Resource Allocation: A moderator of the relationship of recycling strategy and organizational performance

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Abstract

The purpose of this paper is to examine the effect of recycling strategy on organizational performance by collecting and analysing data from the household appliance industry in Egypt. In addition, this paper also tests the effect of resource allocation as a moderator variable for the relations between recycling strategy and organizational performance. The proposed research model describes the impact of recycling strategy on organizational performance and the effect of resource allocation as a moderator variable for the relation between recycling strategy and organizational performance. The proposed research model describes the impact of recycling strategy on organizational performance and the effect of resource allocation as a moderator variable for the relation between recycling strategy and organizational performance. The proposed research model and hypotheses were tested using correlation analyses, regression analyses and structural equation modelling based on data collected from 89 companies in the Egyptian paper industry. According to the results of the study, recycling strategy are positively associated with organizational performance. Moreover, resource allocation moderates the relation between recycling strategy and organizational performance. The generalization of the study results may be limited by the size of the sample. This study provides a useful working model in the household appliance industry. The results suggest that using recycle strategy will contribute to improving organizational performance, and appropriate resource allocation will moderate the relation between recycle strategy and organizational performance.

Keywords: Recycling Strategy, Resource Allocation, Organizational Performance, and Egypt.

1. Introduction:

The aim of this research is to investigate different activities related to reverse logistics and its role in creating competitive advantages and improving the company's performance. One of the main activities related to reverse logistics is the disposition of the returned product without polluting the environment as well as reducing the cost of disposition. The current research investigated the effect of recycle strategy as one of disposition strategies on the company's performance and how to use such strategies to gain competitive advantages and create sustainability. Data from 108 companies in the Egyptian household appliance industry were collected and tested using Correlation Analyses, regression analyses and structural equation modelling.

Reverse logistics is the reverse flow of the product from the point of consumption to the point of producing the product. The product may be returned because it does not fit the customer need, or a part of a product, such as cans, can be returned to be recycled. We could differentiate between many reasons for returning a product such as the following: faulty order processing, retail overstock, end of product life cycle, product replacement, manufacture recall programs, installation or usage problems, warranty claims, etc. (Schatteman, 2006).

Managers are often unaware of the impact returns management can have on their customers, resources or bottom line. In fact, improving reverse logistics can help companies increase revenue up to 5% of total sales. Companies often

view returns as a cost of doing business and ignore the potential revenue opportunity. In the electronics industry, the average return rate on sales is 8%, but the return rate within subcategories can range from 4% to 15% (Schulze et al., 2014). This equates to \$14 billion in annual returns, and many of these products are not defective at all (Petersen and Kumar, 2010). Years of testing returned consumer electronics have established that the non-defective rate for consumer electronics remains at approximately 65% of total goods returned, meaning that only 35% of goods are actually defective (Schulze et al., 2014).

Recently, the topic of managing returns was also taken as part of research priorities, for its nature reverse flow is moving between different supply chain members from downstream to upstream (Guide and Wassenhove, 2009; Stock et al., 2010; Rogers et al., 2012). The functionally aligned approach to working across the supply chain has become critically important to ensure ongoing and profitable relationships (Blackburn et al., 2004). Therefore, the current research will follow the stream of such studies to try to minimize the gap in the literature. In today's business world, the concern is not only reducing costs to gain more profit, but there is also a shift toward achieving sustainability by achieving the concept of triple bottom line, which demonstrates the need to achieve a balance between social responsibility, environmental preservation and economic prosperity to achieve sustainability (Correa and Xavier, 2013).

This increase in scholar and practitioner focus reinforces the emergence of returns management as a key strategic capability for any organization within the supply chain. Reverse logistics as a part of any company's activities should be completed with the same concern to achieve the triple bottom line concept (Hazen, 2011; Greve and Davis, 2012).Dealing with returned products is one of the major activities related to reverse logistics; we could distinguish between several disposition strategies such as recycling and remanufacturing. Each strategy may have a different impact on the environment and company performance. Therefore, each strategy could be used as a tool for achieving competitive advantages and achieving sustainability (Skinner et al., 2008).

