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THE EFFECT OF LOGISTIC BUSINESSES' GREEN WAREHOUSE MANAGEMENT PRACTICES ON BUSINESS PERFORMANCE

Abstract:

Due to the inevitable effect that businesses are living organisms, the concepts of sustainability and green have become the main values for many businesses. Today, the concept of sustainable green warehouse is commonly related with integration, balancing and management of economic, environmental and social inputs and outputs of operations in warehouses with green buildings. Sustainable green warehouse can be defined as the cluster of technological and organisational solutions designed for the efficiency of warehouse processes by maintaining the highest social standards and minimizing the effect on nature in terms of financial efficiency. However, businesses are aware that it is difficult to get effective and efficient warehousing and distribution services as third party logistics (3PL) for flows in supply chain in the present business environment. In this context, companies offering warehousing and distribution services should have values that provide them with competition advantage, increase their brand equities, and decrease operation costs such as green buildings, lighting systems with motion and time sensors, automatic handlings equipment that uses renewable energy, natural ventilating systems, solar panels, water treatment systems, ISO standards, and 5S philosophy. In near future, it will be understood that maintaining economic and operational efficiency, minimising damage to environment, and creating appropriate working environments can only be possible, and permanent via efficient management of green warehouses. The present study investigates the practice of sustainability principles in terms of warehouse, warehousing and distribution management. This paper explores the GWM practices and performance of the business an empirical analysis of logistic enterprises within Turkey.

Keywords:

Green warehouse management, Green warehousing, Performance, Environment, Green Economy

Introduction

Globalization and rapidly-growing technology have brought an increasing competitive setting along with them. And this situation makes the rivalry conditions among businesses even harder compared to past. For businesses, under these conditions, showing superiority against their rivals, increasing their profits or decreasing their costs are, without a doubt, possible with a sustainable developing strategy. Flexible businesses are, in an innovative world, capable of making the world know them, showing superiority to their rivals and having their place in the big markets.

Today, businesses headed to environmental issues especially to claim this rivalry superiority. As a result of this heading, businesses in different sectors focused on manufacturing goods and services which are environmentally-friendly and green practices gained importance. In this context, more environmental manufacturing, renewable and efficient power use, green building use, decreasing air and noise pollution, decreasing carbon emission, using more environmental vehicle fleet, storing and optimization of storing sites, optimized product movements and handling activities, waste management and green packaging are some of the practices performed in the name of environmental (Emmet and Sood, 2010).

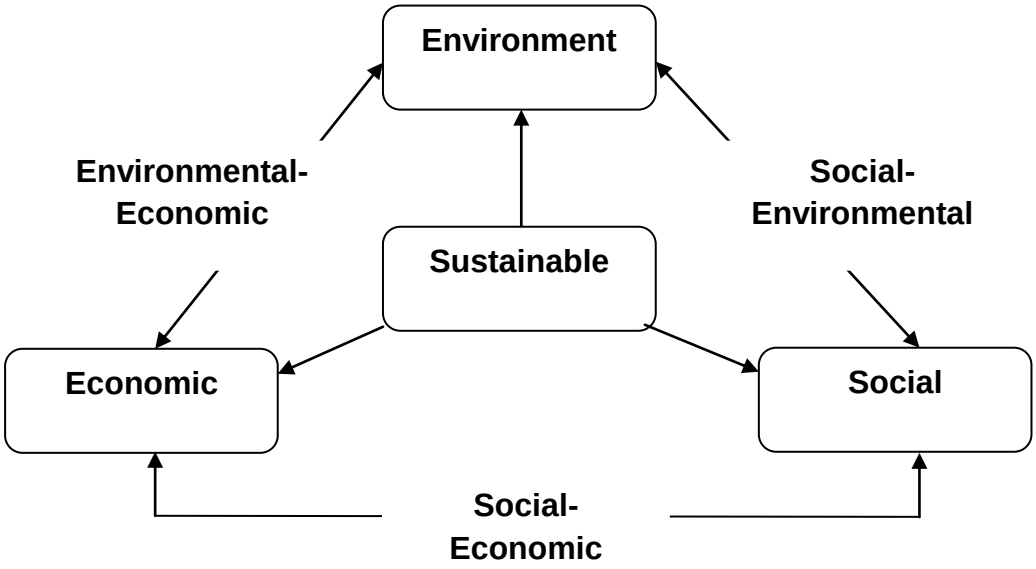
In Turkey as one of the developing countries, power use increases more and more every passing year. According to the Environmental Performance Index (EPI), Turkey is at the place of 99 with 67.68 points among 180 countries in the world (EPI, 2016). Turkey, within the 10 basic issues specified by EPI, had points of 79.03 in air quality, 74.43 health impacts 85.06 in water and sanitation, 78,99 in water sources, 87.04 in agriculture, 68.48 in forests, 57.82 in fishing, 22.53 in biological variety and habitat, and 47.77 in climate and power (EPI, 2016).

