The impact of buffer management on implementation of life cycle sustainability and triple bottom line: case study of Samsung Egypt

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Abstract

The main aim of this study is to determine the impact of buffer management on implementation of life cycle sustainability and triple bottom line for effective operational performance. This study is focused on case study approach. Questionnaires were used in this study. Empirical results show that only buffer management has an impact on implementation of life cycle sustainability for effective operational performance in Samsung Egypt, while the rest hypotheses have no impact. The study is applied in Samsung Egypt.

Keywords: Buffer management, life cycle sustainability, triple bottom line

الملخص

تهدف هذه الدراسة الى تحديد دور إدارة مخزون الأمان فى التطبيق الناجح للعمليات المستدامة لتحقيق أداء فعال للعمليات. وترتكز الدراسة على منهج دراسة الحالة وقد تم الاعتماد على الاستبيانات. وتشير النتائج التطبيقية إلى أن إدارة مخزون الأمان له تأثير فقط على التطبيق الناجح لدورة حياة العمليات المستدامة، وذلك لتحقيق الأداء الفعال للعمليات فى الشركة "أ". فى حين أن باقى النتائج تشير إلى أنه لا يوجد تأثير على الأداء الفعال للعمليات.وأخيراً هذه الدراسة تركز على شركة التصنيع "أ".

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1. Introduction

Egyptian manufacturing companies face a lot of problems and many other challenges, which are: increase of international competition in the Egyptian market, weak infrastructure of the public organizations and some private Egyptian organizations, scarcity of resources, low quality of suppliers in most Egyptian manufacturing industries, increasing of pollution and delays in deliveries to customers in the Egyptian market (Salaheldin and Eid, 2007).

Therefore, Egyptian organizations greatly aware the importance of buffer management and sustainable management in order to have a competitive advantage in the market, and also, for solving the problems facing them. Besides that, the implementation of buffer management and sustainable management has an effect on operations performance in the Egyptian manufacturing companies.

2. Statement of the Problem

According to the previously mentioned reasons, there is a necessity to empirically recognize the impact of buffer management inorder to have successful implementation of sustainable management in shape of life cycle sustainability and triple bottom line in Egyptian manufacturing companies. Furthermore, search is needed to clarify to what extent Egyptian manufacturing companies apply buffer system, and also, how buffer management leads to effective operational performance through its implementation.

3. Research Questions

To analyze the impact of buffer management on successful implementation of life cycle sustainability and triple bottom line for achieving effective operational performance.

Therefore, it was developed the following overall question, which is:

- What is the impact of buffer management on successful implementation of sustainable management for achieving effective operational performance?

4. Research objectives

The previously mentioned was the overall research question which will be answered by this current study. To do that, the following main objective of this current study was assigned to:

- Determine the impact of buffer management on successful implementation of life cycle sustainability and triple bottom line for achieving effective operational performance.

5. Importance of the study

The contribution of this study is mainly focused on the following:

- ***Firstly,*** the findings of this study will contribute to operations management literature in general and to buffer management and sustainable management literature in particular. This may provide some ideas for other researchers to conduct more researches in the field of buffer management and sustainable management.

- ***Secondly,*** there has been reported few researches about buffer management and sustainable management in less developed countries in general, and in Egypt in particular in operations management perspective. Therefore, this research will be a first attempt at reporting a story about the relationship among buffer management, sustainable management and effective operational performance.

6. Theoretical background

6.1 Buffer management

Cox III, J.F. & Schleier, J.G, (2010) mentioned that work centers in most times have interruptions, because of: resource breakdowns, process delays, etc. Production `s lead time is "lead time—it is the time taken to transfer the raw material to a finished part or product—it is equivalent to the total of process times and setup times for every step of the routing for that product."

A resource breakdown is an example of disruption that cause difficulty to deliver the product on time. As some types of disruptions are uncontrollable, planned lead times will have to be greater than the total of process and setup times.