The current study focuses on handling returned products as one of the operations of reverse logistics. This would take place through identifying the impact of recycle strategy various on the performance level of the company. Moreover, the study identifies the effect of allocating resources to reverse logistics activities by the company on the hypothetical relation between the recycle strategy of returned products and organizational performance.

The research goals were translated in the following research questions: 1-How can reverse logistics performance most effectively be measured? 2-How do companies' use recycle strategy to gain competitive advantages?

2. Literature review:

2.1 Disposition Strategies

In 2001, Trebilock stated that the function of reverse logistics includes five consecutive activities, including: authorizing the collection of returned products from customers, transportation, auditing operations, handling returned products, and establishing a data system to track returned products. However, a group of researchers categorized reverse logistics as the second process of the reverse supply chain processes, which includes picking up the product, reverse logistics, auditing and handling returned products, recondition, and remarketing (Prahinski and Kocabasoglu, 2006; Blackburn et al., 2004; Guide and Wassenhove, 2003).

Meanwhile, in 2008, Skinner et al. described the process of handling returned products as the preparatory strategic step towards achieving high performance by the company. On the other hand, Kumar and Putnam (2008) said that companies could gain profits through handling returned products in the right way by remanufacturing and recycling. If companies adopted the strategy of accepting returned products from the customers to achieve customer loyalty, reverse logistics then becomes a vital function that contributes to achieving this strategy, eventually leading to a reduction in the costs of the product (Mollenkopf and Weathersby, 2003).

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For Fernandez et al. (2008), the adopted approach while handling returned products depends on the cost and value of the remanufactured products, the complexity of the product design, and the market value of the product. Meanwhile, in 2003, Norek stated that companies have at least five alternatives to address dispositions:

1-Reselling returned products as good as new products in case customers returned the product because of their dissatisfaction with its performance.

2- Repairing or resealing returned products and selling them as second-hand products.

3- Repairing or repack returned products and selling them as new products.

4- Reselling these products with low prices to scrap stores.

5- Selling these products by weight and not by unit to scrap stores.

Moreover, Skinner et al. (2008) pinpointed five disposition strategies for returned products through conducting interviews with a number of logistics managers. These strategies are:

1-Disposal: this strategy is used due to the inability to sell or use dispositions or if returning these products to the company is economically inefficient.

2- Recycling: this strategy is used in case the components of dispositions could be reused in the production of the same product or other products.

3- Reconditioning the returned products.

4- Remanufacturing.

The essential difference between reconditioning and remanufacturing a product lies in the effort needed to enhance and repair returned products. Remanufacturing requires more effort to enhance and repair a product; however, in both cases, returned products are sold right away.

5- Resealing returned products is used in case they did not need any reparation or reconfiguration.

According to Khor and Udin (2012), there are five disposition strategies, which are similar to those suggested by Skinner et al., 2008. These strategies are:

1-Repair: this strategy represents the efforts exerted to exchange or repair the damaged parts of the products to put them back to work in a natural way.

2-Recondition: this strategy involves taking apart the parts of the product that caused the problem to examine, repair or exchange them.

3-Remanufacturing: this strategy includes the total dismantle of the product to examine all of its parts to repair or exchange the damaged ones.

4- Recycling: in this strategy, the proper parts and components are taken out of the product to be reused.

5- Disposal: this strategy is used due to the inability to sell or use dispositions or if returning these products to the company is economically inefficient.

The most widely used strategy in Egypt to handle the returned product is recycling, that is why the current research focused only on the effect of using recycle strategy on the company performance.

2.2 Organizational Performance

According to Slater and Olson (2000), the basic literature hypothesis in the field of strategy application relies on a concept that states that different work strategies require different organizational practices in order to reach optimal performance. Here we notice that a company must efficiently and effectively apply its competitive strategy in a way that contributes to achieving competitive advantages and maintaining those (Morgan et al., 2004). Moreover, one of the important decisions that is linked to the competitive strategy of a company is the choice of returned product disposition strategies. The choice of strategy contributes to enhancing the organizational effectiveness in order to achieve excellent performance levels (Slater and Olson, 2000).