Sustainable development started to gain more attention with the release of Brundtland report in 1987. In this report, sustainability is referred as “the development where today`s needs are fulfilled to meet one`s own needs without threating the ability of future generations” (WCED, 1987).

Sustainable development is the entire equilibrium and integration among environment, social setting and economical setting (Nowako wska-Grunt 2008). Dimensions of sustainability are related to each other and any change in the aims of a dimension affects the other two dimensions significantly. In this context, developing a real understanding of the relatedness of these three dimensions and success of relations in dynamic structure of sustainability’s three dimensions among themselves can come to existence with a powerful top management support. (Tan et al., 2009). In the Figure 1, the relation between Sustainability and its dimension is shown.

World Sustainable Development Business Counsel emphasizes that sustainability is a necessity more than an option for businesses. (NZBCSD, 2002; WBCSD, 2003).

Figure 1 The relationship between sustainability and dimensions



Tan et al., 2009

Green Warehouse Management

Businesses did not realize how important the contribution provided to organized performance by logistic function is for a long time. In general logistic is connected systematically with the activities like transportation, storage, loading and unloading, packaging, distribution and distribution processes and information management (Wen and Gu, 2014: 878).

Today, businesses evaluate the factors like cost efficiency and customer satisfaction as the main performance indicators. However, Lindon et. al, and Quariguasi et. al, in their studies, emphasized / mentioned that businesses which give services in areas like product transportation and storing are changing their current work models towards sustainable models (Linton et al., 2007; Quariguasi et al., 2008).

In this context, today, generally sustainable green storage management is associated with integration, balancing and management of economic, environmental and social inputs and outputs of activities / operations in the storages with green building. Sustainable green storage can be defined as cluster of technological and organizational solutions designed for the productivity of the processes in the storage by minimizing the effect on the environment in terms of sustaining the highest social standards and financial productivity (Emmet and Sood, 2010: 135-136; Tan et al., 2009).

According to the report of World Business Counsel, 40% of emission of greenhouse gases in the world is caused by the buildings (WBCSD, 2007: 27).

In this context, green storage starts with green building. Design and construction of the building where the storage will be should be made according to the criteria of green storing. It is really crucial to for green buildings to have proper heat isolation, be

proper to storage requirements of products, and be suitable to climate conditions and the use of renewable and efficient power use in the storage. As a result of using solar panels in green storages, obtained renewable power can be used on heating and cooling of the storage, equipment and machinery used on the operations. Another important point for green storing is the optimization of the amount of used power used as a result of preferring storing equipment and tool with automation system in movements of products in the storage and stock management For instance, a proper air conditioning systems which will create a good inner air quality and eliminate pollution in the inner setting should be installed. Again, renewable tools like container, pallet, parcel, safe and box`s being in a standard size provide efficient stock, transfer, storing, handling and automation performance. In green storages, use of time illuminating systems, movement sensors and power-efficient illuminating armatures increases efficiency of power. Other issues that sustainable green storage management is interested in are followings (Emmet and Sood, 2010: 135-137):

- Creating suitable working conditions for the employees and decreasing power use in the storage processes with efficient planning,
- Increasing power efficiency with the use of time illuminating systems, movements sensors and power-efficient illuminating armatures,
- Using natural light in the proper places of the storage,
- Using hot water for the heating and cold water systems for the cooling of the storage,
- During the handling process, using tools which provide power efficiency (forklift, conveyor and automatic installing and collecting systems AS/RS)
- By making accurate guess of demand, manufacture and stock levels of marketing, sale, operation and logistic departments, integrating sale and operation processes
- By integrating supply chain, with information sharing among supplier, manufacturer and client, making accurate guessing and doing common action,
- By using Information and Communication technologies, sharing real-time sale data and updating stock levels and re-order status,

Sustainable green storage management helps companies to maximize correct inventory management and storing capacity (Wen and Gu, 2014: 878). Decreasing demand on storage activity is one of the advantages of logistic (Wen and Gu, 2014: 878). Following stocks livingly, determining re-order delivery durations should be provided with the minimum power use. Correct guessing of demand and order delivery durations causes a decrease on stock levels and areas. Creating minimum waste, providing correct area use in storages and decreasing investment, workmanship and use costs are the main goals of efficient stock management, to reach efficient, productive and good stock management, following criteria should be taken into consideration (Emmet and Sood, 2010:137):

- Decreasing stock level with correct demand guess,
- Better planning for fixed and known supply times and disposing uncertainties,
- By optimizing the supply policies among the players in the supply chain, decreasing cost of supply chain,
- During the storing processes, decreasing wasting, disposing ratio and recycling amounts by using less raw materials,

Today, 7 fundamental trends are taken into consideration for the design of sustainable green storages. First one of these trends is choice of storage place criterion.