Any task is exposed to variability, variability is defined as actual time that task is performed—started or finished—that is different from any plan which does not permit some degree of holding safety time. Through safety time, it is important to refer to time buffer. What makes the application of the time buffer concept exceptional and powerful is the explicit recognition, that connected to the goal of a drum-buffer-rope planning system. This goal is not to make each task to be on time as a planned schedule, but to make the actual flow through the system appropriately reliable to satisfy market demand and to keep throughput maximized. In other words, the objective is not to protect the ability of each task to be on time (to a plan) but to make sure that the entire system is on time to eliminate waste and to maximize throughput. According to what previously mentioned buffer management can be categorized to the following:

a- Specifically, a time buffer can be defined as: “A time buffer is extra lead time permitted, beyond the required setup and process times, for materials to flow between two specified points in the product flow”.

The objective of time buffers is to keep the system throughput from the internal disruptions that are existed in any process. The relationship between production lead time and process times can be expressed by the following relationship (Production lead time = Sum of process times and setup times +Time buffers).

The only way to guarantee that the flow at the end of the system matching the promised due dates is to deliver protection from disruptions by using time buffers.

b- The capacity buffer is defined as “the protective capacity of both constraint and non-constraint resources that permit these resources to be protected”.

c- The Stock buffers are defined as “a quantity of physical inventory kept in the system to protect the system’s throughput”.

d- The space buffer as “Physical space is found directly after the constraint that can adapt output from the constraint when there is a stoppage downstream that would otherwise force the constraint to stop working”

Buffer management should be utilized on each of these types of buffers to confirm that the effective operation of the constraint and high due date performance are achieved. They should also be controlled to confirm that they are not too large. Time buffers effect lead time, while stock buffers effect inventory investment.

6.2 Sustainable management

Kleindorfer, Singhal & Wassenhove (2005) mentioned that the main aim of sustainable management is to harmonize the environmental, health and safety concerns with green product design, lean and green operations and closed-loop supply chains. And they also, stated that organizations focus on profit, people and planet through their operations.

Liyanage (2007) mentioned that operations sustainability is:“...adjusting business strategies and activities that meets the wants of wider stakeholders of a commercial business (e.g. manufacturing, production, process) and also of the operator or the owner of the plant in question, through processes and products that has well-balanced and positive economic, social, and environmental implications”.

Based on the previously mentioned definitions, sustainable management can be composed of: life cycle sustainability and triple bottom line in order to be studied.

6.3 Life cycle sustainability

Life cycle sustainability consists of the following factors:

- Reduce resource utilization: Implementation of enhanced advanced technology and method by use of fewer materials or energy efficiency methods within product and process level and targeting for less by product waste during operations. For example, yearly budget plan for evolving new advanced technology and financial stability for development (high growth rate), implementation successful rate for new technology or method.

- Recyclability of returned product: Always pursue an opportunity for increasing usage of recyclable materials when designing new products and processes. These designs should not have impact on the functional capability and the utilization of returned products. For example, recovery rate (i.e. first use and subsequent use on within post-use processes), transportation efficiency, usage demand oppose consumption plan, negotiation opportunity for product recovery (i.e. increase recyclability rate with less original materials upon agreement from customers, etc.), disposal options, quality performance, durability or upgradeability.