In addition, Khor and Udin (2012) stated that the interests and job descriptions of each organizational department in a company differ. Therefore, the standards of organizational performance will also vary according to different career fields. In the case of handling the function of logistics in general and returned product disposition strategies in particular, relying on financial standards only while measuring performance is not acceptable. However, the environmental dimension must be considered as one of the standards of measuring performance because of its effect on the environment.

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2.3 Allocating Resources

According to Peteraf (1993), the resources theory is based on a concept that states that resources, which are owned or controlled by a company, can contribute to creating competitive advantages for the company. However, these resources must not be copied or substituted by other competitors. The resources of a company include assets, capabilities, organizational process, organizational characteristics, information, knowledge, etc. The company controls these resources as they enable it to set and execute its strategy in a way that boosts the efficiency and effectiveness of the company (Barney, 1991; Daft, 1983).

There are two approaches in management literature that are concerned with the resources of a company. The first one is linked to research in the field of strategies, as it focuses on the importance of creating a link between the points of strength and weakness of a company while taking into consideration the chances and threats of the external environment (Das and Teng, 2000). Meanwhile, the second approach stresses the internal aspects of an organization, as studies in this approach focused on the impact of resources owned by the company on its level of performance (Conner, 1991). For their part, Closs and Xu (2000) stated in their study that the performance levels of the function of logistics vary according to the allocation of resources among companies, whereas statistical analysis of a survey conducted by Daugherty et al. (2001) about reverse logistics revealed that the allocation of resources has a direct effect on the capability of reverse logistics to achieve its targets.

Reverse logistics is no longer a tool for minimizing costs only, but it also helps improve sales performance, so reverse logistics will have a positive effect on the company profit margin. In addition, literature in the field of reverse logistics is also concerned with the environment and how companies will address returned products without polluting the environment (Jayaraman, 2007; Xie, and Breen, 2012). Huscroft et al. (2013) tried to identify the convergence and divergence between research and practice in the area of reverse logistics. Their results demonstrated that there is a convergence between research and practice in three issues: customer support, top management support and environmental issues. These three issues represent the future research in the area of reverse logistics (Huscroft et al., 2013).

Research in the area of supply chain in general and in the area of reverse logistics specifically represent an active and new area that still needs to be investigated. In particular, research is needed surrounding how to plan and manage reverse logistics in an efficient and effective way to achieve sustainability and keep the environment green (Govindan et al., 2014; Nuss et al., 2014).

In an in-depth reverse logistics literature review of 382 articles by Govindan et al. (2014), they discovered that reverse logistics from adaptation and implementation as well as the recycling perspectives has been covered empirically by several researchers. However, there is a need to explore the different disposition strategies like recycle and their effect on performance. In addition, Agrawal et al, 2015 stressed the need for future research covering the different disposition strategies and filling the literature gap, as they identified a small number of research papers that focused on the effect of disposition strategies.

The proposed research is an attempt to fill the literature gap related to reverse logistics activities in general and recycle strategy in particular and its impact on performance as well as how companies will use recycle strategy as a tool for achieving superior performance.

3. Development of research hypotheses

Previous reviews of the literature demonstrated that returned product disposition strategies in general and recycle strategy in particular have an impact on the level of performance. This impact controls the capabilities of the company to create competitive advantages. However, according to Daugherty et al. (2001) and Skinner et al. (2008), this effect is linked to allocating resources by the company in order to apply disposition strategies. Therefore, the following model was set to reveal the relation between the main variables of the current study.



Figure 1. Suggested research model

According to this model, the following hypotheses were set to examine the relation between the variables of the study:

H1. Recycle strategy have a significant impact on organizational performance.

H2. Allocating resources for recycle strategy will moderate the relation between recycle strategy and organizational performance.

4. Research design methodology

A survey has been developed to collect the data from the industry. The survey questions are presented in Table 1.

