity and ability to find and use knowledge are significant associated with green product innovation ($p < 0.5$). The level of relationship is not statistically significant. Therefore, this analysis supports the hypothesis H2a, H4a and H3a is partially supported; meanwhile, there is no evidence to support H1a.

(b) Green process innovation

Table 2. Multiple regression results for green product innovation

Variables	Model 5 β	Model 6 β	Model 7 β	Model 8 β
Control variables				
Years of operation	.091	.098	.086	.093
Category[a]	.223**	.223**	.199+	.201+
Employee	.082	.100	.122	.146
Room	-.146	-.126	-.204+	-.170+
Type of hotel[a]	-.245***	-.159+	-.250***	-.193**
Ownership[a]	-.061	-.069	-.112	-.107
Main variables				
Level of relationship with customers and businesses in the industry		-.009		-.010
Level of relationship with state management agencies and supporting organizations		-.081		-.146+
Multiplexity		.405***		.308***
Ability to find and use knowlege			.337***	.246**
Adjussted R Square	.079	.202	.186	.239
F	3.942**	6.769***	7.671***	7.432***
N= 209; P+ <0.1; P* <0.05; P** <0.01; P*** < 0.001 [a] Category, type of hotel and ownership are dummy variables All coefficients are standardized				

Source: Author

In Model 8, all control and independent variables were entered into the regression equation. As a result, 4-5-stars hotel tends to impact green process innovation; hotel size and city hotel are inversely significantly associated; the remaining control variables have no significance. There are only groups of factors about multiplexity for the two independent variables, the ability to find and use knowledge is strongly positively associated with green process innovation ($p < .001$). The overall review of the regression results for green process innovation shows that the hypothesis H2b, H4b are supported, the hypothesis H3b is partly supported, and H1b is not supported.

Perfomance results

(a) Market performance results

Table 3. Multiple regression results for market performance results

Variables	Model 9 β	Model 10 β	Model 11 β	Model 12 β	Model 13 β	Model 14 β
Control variables						
Years of operation	-.120	-.134+	-.124*	-.123+	-.127+	-.115+
Category[a]	.231**	.213*	.180*	.181*	.214*	.198*
Employee	.175	.172	.223*	.223*	.169	.236*
Room	-.147	-.149	-.203*	-.203*	-.136	-.219*
Type of hotel[a]	-.070	-.047	-.031	-.033	-.051	-.049
Ownership[a]	-.083	-.070	-.121+	-.122+	-.078	-.130+
Green product innovation		**.127+**		-.009		
Green process innovaion					.075	-.090
Innovaion antecedents						
Level of relationship with customers and businesses in the industry			.205*	.204*		.204*
Level of relationship with state management agencies and supporting organizations			.035	.036		.022
Multiplexity			.131+	.133+		.159*
Ability to find and use knowlege			.224**	.226**		.246**
Adjussted R Square	.046	.057	.229	.225	.046	.231
F	2.644*	2.759***	7.095***	6.419***	2.423***	6.612***
N= 209; P+ <0.1; P* <0.05; P** <0.01; P*** < 0.001 [a] Category, type of hotel and ownership are dummy variables All coefficients are standardized						

Source: Author

Model 10 explains 5.7% of the market performance at (.127, p <.1). Hence the hypothesis H5a is partly supported. Model 13 results show that green process innovation does not affect market performance. Therefore, the H5b hypothesis is not supported for market results. To test the mediating impact of green product innovation, green process innovation (hypotheses H6a, H6b). The study followed the method recommended by (Baron & Kenny, 1989). Observing models 4, 8, 11, 12, and 14 indicates that green product innovation and green process innovation fail to mediate the relationship between its antecedents and the hotel's performance.

(b)Financial and operational results

Table 4. Multiple regression results for financial and operational results

Variables	Model 9 β	Model 10 β	Model 11 β	Model 12 β	Model 13 β	Model 14 β
Control variables						
Years of operation	-.017	-.032	-.020	-.024	-.029	-.022
Category[a]	.196$^{\bullet}$	.177$^{\bullet}$	.115	.108	.166^{+}	.110
Employee	.200^{+}	.197^{+}	.288$^{\bullet\bullet}$	.287$^{\bullet\bullet}$	.189^{+}	.284$^{\bullet\bullet}$
Room	-.208^{+}	-.210^{+}	-.267$^{\bullet}$	-.267$^{\bullet}$	-.188^{+}	-.263$^{\bullet}$
Type of hotel[a]	-.015	.010	.011	.017	.018	.016
Ownership[a]	-.020	-.005	-.052	-.046	-.011	-.049
Green product innovation		**.139^{+}**		.044		
Green process innovaion					**.135^{+}**	.025
Innovaion antecedents						
Level of relationship with customers and businesses in the industry			.360$^{\bullet\bullet\bullet}$	.362$^{\bullet\bullet\bullet}$		.360$^{\bullet\bullet\bullet}$
Level of relationship with state management agencies and supporting organizations			-.059	-.063		-.056
Multiplexity			.098	.090		.090
Ability to find and use knowlege			.161$^{\bullet}$	.152^{+}		.154^{+}
Adjussted R Square	.021	.035	.202	.200	.033	.199
F	1.746	2.065$^{\bullet}$	6.200$^{\bullet\bullet\bullet}$	5.656$^{\bullet\bullet\bullet}$	2.008^{+}	5.622$^{\bullet\bullet\bullet}$

