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An evaluation of corporate customer need with regard to the use of product service systems for the furniture business through environmental marketing

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Abstract

Presently, the entrepreneur and the manufacturing industry are considering a change in their business strategy by putting more emphasis on products and services that place importance on environmental marketing. The idea of a product service system that aligns with environment-friendly furniture is a new concept in developing countries such as Thailand. Entrepreneurs have found it challenging to evaluate whether or not the consumer is willing to pay for environment-friendly products and services that have been carefully designed. The objective of this research was to evaluate 124 companies, in Bangkok. Analysis to measure awareness and environment-friendly consumer behavior was based on consideration of consumers' behavior in the purchasing and usage of furniture, using statistics, a t-test and ANOVA, with tests at a confidence level of 95%. The research found that consumers from the government sector have awareness of environmental impact and are willing to purchase environment-friendly furniture more than those from the private sector at a statistically significant level, with regard to detoxification at $p = .002$, de-energization or de-carbonization at $p = .010$ and de-waste at $p = .003$. On average, large organizations are more willing to purchase environment-friendly furniture than organizations of other sizes. Both the government and private sector have similar requirements regarding the characteristics of furniture design. The service requirements of both sectors are also at a high level while furniture is in use post −purchase.

Introduction

Environmental problems have encouraged entrepreneurs to have an interest in applying environmental savings as a company business strategy in order to improve effective production and develop the quality of their product (Durmaz & Yasar, 2016). In the past, the furniture industry put emphasis on adding value to products, and fully utilizing natural resources in production to compete with competitors and encourage economic growth. Nowadays, consumers tend to purchase new furniture to replace usable existing furniture more frequently than before (European Furniture Manufacturers' Federation [UEA], 2004). Based on such reasons, entrepreneurs have been encouraged to place more importance on using an environment-friendly system as a business strategy. One of these strategies is the Product Service System (PSS), an acceptable instrument developed by environmental

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academics as an effective method to run a business aligned with environmental responsibility for sustainable society (Tukker, 2015). It is an idea that supports reduction of the effects on the environment and is also another way to channel the relationship between the entrepreneur and consumer by delivering an effective product (Manzini, 1996). This idea creates an environmental market by combining three sustainable factors together: economy, society, and environment (Kumar, Zillur, Kazmi, & Praveen, 2012). However, the implementation of the "ecodesign" in the PSS of furniture businesses is still new in developing countries such as Thailand. It is important for entrepreneurs to know if mainstream consumers realize the importance of environment-friendly products and are willing to purchase environment-friendly products or not. Hence, the objective of this research was to evaluate corporate furniture-consumer awareness and to value the environment-friendly products and services by collating data from public and private entities since they both purchase high volumes of furniture compared with the gross domestic product (GDP). Besides, their policies involving organizational culture, profit motivation, and corporate social responsibility (CSR) are indisputably distinct. Due to the mentioned circumstances, this research then presumed that the awareness and valuing of environment-friendly products and services differed by organizational attributes encompassing corporate size and segment.

Literature Review

Tools for Ecodesign and Sustainable Product Design

The study of Centre for Design at RMIT (2001) found that the life cycle of furniture is tending to be shorter with a high product turnover, which shows the tendency of changing furniture more frequently due to the quality of materials and the existing functions of the commercial furniture. The majority of the environmental impact from the furniture occurs in the early preparation of the raw materials and the disposal of products late in the product life (Lewis, Gertskis, Grant, Morelli, & Sweatman, 2001). Environmental design of products, also known as the "ecodesign" concept, has been used since 1990 (Brezet & Hemel, 1997). This section continues to describe and characterize the detail of ecodesign integrated with the principles of environmental impacts reduction. The researcher has incorporated concepts from Besch (2004), Brezet, Bijma, Ehrenfeld, and Silvester (2001), Cole, Elliott, and Wu (2008), Hayles (2015), Mont (2004), Wimmer and Zust (2002), and Wimmer (2008) as described in Table 1.

Product Service System Design Strategy

The strategy and the method of the product service system first occurred in the context of the European Industry. PSS was mentioned in the sense of becoming a new pathway for the business sector in gaining advantages in the use of resources and reducing the environmental impact (Vezzoli, Kohtala, & Srinivasan, 2014). It is the combination of outstanding product design and service that creates lower environmental impact and higher participation throughout the product life cycle (Manzini, 1996). The current research emphasizes using the concept of PSS in terms of product-oriented services. Previously, the process of this business type emphasized selling the existing products and adding some product-related services, such as warranty or maintenance contract (Tukker, 2004). In fact, the early concept of PSS that was developed by Stahel Walter had a foundation that was connected to the environmental scope, such as the concept of a closed material loops system, product lifetime extension, and the increase of advantages from providing supportive services for the usability of the products (Stahel, 1984).