	Table 1. Survey Questions							
Recycling	-This strategy involves collecting used products from customers for recycling.							
Strategy	-This strategy involves collecting used packaging from customers for recycling.							
	-Procedures for recycling have been established.							
	-Procedures for handling hazardous materials for end-of-life products have been established.							
	-Recycling procedures reduce the amount of energy required for extracting virgin material.							
	-Material recycling is the re-melt of materials to make new products.							
	- Energy recycling is the extraction of heat from burning materials.							
	- Recycle involves disassembly up to material level.							
	- Recycle involves reusing materials from used products and components.							
	-Suppliers are required to collect back recyclable product.							
	-Suppliers are required to collect back recyclable packaging.							
	Source: Adapted from (Khor and Udin, 2012).							
Organizational	Please indicate the scale of business benefits that was apparent to your organizations for the past							
performance	three years (1: not at all, 2: a little bit, 3: to some degree, 4: relatively significant, and 5:							
	significant).							
	1-Environmental Outcome							
	- Significant reduction of air emission.							
	- Significant reduction of waste water pollution.							
	-Significant reduction of solid waste generation.							
	-Significant reduction of hazardous waste consumption.							
	- Minimal occurrence in environmental accidents i.e., spills.							
	- Minimal occurrence in fines or penalties pertaining improper waste disposal.							
	- Recognition or reward for superior environmental performance.							
	-Significant improvement in commitment towards environmental management standards or							
	practices.							
	2-Profitability							
	-Significant improvement in revenue from after sale services.							
	-Significant improvement in reclaiming reusable products.							
	-Significant reduction in inventory investment.							

	-Significant reduction in cost of goods sold for recovered products.
	-Significant reduction in the cost for purchasing raw materials, components or subassemblies.
	-Significant reduction in the cost of packaging.
	-Significant reduction in cost for waste treatment.
	-Significant reduction in cost for waste disposal.
	3-Sales Growth
	-Significant improvement in sales of used product at secondary market.
	-Significant improvement in sales of new products through price discounts.
	-Significant improvement in sales of new technologies by means of trade-in programs.
	-Significant improvement in market share.
	-Significant improvement in relationship with customer to encourage repeat buyers.
	-Significant improvement in corporate environmental reputation among environmentally
	conscious customers.
	-Significant improvement in sales growth.
	Source: Adapted from (Khor and Udin, 2012).
Resources	Please indicate the extent of existence of the following items at your company (1: very low extent,
allocation	2: low extent, 3: moderate extent, 4: high extent, and 5: very high extent of existence).
	1- The level of technological resource commitment to reverse logistics within your company.
	2- The level of managerial resource commitment to reverse logistics within your company.
	3-The level of financial resource commitment to reverse logistics within your company.
	Source: Adapted from (Skinner et al., 2008).

The current research focuses on the paper industry in Egypt, in which 136 working companies are involved, according to the CAMPAS 2017 statistical yearbook (http://www.capmas.gov.eg.). The survey was presented to the purchasing and production managers of the 136 companies working in the field of paper.

The survey was sent by mail and was followed up by a phone call to make sure that the survey was fulfilled by the purchasing and production managers in the targeted companies and to answer the managers' enquiries related to the questionnaire. A total of 89 surveys have been returned with a response rate 65%.

5. Data analyses and results

5.1 Measures of validity and reliability

According to Garver and Mentzer (1999), all measures must reflect convergent, discriminant and predictive validity and reliability. Additionally, in 1999, Koufteros indicated that the measurement model must fit the data relatively well. To measure the convergent validity, Ahire et al. (1996) suggested using the Normed-Fit Index (NFI) coefficient with a value greater than 0.90 representing strong validity; according to table 2, the NFI values for all variables exceeded 0.9, indicating strong validity for the measures.

According to Kenny (2012), poor discriminant validity means the correlation between two variables equals or is very close to one or minus one. Table 3 indicates that the range of correlation coefficient between two variables is between 0.235 and 0.589, showing high discriminant validity. To measure the predictive validity, the correlation matrix was built between all of the study variables. The study variables, according to Table V, are correlated, indicating the predictive validity (Ahire et al., 1996; Garver and Mentzer, 1999). Moreover, to measure the reliability of the variables, Cronbach's alpha has been measured for each variable. According to Garver and Mentzer (1999), all variables alpha exceeded 0.9, indicating sufficient reliability (see table 4).