One of the most significant strategic decision of a business is to determine where the storage will be constructed physically. In this context, criteria like workforce, transportations hallways, raw material, closeness to suppliers and customers, quality of life, financial profit and economic extent, environmental effects / footprints and social extent should be taken into consideration (Tan, Ahmet, and Sundaram, 2010: 874).

Businesses, to decrease power use in transportation and decrease environmental emissions, should make studies towards choice and installment of distribution plants which has network structure close to ports and/or clients (Napolitano, 2013: 1).

In literature, while deciding on the place of sustainability and optimal distribution center following criteria should be taken into consideration; (1) economic, environmental and social dimensions of sustainability, (2) qualitative criteria like employment, cost, customer relations, (3) co-relations among the dimensions of sustainability, (4) opportunities and risks, (5) strategic decisions like obeying legal terms or superiority of rivalry which the businesses may choose, (6) being in a relation with shareholders, (7) life cycle of the products (Tan et al., 2009; Farzad et al., 2009; Sarkis et al., 2010; Carter et al., 2008; Dyllick et al., 2002; Leach et al., 2010; Min et al; 200; Akkerman et al., 2010; Liu et al., 2008; Terouhid et al., 2012).

Second of these trend is illumination criterion. Illumination has always been one of the most popular attempts for sustainability since a storage create illumination with the 30% of total used energy. Coca-Cola Company that uses one of the popular illuminating system which is daylight sensor has decreased its power consumption. The studies shows that in the setting with natural light, efficiency and participation at work has an increase (Napolitano, 2013: 2).

Third of trends is recycling. Recycling, reusing and renewing which are the popular tendencies of sustainable design should be performed in accordingly with stage of storage planning, stage of construction and daily operations. In this context, prior to the construction of storage area use, materials to be used, power consumption and costs should be evaluated well for sustainability. In every part of the supply chain returnable plastic caps which provides efficiency and have standard designs should be used. A firm named IFCO system has minimized operational cost of their client by

using returnable plastic caps (RPC) and reducing wasting by 90% (Napolitano, 2013: 2).

Forth of the trend is the Net-Zero building practice. Net-Zero building has a substructure which can produce a year of power to use by itself. Optimization of power footprint performance is aimed. After determining optimal building power performance, a renewable energy strategy is formulated and power production is provided by placing solar panels to the roof of the storage (Napolitano, 2013: 2).

Fifth of the trend is smart building practice. It is also desired for storages to have a smart substructure as much as being green. There are various practices of these smart building or power management systems. The best practice which provides visibility for the performance of equipment and used power for the storage managers is the use of power sub-meter (Napolitano, 2013: 2). Power sub-meters are designed to be used places where the consumption points are dispersed like in factories, sites, hotels, big business districts, marina and places whose internal consumption should be inspected. There are preferred due to their small sizes, high measurement precision, having different models for various needs, being watchable from automation systems (TEDAŞ, 2015).

These data are later sent to web-based building management software for analysis and its opportunities for power and cost savings are expected (Napolitano, 2013: 2).

Sixth of the trends is the use of high-volume and low-speed fans (HVLS) in storages. HVLS fans which are designed to carry large columns of the air in low speeds help to regulate a plant's temperature by decreasing between 3 or 5 degree from floor to the ceiling. While providing a much comfortable working setting for the employees, it also causes a decrease on costs of heating and cooling around %12-50 (Napolitano, 2013: 2).