Environmental Service Design

Nowadays, many manufacturers have considered a business strategy that emphasizes being service orientated

Table 1
Five principles of environmental impacts reduction related to product design

Dematerialization	Detoxification	De-Energization or (De-Carbon)	De-Waste	Effective Usage
-Design to reduce the amount, number, and type of materials	-Design for disposability	-Design for energy recovery by recycling and reusing	-Design for disposability	-Design for adaptability and usability
-Design for material substitution	-Design to avoid or reduce chemical usage in products	-Design to integrate functions and reduce components	-Design for material recycling or reuse	-Design for durability/product life extension
-Design for recycling and using recycled materials for components	-Design to best minimize waste and use eco-friendly, biodegradable materials	-Design using local raw materials to reduce energy used for transport	-Design of a symbol which identifies a material's method of disposal	-Design for a long-lasting product life cycle
-Design to integrate functions to reduce components	-Design of a symbol which identifies a material's method of disposal	-Design to reduce energy consumption or utilize renewable energy	-Design to reduce the amount of waste through usage of eco-friendly biodegradable materials	-Design for ease of dissemination for repair and upgrade

Note. (1) De-Materialization is reduction in the use of natural resources; (2) De-Toxification is reduction in the release of toxins throughout the life cycle; (3) De-Energization or De-Carbon is reduction in the use of energy or carbon; (4) De-Waste is reduction of the waste from consumption; and (5) Effective usage is promotion of the effective usage of products. All five categories are allowed to implement across each other

more than being product orientated (Tan, Andreasen, & Matzen, 2008). Mont (2002) studied the service method to support the design of eco-efficient service. It was stated that in the relationship of the product services and the stages in the product life cycle, these services must enhance the performance in the three criteria of sustainable development, which are the business potential, the environmental stability, and the satisfaction of the customers who are the representatives of the social dimension. Apart from these criteria, the development of these services must coordinate with the product design in each product life cycle to reduce the environmental impact and encourage longer usability of the product. Therefore, the researcher determined three steps in the product service life: 1) Pre-Purchase Services; 2) Post—Purchase/Product Support Service; and 3) End-of-Life Service. The researcher incorporated concepts of service design and these are described in Figure 1.

Methods

Measurement Design

This research produced more precise questions regarding the specific details of each product. The 25-item questionnaire measuring the awareness of environmental impacts and consumption behavior with regard to eco-friendly furniture products was given to the corporate purchasers responsible for purchasing or selecting furniture designs for their company, as shown in Table 2.

The survey and questionnaire on customer demand regarding product features and service delivery used a 5-point Likert scale. Customer demand regarding furniture features, and product features affecting selection or desire was classified as: 1) basic features of furniture, 2) influence of fashion and design trends, 3) eco-friendly design process, 4) innovative, and 5) price.

Demand for service support at each stage of product life was defined with regard to the following three stages: 1) pre-purchase, 2) product support service, and 3) end of life.

The questions were evaluated using Item Objective Congruence (IOC) by a group of five professional experts in product design and environmental aspects. The IOC results revealed that no question received an average score below the minimum standard (.6) and Cronbach's alpha coefficient (α) was .867, which implied good internal consistency.

Sampling Techniques

The study applied a purposive sampling technique to engage the participating business organizations. The final