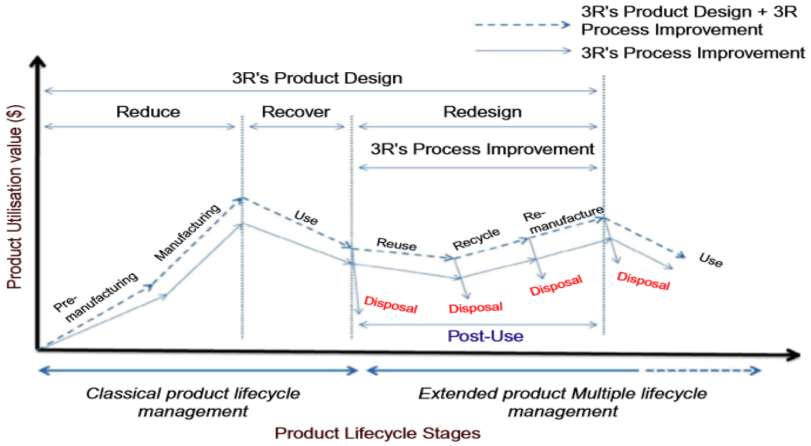
- Reusability of returned product: Utilize usable condition of equipments, in-process packaging, etc. or always seek for any secondary market opportunity for a product having reused components (e.g. consider reusable products in developing countries) or by-product waste that has reused potential and option for other industries.

- Recoverability of returned product for further processing: It is the ability of organizations to have technology concerns with the processes of recovering used components in products.

- Remanufacture ability of returned products as usable product: Additional involvement on reprocessing or refurbish/repair of returned products or components to conserve its original identity or preferably rebuild with most reused components or parts for this operational approach after use or post-use stage.

- Redesign future post-use processes as usable products: Implementation of advanced technology and methods by incorporating 3R's (recycling, reuse and remanufacturing) processes improvement levels as a foundation for redesigning any product or component to extend its usage lifecycle (less energy/resource usage, modular design for easy recycling, reuse and remanufacture, unique identity to the returned product, etc.). For example, development of future post use processes (i.e. modular design (e.g. per cent of change against previous design), reduction on hazardous materials (e.g. per cent of reduction in usage), ease of installation and mobility, etc.).

The following diagram shows operations sustainability processes:



Kuik, Nagalingam, & Amer, Y. (2011), "Sustainable supply chain for collaborative manufacturing", PP.990.

Liyanage (2007) clarified that triple bottom line refers to the following sustainable operations:

- Economical sustainable operations focus on; cost and investments related to RAMS (reliability, availability, maintainability, supportability processes), life-cycle costs of usage, life cycle profit earnings of commercial applications, etc.
- Social sustainable operations focus on; hazard exposure due to product characteristics, operability interface, usability design, customer service packages, warranties, etc.

- Environmental sustainable operations focus on; eco-friendliness, material re-usability, waste production under commercial applications, etc.

6.4 Research hypotheses

The hypotheses were developed through literature review, they are as follows:

H3.1. There is a significant impact of buffer management on successful implementation of life cycle sustainability for achieving effective operational performance.

H3.2. There is a significant impact of buffer management on successful implementation of economical sustainable operations for achieving effective operational performance.

H3.3. There is a significant impact of buffer management on successful implementation of environmental sustainable operations for achieving effective operational performance.

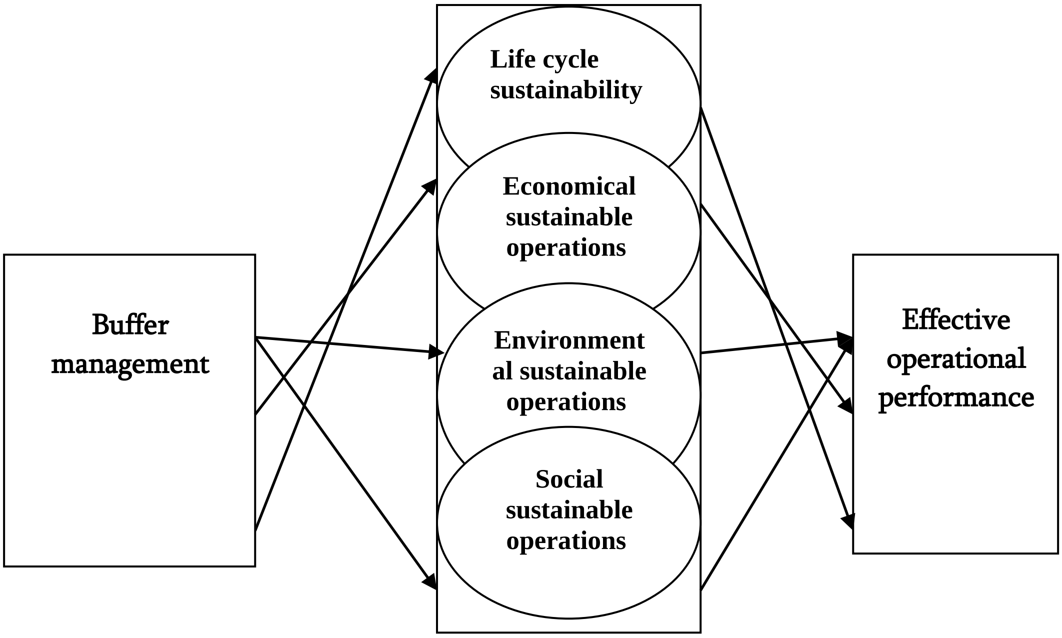
H3.4. There is a significant impact of buffer management on successful implementation of social sustainable operations for achieving effective operational performance.