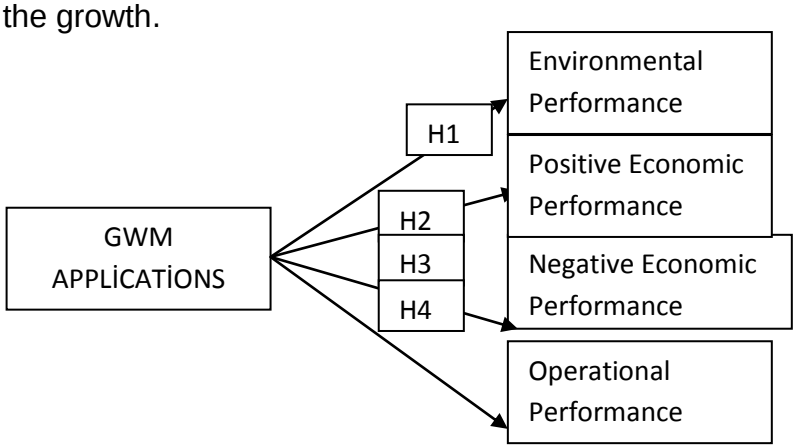
Last of the trends is good identification of the goals. Among many attempts, the most important one is the effective identification of the goal. In this context, why is there a goal of sustainability; to decrease cost of power or to create a consistent harmony with the goals of the company? (Napolitano, 2013: 2). Sustainable green practices, contrary to general belief, makes profit more than the cost in the long run (Emmet and Sood, 2010).

"Green Warehouse Management" Warehouse Companies in Turkish Logistics Industry

As the significance of logistic increases in the global scale, Turkish logistic sector also develops. Turkish logistic firms are in many different places of the world, and global multi-national logistic firms have also started operating with Turkish branches. For Turkish storage businesses to service internationally, along with the international regulation (especially Europe) issues like health, safety and environmental management (HSE), power use, disposal of waste, recycling, release of greenhouse

gases and emission, they also require to have proper work periods, sub-structure and service integrity. After the wave caused by the global “green” tendency, storage businesses that service in the Turkish logistic sector focused on environmentally friendly operations. Even though most of these companies are multi-national and international companies, small and moderate scaled businesses are becoming more and more aware.

In this context, firms that gives storing service in Turkish logistic sector should have an active role in national and international projects related to preserving environment, waste management and power efficiency. Turkish logistic firms should declare themselves as environmental in strategic management points and should focus on sustainable development. These companies should revise their organizational structure periodically and update their policies related to environment to adapt to the change and the growth.



H1: Green storage management practices affect environmental performance.

H2: Green storage management practices affect positive economic performance.

H3: Green storage management practices affect negative economic performance.

H4: Green storage management practices affect operational performance.

Methodology

The main aim of this study is to determine effect of businesses, managers that gives storage services in Turkish private and public sectors, and green storage management practices on the performance of the business. Within the scope of this aim, in this section related to the methodology of the study, information related to population of the study, sampling, sampling method, scales used in the study, their reliability and validity and how the collected date will be analyzed is given.

Population and Sample

The population of this study is consist of the first, medium and high level managers of businesses that give storing service in Turkish private and public sectors. In the study, quota sampling method is used and 453 valid questionnaire is analyzed.

Data Collection

Data used in this study consist of questionnaire responses of first, medium and high level managers of accommodation businesses. The questionnaire used in the study consist of, (a) adopting green storage management practices, (b) performance of the business.

Green storage management practices consist of 22 items. The performance scale consists of 20 items and gathered under 4 dimensions. It consists of environmental, positive, negative and operational performance. All scales are measured according to the Likert scale range of 5 (1=strongly disagree, 2= disagree, 3=neutral, 4= agree, 5=strongly agree). During the main practice, around 1000 questionnaires are distributed to businesses randomly, 453 of these returned and evaluate within the scope of the study. This ratio is accepted as sufficient for statistical analyses to be performed.

Reliability And Validity Of The Scales

For scales used in the studies to be reliable, their alpha value has to be at least .70. In the Table 1, when the Cronbach Alpha reliable factors are inspected relate to Green storage management practices and performance scales, it can be seen that reliability factors of 2 scales are high (α = > .70).

Table 1 Cronbach"s Alpha for Study Scales

Scales	Number of Question	Cronbach's Alfa (α)
GWM Applications	22	,897
Environmental Performance	5	,926
Positive Economic Performance	5	,907
Negative Economic Performance	4	,867
Operational Performance	6	,785

According to the result of correlation analysis, as it can be seen in Table 2, between GWM practices and environmental performance there is a meaningful relation in terms of positive and statistical view (r= 0,608; p= 0,000). Additionally, there is a meaningful relation between GWM practices and positive economic performance in terms of positive and statistical view (r= 0,574; p= 0,000). Also, between GWM practices and negative economic performance there is a meaningful relation in terms of positive and statistical view (r= 0,612; p= 0,000). Between GWM practices and operational

performance there is a meaningful relation in terms of positive and statistical view (r= 0,537; p= 0,000).