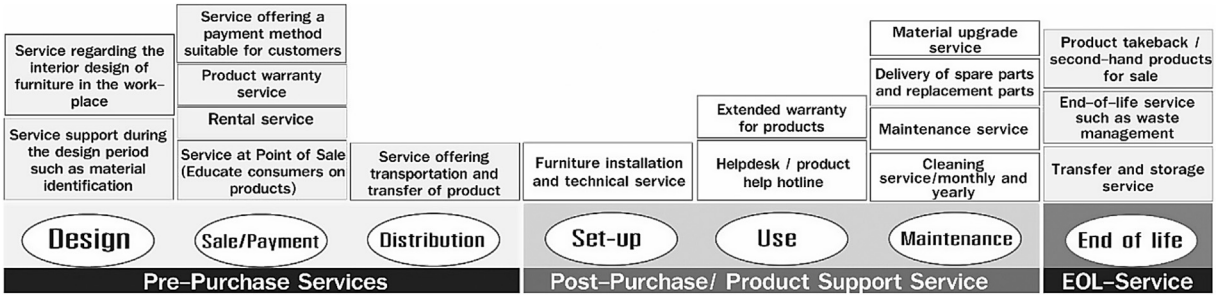

Figure 1 Product-related services focus on product lifecycle

Table 2
Sample questions and scoring criteria of the questionnaire

Dependent variable	Indicator	Question item	Level of importance				
		How important are these issues when considering a corporate furniture purchase?	Low>>>>High				
Environmental Awareness	De-Materialization	*-Prioritization of compact product design using less material*	*1*	*2*	*3*	*4*	5
		-Willingness to pay more for eco-friendly furniture products	*1*	*2*	*3*	*4*	5
	De- Toxification	*-Awareness of hazardous materials in furniture components*	*1*	*2*	*3*	*4*	5
		-Willingness to pick the product lower in pollutants from two similar furniture products	*1*	*2*	*3*	*4*	5
	De- Energization or De-Carbon	*-Focus on products which consume less electricity or fewer batteries when choosing innovative furniture*	*1*	*2*	*3*	*4*	5
		-Willingness to pay extra for clean- technology furniture production with lower CO_2 emissions	*1*	*2*	*3*	*4*	5
	De-Waste	*-Average furniture life of over 10 years and ability to repair*	*1*	*2*	*3*	*4*	5
		-Willingness to pay extra for end-of-product management, like storage, moving, and disposal	*1*	*2*	*3*	*4*	5
Effectiveness of consumption behaviors	Effective Usage	*-Regular replacement of new pieces of furniture rather than fixing the damaged or worn out ones*	*1*	*2*	*3*	*4*	5
		-Willingness to pay extra for furniture maintenance services to get a longer lifespan	*1*	*2*	*3*	*4*	5

selective group of business categorized by the guideline of Stock Exchange of Thailand (SET) was the service-business group which purchased the most substantial number of furniture products in Thailand. In more detail, the service-business sector located in Bangkok was categorized into six groups: (1) 3,028 hotels and temporary accommodation services, (2) 14,330 food and beverage services, (3) 338 educational services (4) 7,332 medical services, and other health providers, (5) 331 media and publishing services, and (6) 70 specialized services selected by the researcher (co-working space). Based on the telephone directory of businesses (Yellow pages) provided by TOT Public Company Limited, the request for survey consent forms was mailed to 394 companies and finally accepted by 124 companies to participate in this research during September to December 2017. The data retrieved from the survey was preliminarily classified by: 1) type of the organization, and 2) size of the organization (Table 3).

The data were statistically analyzed using the independent sample t-test and analysis of variance (ANOVA) for comparison of means between an independent variable and dependent variables. Data processing applied statistical calculations at a significance level of .05.

Table 3
Demographic analysis

Factor	Variable	Frequency	Percentage
1. Organization type	Government organizations	41	33.1
	Private organizations	83	66.9
2. Organization size	Small organizations (S) < 50 employees	70	56.5
	Medium organizations (M) 50–200 employees	26	21.0
	Large organizations (L) > 200 employees	28	22.6

Results

Analysis of Organizations' Characteristics Affecting Awareness of Environmental Impact Through Furniture Consumption Behavior

The analysis found that awareness of reducing environmental impact was at an average level in the government sector and private sector, where the combined average was Mean = 3.37. Overall, those in government organizations were more aware of environmental impact than those in private organizations. In addition, the results from the t-test demonstrated significant differences at the .05 level ($p \leq .001$), as shown in Table 4.

The ANOVA indicated that organization size had a significant effect on the awareness of environmental impact at $p \leq .001$. The results also showed that the average score of willingness to purchase environmentally friendly furniture in large organizations was higher than in medium-sized and small-sized organizations in all aspects, as shown in Table 6.

Consumer Needs Regarding Product Characteristics, According to Type of Organization

The basic characteristics of a product, its usefulness, and durability were at the highest level of need. The means of government and private organizations were significantly different in terms of the design with regard to the furniture components' suitability for recycling at $p \leq .001$ and the use of eco-friendly material components at $p = .006$. The mean of the former was higher that of the latter. On the other hand, the means of private organizations were higher than that of government organizations, in terms of the need for a compact, simple, and lightweight design at $p \leq .001$ and ability to upgrade and flexible product at $p = .033$, as shown in Table 7.