6.5 Study Methodology

6.5.1 Research model

Inorder to understand the research problem and fulfill its objectives, so, research model is formulated to help researcher in collecting data and analyzing it.

Research model is based on pilot study and literature review. This research model clarifies variables and their relations which are identified in the following diagram.



6.5.2 Variables of the research

The research design identifies the variables of the research which are mainly based on literature review of the following studies: Nieminen, J.(2014), Kumar, V. & Christodoulopoulou, A., (2013), Ellis, S.C. (2011), Kuik, S.S., Nagalingam, S.V. & Amer, Y. (2011), Singh, T.P., Bisht, N.S., & Rastogi, M., (2011), Cox III, J.F. & Schleier, J.G, (2010), Inman, R.A., Sale,M.L., & Green Jr, K.W., (2009), Pitt,M., Matthew,T., Riley,M.,& Longden J.(2009), Gill, D. L., Dickinson, S.J., & Scharl, A. (2008), Gupta, M.C., & Boyd, L.H., (2008) , Liyanage, J.P., (2007), Kleindorfer, P.R., Singhal, K., &Wassenhove, L.N.V., (2005), Rahman,Sh., (1998) Motwani, J., Klein, D., &Harowitz, R., (1996),Goldratt, E.M. (1990).

Variables of the research are divided into three categories, which are:

- Independent variable: buffer management.
- Mediator variable: sustainable management is composed of the following sub variables: life cycle sustainability, economical sustainable operations, environmental sustainable operations and social sustainable operations.
  - Dependent variable: effective operational performance.

6.5.3 Construction of the questionnaire

In this study, the questionnaire is based on the impact of buffer management on successful implementation of life cycle sustainability and triple bottom line for effective operational performance; this questionnaire is designed as a five-point Likert scale.

The items of this questionnaire were constructed based on literature review, as the following:

Ch., & Ray, A., (2015), Bourlakis, M., Maglaras, G., Gallear, D., & Fotopoulos, Ch., (2013), Chen, L., Olhager, J. & Tang, O., (2013),Cox III, J.F. & Schleier, J.G, (2010), Ellis, S.C. (2011), Gill, D.L., Dickinson, S.J., & Scharl, A. (2008), Goldratt, E.M. (1990), Gupta, M.C., (2008), Goldratt, E.M. (1990), Gupta, M.C., & Boyd, L.H., (2008), Inman, R.A., Sale,M.L., & Green Jr, K.W., (2009), Kleindorfer, P.R., Singhal, K., &Wassenhove, L.N.V., (2005), Kuik, S.S., Nagalingam, S.V. & Amer, Y. (2011), Kumar, V. & Christodoulopoulou, A., (2013), Liyanage, J.P., (2007), Motwani, J., Klein, D., &Harowitz, R., (1996), Nieminen, J.(2014), Rahman,Sh., (1998) Pitt,M., Matthew,T., Riley,M.,& Longden J.(2009), Verma, R., (1997), Watson, K.J., Blackstone, J.H., & Gardiner, S.C., (2007), Woeppel, M.J.(2001).