To measure the fit between the measurement model and the data, the study's three variables were evaluated by conducting confirmatory analyses. The results of the analyses shown in Table 5 were: chi-square=2.245; SRMR=0.072; RMSEA=0.095; NFI=0.935; NNFI=0.945; CFI=0.962; IFI=0. 957. The previous results indicate a good fit between the measurement model and the data according to Kline (1998) and Koufteros (1999).

Dimensionality and convergent validity assessment results							
Scale	Relative χ^2	SRMR	RMSEA	NNFI	CFI	NFI	GFI
	λ						
Recycle strategy	2.975	0.634	0.086	0.91	0.91	0.945	0.862
Resources allocation Organizational performance	2.967	0.645	0.092	0.90	0.87	0.932	0.845
Environmental outcomes	2.835	0.689	0.093	0.92	0.95	0.962	0.835
Profitability	3.126	0.683	0.092	0.93	0.92	0.945	0.876
Sales growth	3.354	0.622	0.092	0.92	0.88	0.936	0.879

Table 3. Correlation Analysis							
Scale	Recycle strategy	Resources allocation	Environmental outcomes	Profitability	Sales growth		
Recycle strategy	1						
Resources allocation	0.473*	1					
Environmental outcomes	0.482**	0.589**	1				
Profitability	0.586**	0.475**	-	1			
Sales growth	0.466**	0.468**	-	-	1		

Correlation is significant at *0.05 and * *0.01 levels (two-tailed)

	Table 4. Reliability assessment results					
Scale	Cronbach's alpha	Construct reliability	Variance extracted			
Recycle strategy	0.97	0.98	0.86			
Pacources allocation	0.97	0.99	0.87			
Resources anocation	0.94	0.95	0.85			
Organizational performance						
Environmental outcomes						
Profitability	0.95	0.94	0.81			
Sales growth	0.92	0.93	0.80			

Construct/ measures	Standardized	<i>t</i> -value
	coefficients	
Recycle strategy		
RS1	0.93	13.91
RS2	0.91	12.75
RS3	0.92	12.32
RS4	0.93	12.94
RS5	0.90	12.44
RS6	0.86	11.35
RS7	0.94	13.89
RS8	0.93	12.90
RS9	0.89	11.75
RS10	0.88	11.32
RS 11	0.92	13.45
Resources allocation		
RA1	0.92	12.46
RA2	0.91	13.38
RA3	0.89	11.45
Organizational performance		
Environmental outcomes		
EO1	0.87	11.14
EO2	0.86	11.45
EO3	0.92	12.29
EO4	0.89	11.56
EO5	0.90	12.75
EO6	0.93	12.45
EO7	0.89	11.68
EO8	0.87	11.45
Profitability	5.67	11.10
P9	0.93	12.89
P10	0.92	12.46
P11	0.90	12.39
P12	0.91	12.33
P13	0.89	11 39
P14	0.83	10.25
P15	0.89	11.25
P16	0.85	10.36
Sales growth	0.05	10.50
SG17	0.89	11.45
SG18	0.09	11.45
SC10	0.92	12.07
SC17 SC20	0.94	13.49
SG21	0.09	11.30
SC22	0.84	10.89
SU22	0.89	11.49
3023	0.92	12.76

Table 5. Measurement model results Chi-square=2.245; SRMR=0.072; RMSEA=0.095; NFI=0.935; NNFI=0.945; CFI=0.962; IFI=0. 957.

5.2 Structural equation modelling results

The chi-square must be over 2.00 for the model to be accepted (Koufteros, 1999), and the chi-square value for the current research model is equal to 2.245. Moreover, the model NNFI value is 0.945, and the model CFI value is 0.962, indicating the validity of the suggested model according to Garver and Mentzer, 1999, and Koufteros, 1999. They also recommended that the value of NNFI and CFI must exceed 0.90 for the model to be accepted.