Table 4
Comparison of means and standard deviations of environmental-impact awareness, willingness to increase the budget to purchase eco-friendly according to organization type

Dependent variable	All (n = 124)		Government sector (n = 41)		Private sector (n = 83)		*t*-Value	*p*
	Mean	SD	Mean	SD	Mean	SD		
Overall	3.37	.334	3.50	.359	3.30	.301	3.321	.001*
De-Materialization	3.39	.405	3.44	.416	3.37	.400	.963	.337
De-Toxification	3.42	.492	3.63	.521	3.32	.446	3.248	.002*
De-Energization, CO_2	3.34	.409	3.48	.323	3.28	.432	2.601	.010*
De-Waste	3.40	.430	3.56	.461	3.32	.394	2.997	.003*

In other words, furniture usage behavior was less effective in government organizations than in private organizations, at $p \leq .001$, as shown in Table 5
*$p < .05$ level of significance

Table 5
Comparison of means and standard deviations of the effectiveness of furniture consumption behaviors, according to organization type

Dependent variable	All (n = 124)		Government sector (n = 41)		Private sector (n = 83)		*t*-Value	*p*
	Mean	SD	Mean	SD	Mean	SD		
Effective usage	3.35	.443	3.17	.350	3.45	.457	−3.478	.001*

*$p < .05$ is the level of significance

Table 6
Comparison of environmental-impact awareness, willingness to increase the budget to purchase eco-friendly furniture, according to organization size

Dependent variable	Small organizations (n = 70)		Medium organizations (n = 26)		Large organizations (n = 28)		F	*p*	*Post hoc* test
	Mean	SD	Mean	SD	Mean	SD			
Over All	3.26	.462	3.35	.563	3.90	.572	15.635	.000*	1,2 < 3
De-Materialization	3.36	.615	3.58	.578	3.96	.637	9.887	.000*	1 < 3
De-Toxification	3.50	.608	3.73	.533	4.07	.604	9.436	.000*	1 < 3
De-Energization,	2.90	.684	2.77	.765	3.71	.600	17.067	.000*	1,2 < 3
De-Waste	2.89	.692	2.92	.845	3.64	.870	10.278	.000*	1,2 < 3
Effective usage	3.70	.823	3.77	.587	4.11	.737	2.905	.059	–

*$p < .05$ level of significance

Consumer Needs in Terms of Service Delivery Methods

Overall, the need to provide services is the highest-ranked consensus in both groups, and there is a need for a way to deliver this. The means of the two groups regarding service during the product life cycle or post −purchase were higher than the means regarding service in the other periods. The mean of government organizations regarding the end-of- life service, this period was significantly higher than that of private organizations, at $p = .008$, as shown in Table 8.

Discussion and Recommendations

This part provides an overview of the situation on the environmental awareness issue through the purchase and use of furniture from corporate consumers' assessment. The findings are as follows. The government sector had significantly higher recognition on the importance of environmental impacts when purchasing furniture than their private counterpart at $p \leq .001$ and both sectors were typically moderate (3.37). For the size of organization issue, the results revealed that large organizations had higher recognition on environmental issues than medium and small organizations at $p \leq .001$. These research findings were in agreement with the studies by McMurray, Islam, Siwar, and Fiend (2014) and Testa, Annunziata, Iraldo, and Frey (2016) that found organizations with different management policies and managerial structures, sizes, and investments willingly associated with the organizations' green procurement (GP) approach. The researcher further investigated open-ended questions in the questionnaire; overall data could be analyzed and that there probably were latent variables associated with organizations' purchasing of eco-products such as personal insights into environmental impacts of the products, clear policies, commitment on GP, and CSR guideline, which were adopted by the organizations. The results also indicated that some organizations (mostly autonomous university samples) had initiated to procure eco-friendly products and services. Min and Galle (2001) suggested that differences between large and small organizations could be reduced if they promoted relevant personnel to learn more about awareness and understanding of environmental issues. Another recommendation is that manufacturers should provide customers information or an approval label for