The modifications made to this questionnaire were determined by the researcher's own knowledge on conditions of the Egyptian industrial sector situation and the theoretical issues are discussed previously in literature review and also depending on pilot study.

Having established an approximate schedule of questions relevant to the issues under investigation in the current study, i.e. the impact of buffer management on successful implementation of life cycle sustainability and triple bottom line for effective operational performance, a pilot study was conducted to confirm whether the theoretical and practical issues identified by the researcher were appropriate to the manufacturing environment.

Questionnaire was provided in Arabic language since Arabic is the main language. The Arabic version was translated from English and then back translated to ensure equivalency. The questionnaire was validated (face validity) by 30 managers in the case study in the practical stage.

6.5.4 Reliability of the questionnaire

- buffer management: Cronbach's α of buffer management is 0.629 > 0.60, as the lower limit of Cronbach's α is 0.60, it will be accepted and will not remove any item in order to keep the factor from any change in its variables.

- life cycle sustainability: Cronbach's α of life cycle sustainability is 0.853 > 0.60, as the lower limit of Cronbach's α is 0.60, it will be accepted and will not remove any item in order to keep the factor from any change in its variables.
- economical sustainable operations: Cronbach's α of economical sustainable operations is 0.765 > 0.60, as the lower limit of Cronbach's α is 0.60, it will be accepted and will not remove any item in order to keep the factor from any change in its variables.
- environmental sustainable operations: Cronbach's α of environmental sustainable operations is 0.711 > 0.60, as the lower limit of Cronbach's α is 0.60, it will be accepted and will not remove any item in order to keep the factor from any change in its variables.
- social sustainable operations: Cronbach's α of social sustainable operations is 0.684 > 0.60, as the lower limit of Cronbach's α is 0.60, it will be accepted and will not remove any item in order to keep the factor from any change in its variables.

- effective operational performance: Cronbach's α of effective operational performance is 0.648 > 0.60, as the lower limit of Cronbach's α is 0.60, it will be accepted and will not remove any item in order to keep the factor from any change in its variables.

6.5.5 Sample

In this study, the population is the Egyptian electronic appliances companies and the sample is Samsung Egypt which is a leading electronic appliances company. This company was selected for its relative importance in comparison with the rest

Egyptian electronic appliances companies on the bases of investment, number of workers and value of production.

In this study data is collected through targeting managers in Samsung Egypt. The researcher distributed 30 questionnaires in the company; these questionnaires are directed to top managers and middle managers. Samsung Egypt is a private sector company, located on 6th October City (industrial zone).

30 questionnaires were sent to managers in Samsung Egypt.

Sent questionnaires	30
Total responses	27
Final usable responses	27
Response rate as percentage of sent questionnaires	90 percent

Table 1: research sample

The total response rate is 90 percent, which is acceptable rate to work from.

7. Case study of Samsung Egypt

7.1 Samsung Egypt profile

In the following table a description for Samsung Egypt that provides detailed information about the current situation for it as a step-in order to understand the environment of Samsung Egypt.

General characteristics	Samsung Egypt
Product	**Electronic appliances**
Investments	**Around 1.7 billion L.E**
Production strategy.	**Assembly to order**
Automation	**Almost automated by (80%)**
Order winner	**Delivery and quality**
Layout type	**Product layout**

Profit (%)	**Increased around 10%**
Cost (%)	**Decreased around 8%**
Buffer status (%)	**Around 35%**