The hypothesized relationship between recycle strategy and organizational performance is positive and significant with an estimate of 0.59 and a t-value of 5.72, which recommended the acceptance of the first hypothesis. To test the effect of resources allocation as a mediator on the hypothesized relation between recycle strategy and organizational performance, the author carried out two regression analyses where the predictor variable (recycle strategy) and moderator variable (resources allocation) were entered in the first step and the interaction of the predictor and the relevant interaction term was entered second. Similarly, two other regression analyses were carried out with reference to profitability and sales growth. The results are presented in Table 6.

Regression of environmental outcomes on resource allocation and recycle strategy								
Step	Variable	R ²	Adjusted	ΔR^2	ΔR ² Sig	b	βα	Sig
_	entered		R ²		_			_
1	Resources					-0.435	-0.322	0.069
	Allocation							
	Recycle	0.685	0.683			0.229	0.191	0.412
	Strategy							
2	$RA \times RS$	0.687	0.68	0.051	0.011	0.150	0.854	0.91
Regression	of profitability	on resource	allocation and	l recycle stra	tegy			•
Step	Variable	R ²	Adjusted	ΔR^2	ΔR ² Sig	b	βα	Sig
	entered		R ²					
1	Resources					0.271	0.181	0.528
	allocation							
	Recycle	0.029	0.18			0.498	0.188	0.285
	Strategy							
2	$RA \times RS$	0.031	0.13	0.001	0.502	-0.52	-0.376	0.503
Regression	n of sales growth	on resource	allocation an	d recycle str	ategy			
Step	Variable	R ²	Adjusted	ΔR^2	$\Delta R^2 Sig$	b	βα	Sig
	entered		R ²					
1	Resources					0.741	0.667	0.000
	allocation							
	Recycle	0.681	0.676			-0.372	-0.315	0.067
	Strategy							
2	$RA \times RS$	0.683	0.676	0.003	0.287	0.042	0.189	0.288

Table 6	Moderating	effect c	of resource	allocation
I able 0.	moucramig		JI ICSOUICC	anocation

^a Coefficients from the final step

As shown in Table 6, the interaction of resource allocation and recycle strategy was significant in all the different the case of environmental outcomes (β =0.854; *p* < 0.01) explaining 5.1% of its variance. According to the previous results, the second hypothesis was partially accepted.

6. Discussion and Conclusions

The main outcome of the current study is that recycle strategy has a direct and significant effect on organizational performance. On the other hand, resource allocation moderates only the relation between recycle strategy and environmental outcomes. The previous results are consistent with the conclusion reached by Skinner et al., 2008, which states that repair and disposal strategies have a direct impact on the level of performance. In addition, they are consistent with the results of Khor and Udin (2012), which state that repair and recycling strategy has a direct impact on the company's profitability with the presence of resources allocation as a moderator variable that governs this relation.

According to Schulze et al. (2014), a large percentage of purchased goods in the household industries will be returned, which will affect profit, so companies need to use different disposition strategies to reclaim a part of the returned product cost. The current research finding supports the effect of used dispositions strategies (recycle) in the paper industry on performance. The working companies in the Egyptian paper industry should continue to use recycle

strategy as a tool for gaining a competitive advantage through reducing cost and improving performance. In addition, the companies need to allocate adequate resources for such strategy to make sure of its effectiveness.

The current study is one of the few studies in Egypt that evaluated the relation between one of the strategies of disposition and performance levels and also tackled the impact of resource allocation in this relation. Nevertheless, one of its points of weakness is its application on one industrial sector only. Hence, the hypotheses of the study must be reassessed and reapplied to different industrial sectors to form a clear image of the nature of the relation between the variables of the study in Egypt. In addition, this study has not taken into account external environmental variables such as laws and governmental legislations, which have an impact on the given relations between the variables of the study.

Finally, a number of recommendations could be set with the aim of attracting attention to disposition strategies and their impact on the environment:

1-The state and its institutions must set a number of mechanisms and legislations to contribute to the application and usage of different disposition strategies due to their positive effect on the environment.

2-Non-governmental organizations in Egypt must raise awareness of the importance of protecting the environment and its impact on the level of performance and profitability of companies.

3-The private sector and its different companies should work on passing on the experiences of companies in developed countries and the technologies used in handling dispositions in a way that maintains the environment.

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