Table 2: Summary of Correlations Analysis and Descriptive Statistics

Scales	Mean.	S.D.	GWM Applications	Environmental Performance	Positive Economic Performance	Negative Economic Performance	Operational Performance
GWM Applications	3,33	0,24	1				
Environmental Performance	3,51	0,39	0,608**	1			
Positive Economic Performance	3,42	0,13	0,574**	0,737**	1		
Negative Economic Performance	3,49	0,25	0,612**	0,642**	0,649**	1	
Operational Performance	3,48	0,45	0,537**	0,678**	0,689**	0,680**	1

*p< ,001

Research Findings

In the study, primarily measures of central tendency such as frequency and percentage distributions are used for the classification of customer demographics. Then, exactly between GSCM pressure with GSCM practices and performance correlation analysis to test the relationship (Pearson); GSCM edition of the regression to explain the impact of the GSCM practices and performance (simple / linear) analysis was performed. All sections were analyzed separately obtained data about the results of the analysis are given in about one table.

Discussion

Demographic Information

Demographic information is given about the participants in Table 3.

Table 3: Demographic Results (n = 453)

		Frequency(f)	Percent (%)
Gender	Male	401	88,5
	Female	50	11,0
	Unanswered	2	0,4
	Total	453	100
Age	Between 18-29 age	120	26,5
	Between 30-49 age	289	63,8
	Between 50-65 age	32	7,1
	66 age and more	0	0
	Unanswered	12	2,6
	Total	453	100
Graduate	Primary school	4	0,9
	Secondary education	25	5,5
	High school	139	30,7
	Vocational school	61	13,5
	Bachelor's degree	190	41,9
	Master degree	28	6,2
	Doctor's degree	4	0,9
	Unanswered	2	0,4
	Total	453	100
Title	First Level Managers	111	36,8
	Mid-level Managers	160	53,0
	Senior Managers	22	7,3
	Unanswered	0	0
	Total	453	100
The Duration of Work Experience	less than one year	13	2,9
	1-3 years	47	10,4
	4-7 years	120	26,5
	8-11 years	99	21,9
	12 years	152	33,6
	and more	22	4,9

	Unanswered		
	Total	453	100
Ownership	State-owned	12	2,6
	Joint venture	43	9,5
	Foreign direct investment	6	1,3
	Private	383	84,5
	Unanswered	9	2
	Total	453	100
Service Network	Local	40	8,8
	Regional	141	31,1
	National	135	29,8
	International	113	24,9
	Global	13	2,9
	Unanswered	11	2,4
	Total	453	100
Warehaouse Type	General	4	0,9
	Contracted	25	5,5
	Cold storage	139	30,7
	Distributing center	61	13,5
	Warehaouse	190	41,9
	Others	28	6,2
	Unanswered	2	0,4
	Total	453	100

To test if the independent variable has an effect on dependent variable, simple linear regression analyses are carried out.

Table 4: GWM Between Practice and Performance Regression Analysis

Dependent	R^2	İndependent	B	Std. F.	t	p	F
GWM Applications	0,462	EP	0,176	0,036	4,928	0,000	96,304
		PEP	0,092	0,038	2,418	0,016	
		NEP	0,210	0,034	6,249	0,000	
		OP	0,029	0,042	0,702	0,483	

When Table 4 is inspected, it can be seen that GWM practices has an positive and meaningful effect on environmental, positive economic and negative performance; however, they have no effect on operational performance ($p<0,05$).

At the end of the study, it is analyzed that firms which adapt and perform GWM practices affect and increase environmental, positive economic and negative

economic performances. In this context, H1, H2 and H3 are supported. However, H4 is not supported

Conclusions and Recommendations

Today, the companies, due to the increase in environmental concerns and pressures of clients, have to integrate their supply chain with environmental management. Firms that give storage and distribution services within this context should have businesses with values like operation cost reducer, rivalry superiority provider and brand value increaser and take services like green buildings, movement and time sensor illuminating systems, handling equipment that are automatic and use renewable power, natural air conditioning systems, solar panels, water treatment and collecting systems, ISO standards and 5S philosophy. These values help businesses to be one step ahead of their rivals in the eyes of their clients.

Logistic, which is very essential for rivalry, provides opportunities to client to reduce the cost and creates value. Additionally, green logistic, by also operating, contributes to the preservation of limited resources on the world in the long run. Storage businesses which service in Turkish logistic sector have a better awareness to the environmental issues every passing day. In a near future, it will be understood that preservation of financial and operational productivity, minimizing the damage to the nature and creating suitable working setting will only and permanently be possible with the efficient management of green storages.

Sustainable and green practices will be adapted by the businesses with the help of legal and physical sub-structure which will be created by the government, pressure of client to manufacturers and manufacturers to suppliers, public opinion which the non-governmental organizations will create and news of the media on safety, health and environmental issues.

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