7.2 Problem analysis of case study

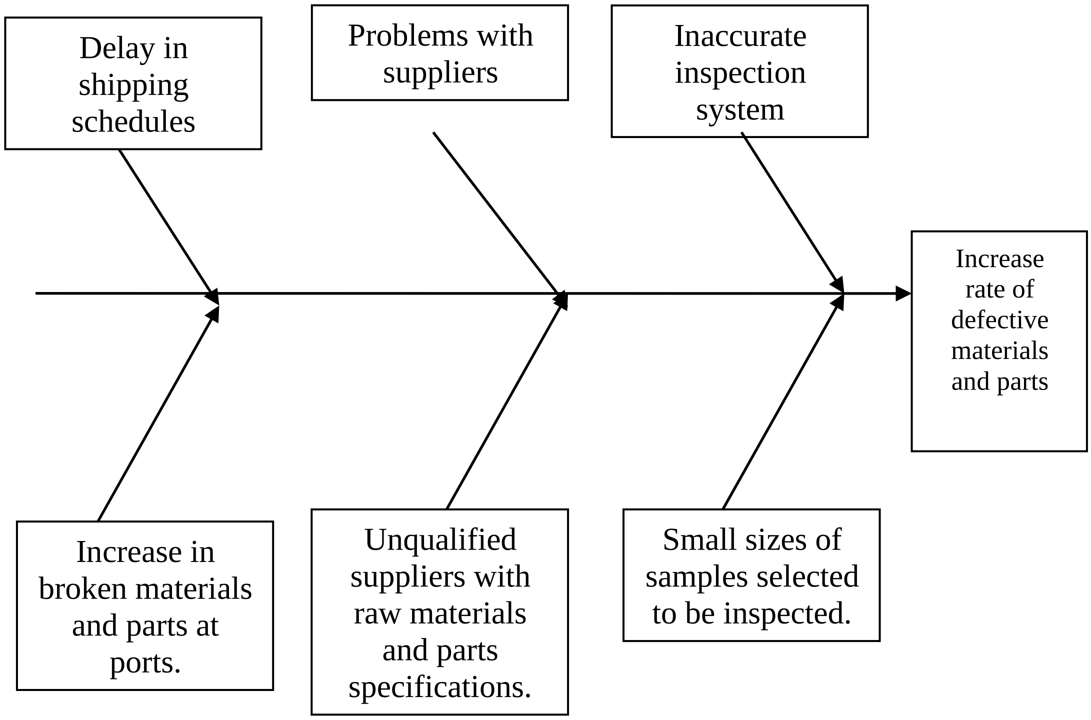
Samsung Egypt nowadays suffers from a critical problem which increased recently because of rising in value of dollar which affected the quantity of imported raw materials and imported parts to be assembled, this problem commonly can be resembled in stoppage of production line of televisions and washing machines.

The reasons can be concluded in the following points:

- Samsung Egypt faces great problem because increase in foreign currency (dollar) which leads to keeping raw materials and imported parts in ports for long time which expose it for damage and increasing defective parts percentage and also, delays in shipping dates.

- Samsung Egypt faces huge problems with identifying inspection system and accurate sample size for inspection as in some cases defective parts in the sample reached to 50%.

- Samsung Egypt suffers from problems with suppliers as some of suppliers do not know how to deal with special specifications of recycled parts.



7.3 Data Analysis of Samsung Egypt

H1.1. There is a significant impact of buffer management on successful implementation of life cycle sustainability for achieving effective operational performance.

Table 2: regression weights

Dependent variable / Independent Variable	Life cycle operations sustainability		Effective operational performance	
	Estimate	**P**	**Estimate**	**P**
Buffer Management	**-0.135**	**0.558**	**-0.512**	*******
Life cycle sustainability			**-0.054**	**0.582**
R^2	**0.088**		**0.125**	

a- The value of estimate for buffer management as an independent variable and effective operational performance as a dependent variable is -0.512 which means that buffer management has a negative effect on effective operational performance, estimate value can be explained through the following results:

- The value of estimate for buffer management as an independent variable and life cycle sustainability as a mediating variable is -0.135 which means that buffer management has a negative impact on successful implementation of life cycle sustainability.
- The value of estimate for life cycle sustainability as a mediating variable and effective operational performance as a dependent variable is -0.054 which means that life cycle

sustainability has a negative effect on effective operational performance.

b- This hypothesis is not significant as p value is more than 0.05 (p value= 0.558), this can be interpreted as buffer management has an impact on successful implementation of life cycle sustainability for achieving effective operational performance.
This can be explained through the following results of the variables relationships:

- the hypothesis is not significant as p value is more than 0.05 (p value = 0.558), this can be interpreted as buffer management (independent variable) has an impact on successful implementation of life cycle sustainability (mediating variable).
- the hypothesis is not significant as p value is more than 0.05 (p value = 0.582), this can be interpreted as life cycle sustainability (mediating variable) has an impact on effective operational performance (dependent variable).

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on effective operational performance (dependent variable).

c- R-square indicates that 8.8% of the variation in the mediating variable ‘life cycle sustainability’ is explained by the variation in the independent variables ‘buffer management’.

- R-square indicates that 12.5% of the variation in the dependent variable ‘effective operational performance’ is explained by the variation in the independent variables 'buffer management'.

H1.2. There is a significant impact of buffer management on successful implementation of economical sustainable operations for achieving effective operational performance.

Table 3: regression weights

Dependent variable / Independent Variable	Economical sustainable operations		Effective operational performance	
	Estimate	**P**	**Estimate**	**P**
Buffer management	**0.323**	***	**-0.168**	***
Economical sustainable operations			**-0.320**	***
R^2	**0.114**		**0.191**	

a- The value of estimate for buffer management as an independent variable and effective operational performance as a dependent variable is -0.168 which means that buffer management has a negative effect on effective operational performance, estimate value can be explained through the following results:

- The value of estimate for buffer management as an independent variable and economical sustainable operations as a mediating variable is 0.323 which means that buffer management has a positive effect on economical sustainable operations.
- The value of estimate for economical sustainable operations as a mediating variable and effective operational performance as a dependent variable is -0.320 which means that economical sustainable operations has a negative effect on effective operational performance.

b- this hypothesis is significant as p value is less than 0.05 (p value=*** means that p value < 0.001), this can be interpreted as buffer management has no impact on successful implementation of economical sustainable operations for achieving effective operational performance.

This can be explained through the following results of the variables relationships:

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on successful implementation of economical sustainable operations (mediating variable).

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as economical sustainable operations (mediating variable) has no impact on effective operational performance (dependent variable).

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on effective operational performance (dependent variable).

c- R-square indicates that 11.4% of the variation in the mediating variable ‘economical sustainable operations’ is explained by the variation in the independent variables ‘buffer management’.

- R-square indicates that 19.1% of the variation in the dependent variable ‘effective operational performance’ is explained by the variation in the independent variables ‘buffer management’.

H1.3. There is a significant impact of buffer management on successful implementation of environmental sustainable operations for achieving effective operational performance.

Table 4: regression weights

Dependent variable / Independent Variable	Environmental sustainable operations		Effective operational performance	
	Estimate	P	Estimate	P
Buffer management	**0.367**	*****	**-0.147**	*****
Environmental sustainable operations			**-0.339**	*****
R^2	**0.191**		**0.170**	

a- The value of estimate for buffer management as an independent variable and effective operational performance as a dependent variable is -0.147 which means that buffer management has a negative effect on effective operational performance, estimate value can be explained through the following results:

- The value of estimate for buffer management as an independent variable and environmental sustainable operations as a mediating variable is 0.367 which means that buffer management has a positive effect on successful implementation of environmental sustainable operations.

- The value of estimate for environmental sustainable operations as a mediating variable and effective operational performance as a dependent variable is -0.339 which means that environmental sustainable operations has a negative effect on effective operational performance.

b- this hypothesis is significant as p value is less than 0.05 (p value=*** means that p value < 0.001), this can be interpreted as buffer management has no impact on successful implementation of environmental sustainable operations for achieving effective operational performance.