N= 209; P^{+} <0.1; P$^{\bullet}$ <0.05; P$^{\bullet\bullet}$ <0.01; P$^{\bullet\bullet\bullet}$ < 0.001
[a] Category, type of hotel and ownership are dummy variables
All coefficients are standardized

Source: Author

Model 8 showed that green product innovation contributes to 3,5% of the variance in financial and operational results. It is statistically significant (.139, p< .1), green process innovation contributes to 3,3% of the variance in financial and operational results and is statistically significant (.136, p< .1). Along with the results in models 10, 13 conclude that the hypothesis H5a is supported, H5b is partly supported (in financial and operational results). Observing the results in models 17, 18, and 20 combined with results in model 4, model 8, analysis by the method of (Baron and Kenny, 1989) shows that green product innovation and green process innovation fail to mediate the relationship between them its antecedents and hotel' performance. This result, coupled with market results' analysis, concludes that H6a, H6b are rejected. In addition to testing the hypotheses, model 17 also shows that level of relationship with customers and businesses in the industry has a strong significance associated with financial and operational results (.360, p <.001), and the ability to find and use knowledge is significant associated with financial and operational results (.161, p <.05).

5. Discussion and implications

5.1. Comments on research findings towards the green product, process innovation's antecedents

The network influences decisions and guidelines in Vietnamese hotels on green products, process innovation. This can be explained by its size, as stated in Rønningen (2010). The tourist industry is mainly small and micro businesses, while the capacity for innovation is often connected with the company's size. Management systems of small companies are not sufficient to support the initiative, and the employees of companies are often less competent than large companies. In addition, SMEs lack a dynamic capacity to maintain their power. They, therefore, rely on outside resources and support (Erkus, Turkish Republic, 2010). Through the knowledge from

the network, hotels can find "green" supplies of inputs and applications, updating green inventions quickly. The study results provide an overview of the hotel innovation network in the context of an upcoming economic environment. The quality of the interaction is determined by the depth/size of knowledge accessible by foreign parties. The tie intensity with customers and businesses in the industry is more important than the tie diversity that has relationships in making green product innovation and processes. Empirical research at the hotels in Vietnam shows that only the 'ability to use knowledge' aspect significantly influences green product and process innovation. The 'ability to find and acquire knowledge' aspect is only partially effective. This is appropriate because the hotel innovation is mainly from the external environment; the hotel business must have the ability to apply or 'imitate' to create innovation.

On the other hand, according to (Stock et al., 2001), the absorption capacity in an organization must reach a certain level to contribute to innovation; the level of absorption capacity is a premise for the level of innovation level. This research also shows that the combination of absorption capacity with the organization's network plays a vital role in hotel's green product, process innovation in Vietnam. The more actively a hotel participates in a network, focusing on improving absorption capacity, the greater the effectiveness of innovation. By successfully integrating external knowledge and absorptive capacity, hotel businesses can develop sustainably, creating a greater competitive advantage than moving towards an innovative strategy focused on the internal R&D process. This is also consistent with the view of (Lichtenthaler, 2008).

5.2.Comments on research findings towards green product, green process innovation and perfomance

The study's findings indicate that green product innovation tends to positively associate with both market results and operational and financial results. In contrast, green process innovation only tends to positively associated with financial and operating results. This can be explained by the characteristics of two types of innovation. Product innovation can be immediately recognized by tourists and other customers, so it has an immediate impact on market results, helping the hotel enhance its ability to respond to changes in the changing business environment. Process innovation has a slower delay and is difficult for customers to see and feel right away. Process innovation will help save costs, positively affect the productivity of an organization. Green product and process innovation only tend to be positively associated with performance but do not show a strong or significant association such as network or absorptive capacity. Although the trend of green consumption is spreading strongly in the community, for Vietnam's hotel and tourism industry, this is still an emerging element, and it takes more time for businesses in the industry to transform.