Table 7
Analysis of consumer need with regard to furniture characteristics

Dependent variable	Government sector (n = 41)			Private sector (n = 83)			*t*-Value	*p*
	Mean	SD		Mean	SD			
Overall	4.14	.392		4.17	.347		−.309	.758
Factors regarding the basic features of furniture								
1. Durability	4.39	.494	2	4.60	.492	1	−2.25	.026*
2. Usability	4.76	.435	1	4.54	.525	3	2.40	.018*
Factors regarding ecodesign								
3. Simple design, compact size, lightweight	3.83	.972		4.31	.603		−3.40	.001*
4. All-in-one design reducing the usage space	4.34	.693	3	4.12	.651		1.74	.084
5. Eco-friendly material components	4.32	.610	5	3.95	.714		2.80	.006*
6. Upgradeable and flexible product	3.90	.664		4.17	.640		−2.15	.033*
7. Design for ease of maintenance and repair	4.20	.459		4.36	.596		−1.71	.090
8. Design for recyclability and dissemination	4.22	.419		3.83	.601		3.71	.000*
9. Symbol identifying material type and the method of disposal	3.80	.601		3.57	.666		1.93	.055
Factors regarding fashion and design								
10. Design with long-lasting usage in mind	4.22	.525		4.51	.503	4	−2.89	.005*
11. Colorful pattern and coating	4.34	.575	3	4.51	.527	4	−1.58	.115
12. Design follows trends in furniture design	3.59	.706		3.75	1.15		−.961	.339
Factors regarding innovative technology.								
13. Innovative functionality	3.95	.631		3.60	.697		2.79	.006*
Factors regarding prices								
14. Reasonable pricing	4.24	.489		4.58	.497	2	−3.56	.001*

*$p < .05$ level of significance

Table 8
Analysis of means and standard deviations of needs regarding service methods

Dependent variable	Government Sector (n = 41)			Private Sector (n = 83)			*t*-Value	*p*
	Mean	SD		Mean	SD			
Overall	4.14	.392		4.17	.347		−.309	.758
Pre-Purchase Services (All)	4.21	.422		4.18	.426		.328	.743
1. Service at point of sale (educate consumers on products)	4.10	.583		4.07	.488		.254	.800
2. Service support during design period such as coloration	4.10	.625		4.45	.569	3	−3.105	.002*
3. Service the interior design of furniture in the workplace	4.10	.735		4.08	.886		.082	.934
4. Rental service (replacing the purchasing method)	4.02	.724		3.96	.788		.413	.680
5. Product warranty service	4.29	.602		4.33	.543	4	−.303	.762
6. Service offering a payment method suitable for customers	4.12	.678		4.19	.614		−.584	.561
7. Service offering transportation and transfer of product	4.78	.419	1	4.75	.437	1	.407	.685
Post−Purchase/Product Support Service (All)	4.27	.420		4.22	.370		.742	.459
8. Furniture installation and technical service	4.56	.550	3	4.33	.521	4	2.328	.022*
9. Helpdesk/product help hotline	3.98	.570		3.87	.658		.944	.348
10. Cleaning service/monthly and yearly	4.15	.615		4.07	.558		.672	.503
11. Maintenance service	4.59	.499	2	4.59	.564	2	−.048	.962
12. Delivery of spare parts and replacement parts	4.39	.494	4	4.22	.564		1.675	.096
13. Material update/upgrade service	4.15	.527		4.25	.678	5	−.883	.379
14. Extended warranty for products	4.12	.640		4.22	.606		−.806	.422
End-Of-Life Service (All)	4.20	.271		4.10	.364		2.719	.008*
15. Transfer and storage service	3.76	.582		3.71	.690		.361	.719
16. End-of-life service such as waste management	4.34	.617	4	3.84	.833		3.392	.001*
17. Product takeback/second-hand products for sale	4.32	.471	5	4.18	.497		1.461	.147

* $p < .05$ level of significance

environmental criteria products because the study results revealed that most consumers were unaware of environmental information on the products, making them unable to compare their environmental impacts. Overall consumer demand for product features and service delivery of the furniture revealed that public and private organizations had comparable basic demands for furniture. However, they had different needs on the ecodesigns of products and services. This suggested that the PSS concept could be developed and implemented to create new business opportunities within the relationships of furniture manufacturers and suppliers and promote new jobs, for example, maintenance or whole PSS lifecycle.

Currently, in Thailand, there exist no regulations governing the procurement of eco-friendly products and services, and each organization is free to adopt GP for its purchasing. This results in a lack of continuity. From the study results, the researcher supports the notion that government agencies are the leaders in the procurement of eco-friendly products since they are the major group of consumers in the country. It is, therefore, believed that they can efficiently drive the procurement of products and services in environmental marketing into an immediate practice rendering a reduction of environmental impacts through consumption of eco-friendly products and services.

Conflict of Interest

There is no conflict of interest.

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