This can be explained through the following results of the variables relationships:

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on successful implementation of environmental sustainable operations (mediating variable).

  - the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as environmental sustainable operations (mediating variable) has no impact on effective operational performance (dependent variable).

  - the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on effective operational performance (dependent variable).

c- R-square indicates that 19.1% of the variation in the mediating variable ‘environmental sustainable operations’ is explained by the variation in the independent variables ‘buffer management’.

- R-square indicates that 17% of the variation in the dependent variable ‘effective operational performance’ is explained by the variation in the independent variables ‘buffer management’.

H1.4. There is a significant impact of buffer management on successful implementation of social sustainable operations for achieving effective operational performance.

Table 5: regression weights

Dependent variable / Independent Variable	Social sustainable operations		Effective operational performance	
	Estimate	P	Estimate	P
Buffer management	0.392	***	-0.184	***
Social sustainable operations			-0.221	***
R^2	0.137		0.148	

a- The value of estimate for buffer management as an independent variable and effective operational performance as a dependent variable is -0.184 which means that buffer management has a negative effect on effective operational performance, estimate value can be explained through the following results:

- The value of estimate for buffer management as an independent variable and social sustainable operations as a mediating variable is 0.392 which means that buffer management has a positive effect on successful implementation of social sustainable operations.
- The value of estimate for social sustainable operations as a mediating variable and effective operational performance as a dependent variable is -0.221 which means that social sustainable operations has a negative effect on effective operational performance.

b- this hypothesis is significant as p value is less than 0.05 (p value=*** means that p value < 0.001), this can be interpreted as buffer management has no impact on successful implementation of social sustainable operations for achieving effective operational performance.

This can be explained through the following results of the variables relationships:

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on successful implementation of social sustainable operations (mediating variable).

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as social sustainable operations (mediating variable) has no impact on effective operational performance (dependent variable).

- the hypothesis is significant as p value is less than 0.05 (p value = *** means that p value < 0.001), this can be interpreted as buffer management (independent variable) has no impact on effective operational performance (dependent variable).

c- R-square indicates that 13.7% of the variation in the mediating variable ‘social sustainable operations’ is explained by the variation in the independent variables ‘buffer management’.

- R-square indicates that 14.8% of the variation in the dependent variable ‘effective operational performance’ is explained by the variation in the independent variables ‘buffer management’.

Conclusions

The results of this study can be summarized at the following:

- Buffer management has no impact on effective operational performance.
- Also, Buffer management has no impact on successful implementation of economical sustainable operations, environmental sustainable operations and social sustainable operations.

- Economical sustainable operations and environmental sustainable operations have no impact on effective operations performance.
- While Buffer management has an impact on successful implementation of life cycle sustainability.

- Life cycle sustainability has an impact on effective operational performance.

Practical implications

This study determined the following practical implications based on the conclusions from the data analysis.

1- Applying preventive maintenance program.
2- Implementing automatic data collection software and discrete event simulation in order to decrease bottleneck.
3- Training employees on the concept of constraints planning.
4- Training employees and workers on concepts of economical sustainable operations.
5- Collaboration with the governmental companies for recycling and getting rid of E-waste.

Research implications

This study focuses on the impact of buffer management on successful implementation of life cycle sustainability and triple bottom line for achieving effective operational performance in the leading electronic appliances Samsung Egypt.

Therefore, other researchers can study in the following fields:

- The impact of buffer management on successful implementation of life cycle sustainability and triple bottom line for effective operational performance in service sector.

- The effect of thinking process on effectiveness of operational performance in service sector.
- The effect of thinking process on effectiveness of operational performance in Egyptian manufacturing sector.
- The impact of buffer management on social sustainable operations in service sector.
- The impact of buffer management on efficiency of operational performance in service sector.
- The effect of simplified DBR system on life cycle sustainability. Case study.

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