5.3. Comments on hypotheses are not supported

Hypotheses H1a, H1b (the level of relationships with external parties on the green product, process innovation) are unsupported that can be explained by the context of the transition economy and the characteristics of culture, society, institution, and working mechanism in mainstream organizations in Vietnam. Relationships with external parties may not be for learning but need more help, assistance, support, and favourable factors in the business process. The reason is that hotel innovation is largely not from internal R&D but due to the absorption of scientific-technological, socio-economic movements and changes in the business environment and consumer trends of the hotel market. However, to gain a deeper perspective on this issue, it may be necessary to develop another qualitative research. The hypotheses H6a, H6b (mediate relationship) are unsupported that can be explained by improving hotel performance. The level of relationships with external parties has a greater influence than the adoption of innovation and not necessarily through innovation. The level of relationships with external parties is not enough to create innovation, but it is important to access partners' knowledge and how partners share necessary and important information. Sometimes, other agents that influence a partner can help the hotel receive the necessary knowledge, which is difficult to access by the hotel's effort.

On the other hand, green product, process innovation in Vietnam's hotels are just interested recently. These innovations are not many, not abundant and diverse. They haven't created the market effect. Hotel businesses are still in the process of learning, applying and testing to make further strides in the future. The attention, promotion and support for the hotel's green initiatives from social and state management agencies are limited. The research results also show that green product innovation and green process innovation only affect performance without leaving a clear impression.

5.4.Comments on green consumption trends and green product innovation, green process innovation in Vietnam's hotels

Green consumption is now considered the consumption trend of the century when environmental issues became a major concern of many countries worldwide. Under pressure from regulatory authorities, from the perceptions and needs of tourists, hotel businesses must adapt and find competitive advantage in the fast and volatile movement of the business environment. Innovation in general and innovation towards green elements is considered the basic way to improve the competitive advantage and future business performance of tourism and

hotel businesses. The results show that although most of the green innovation solutions in hotels are only at level 1, these solutions help improve the quality of products and services, reduce costs to better meet the market's demand, and improve employees' leadership capacity and capacity to be more active and better integrated. Innovation can be done at different levels and can all bring business efficiency to the hospitality business. Green innovation can be done in the different business areas of the hotel business. These innovation efforts can help the hotel achieve "green certificates", which society will recognise as meeting environmental protection standards to introduce, promote, and confirm the quality of its products and services.

5.5. Comments on context research

Tourism and hospitality is a special service industry, so innovation should not occur in this area, as in other industries. The tourism industry has a heterogeneous structure and specific products. A variety of products and services created by various companies are important for the travel experience. In addition, tourism products are intangible and destructive (Hjalager, 2002). Simultaneous production and servicing occur. The tourism industry is characterized by the extent of information and human importance (Camisón & Monfort Mir, 2012). Therefore innovation in tourism and hospitality is very different from innovation in manufacturing (Miles, 2005). Radical innovation in the tourism industry is still quite limited. Innovation in business in emerging economies like Vietnam also has a very special context. Firstly, the level of development of the economy is still low. Secondly, the legal infrastructure is not sufficient and complex as in copyright protection and judging violations.

On the one hand, it makes it difficult for businesses to protect the copyright of their inventions. On the other hand, they also encourage businesses to "imitate" the solutions of other businesses. In the surveyed hotels, product and process innovation are mostly learning and re-applying of the previous businesses, or which the market already has. The new level is only low level, "new to firm". On the one hand, because hotel enterprises absorb innovation from the environment primarily or because most small and medium enterprise models are limited in resources, on the other hand, may be partly due to the influence of institutional environment.

6. Conclusion

This research seeks to create an integrative model that links the determinants of innovation, innovation and performance in Vietnam's hotels in the knowledge-green product and green processes; a test that model in Vietnam. Through the research process, results of data analysis and conclusions of the study, it can be said that the study has made the following major new contributions:

First, this study helps provide a picture depicting the difference between product innovation and process innovation. To promote green product innovation and green process innovation, managers must recognize innovation from a strategic perspective and need a plan to achieve the goal. Besides focusing on studying green consumption trends, managers need to expand their network and actively participate in ties diversity to tighten connections in the network. Second, in addition to sharing and accessing new knowledge streams, managers need to focus on improving their organization’s absorption capacity that is compatible with the new knowledge to create innovation. Third, policymakers should focus on the industry innovation system towards creating and using green technologies in the tourism industry because the sector innovation system enhances the development of green innovation in the tourism business; encourage innovation behaviours of firms and tourism destinations. Finally, it is recommended for industry authorities. These agencies can adopt innovation policies to increase the quality and effectiveness of innovation activities and promote information exchange so that effective cooperation can be found. This study helps provide a picture depicting the difference between product innovation and process innovation (the two types of innovation are still being debated as integrated or unintegrated in the service sector). Besides theorizing the hotel’s green product and process innovation, this work also introduces a new research model and provides new data sets in the context of an emerging economy. The study integrated theinfluence network and absorptive capacity on innovation in the hospitality industry to fill the research gap in the field.

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