

New environmental factors affecting cost systems design after COVID-19

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ABSTRACT

The COVID-19 pandemic is changing the way firms do business and changing it quickly. At the present time, there is an urgent need to restructure many activities within companies, including the redesign of cost systems to accommodate the negative effects resulting from this disease. This paper aims to examine the impact of certain environmental factors on cost system design (product diversity and relevant cost information) which has been examined by previous studies. It is important to research this topic again and to suggest other factors (technological changes and triggered exception operational losses) resulting from changing operational style after the worldwide spread of COVID-19. The empirical results indicate that the cost system design applied in industrial corporations listed on the Amman Stock Exchange is positively affected by technological changes, triggered exception operational losses, and relevant cost information, while no relationship was found with product diversity.

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1. Introduction

The importance of the cost system depends on providing managers with needed information to make decisions. Costing is an estimation performed by the company's management to arrive a linear function that approximates underlying actual cost behavior, within the relevant range (Labro, 2006). The cost systems design is greatly affected by the surrounding environment, whether internal or external. Sudhashini and Xin (2018) and Elhamma and Zhang (2013) stated that external environment has statistically significant relationship with ABC application. Products and systems are more complex (Hari et al., 2008). Cost systems generally rely on direct labor to allocate indirect costs to products and services. The direct costs can be traced accurately since they are related to a specific activity, but the difficulty lies in the allocations of indirect or overhead costs because they are related to more than one operational activity that may occur separately or together (Cooper & Slagmulder, 1999). Therefore, entities need to give more attention to cost system designing to allocate different cost accurately and obtain useful information to make various decisions. The COVID-19 pandemic is changing the way organizations do business and changing it quickly. Companies are now working to adapt to new actions and strategies, often rapidly shifting direction to accommodate the negative effects resulting from this crisis and reduce losses as much as possible. Cost-cutting is a prudent strategy for businesses struggling to survive the economic impact of the coronavirus (COVID-19); therefore, there is an urgent need at the present time for a restructuring of many activities within the company, including the redesign of the cost system.

2. Statues of Jordan

Since the emergence of COVID-19 in China and warnings of the dangers of its spread, the Jordanian government took different proactive procedures to prevent the epidemic reaching its territory. The first confirmed case of coronavirus was recorded in Jordan on March 2, 2020, approximately four months after the disease first appeared in China. On March 17, 2020, with the

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beginning of the spread of the virus inside Jordan, the defense law was activated, according to which all official institutions and the private sector were suspended except for the vital sectors, malls and commercial centers were closed, and movement between cities and leaving home was prohibited except in cases of extreme necessity.

The Jordanian Minister of Finance expected a decline in the gross domestic product (GDP) by 3.4% during 2020. By the end of April 2020, local revenues decreased by 610 million GD (860 million dollars) compared to the same period in 2019 as a result of interrupted production in most sectors. As a result of the decrease in the number of infections with the Corona virus in the middle of June 2020, the government has reopened many industrial and service sectors within a specific health conditions to mitigate the losses that will be caused to the public and private sector.

3. Literature Review and Hypothesis Development

Ittner et al. (2002) stated that cost systems are used widely in manufacturing organizations. Cost systems have been shown to have developed considerably in recent years (Drury & Tayles, 2005). Cost systems are being used in an environment in which modern markets introduce new challenges to all types of entities (Hari et al., 2008). In addition, environmental cost accounting is an aspect of environmental management accounting that aims to classify and recognize costs in order to help make better decisions (Okafor et al., 2013). This paper aims to examine the impact of the mentioned environmental factors on cost system design and to suggest other factors resulting from changing operational style after the worldwide spread of the coronavirus (COVID-19).

3.1 Product Diversity

The operational policy used within industrial companies contributes to the diversity of the products offered, which is directly reflected in the costing system used within the company. Product diversification refers to conditions in which types of costs place different requirements on activities or activities that impose different requirements on resources (Akinyomi, 2014). A higher product diversification requires more sophisticated cost systems that require accurate identification and allocation of the company's resources (Ahmadzadeh et al., 2011). Drury and Tayles (2005) measured the complexity of the system through the number of cost groups and different types of cost factors, and the study found that the complexity of cost systems was influenced by product diversity, degree of allocation, size, and corporate sector. Ismail and Mahmoud (2012) and Al-Omiri and Drury (2007) did not find any significant relationship between cost systems and product diversity. Globally, the output of services affected by COVID-19 could be decreased by 9.3%, and in developing countries, GDP would decrease by 2%, which is less than the international standard of 2.5% for developing countries and 1.8% for industrialized countries. (Maliszewska et al., 2020). Substantial changes are also expected in consumer behavior, supply chains, and product diversity as a result of government procedures taken to counter this virus, including the necessity of staying at home to prevent the transmission of the disease between citizens. It has become necessary for companies to supply basic goods and services quickly, safely, and securely. Based on the previous discussion of the results of the most important studies related to this variable, the first hypothesis can be formulated as follows:

H₁: There is a positive relationship between product diversity and cost system design in Jordanian manufacturing firms.

3.2 Relevant of cost information

The management of an organization requires a wide spectrum of information to keep track of the daily operations of the business; relevant cost information is one of the important management tools used in various management decisions in the short and long term (Effik & Bessong, 2016). In order to properly analyze the level of profitability, a high accuracy of cost information is required, and the degree of accuracy required increases if the profit margins of the product are low or there are capacity constraints. (Drury & Tayles, 2005). In addition, increased innovation and technology has generated great pressures on companies in terms of increasing the degree of competition locally and externally, and this requires accurate and relevant information and data related to cost and performance of the company's activities. (Ismail & Reddy, 2017). Ismail and Mahmoud (2012) stated that if the cost system does not accurately accommodate resource consumption, the costs of the product it becomes inaccurate, and may result in the abandonment of profitable products or continue to produce unprofitable products. With regard to the direction of the relationship between relevant cost information and the cost system design, Ismail and Mahmoud (2012), Baird et al. (2004), and Pavlatos and Paggios (2009) found a statistically significant positive relationship between the relevant of cost information and the cost system. Based on the previous discussion of the results of the most important studies related to this variable, the second hypothesis can be formulated as follows:

H₂: There is a positive relationship between relevant cost information and cost system design in Jordanian manufacturing firms.

3.3 Technological Changes

Recently, there is an increasing progress in modern industry in terms of resorting to modern production systems, increase reliance on automated means, and information technology and other phenomena that have caused a fundamental change on the industrial business environment and left some positive effects that have been reflected on cost systems. Cost systems can

become obsolete if they fail to take advantage of technical improvements that permit more efficient data gathering and provide management with relevant, accurate, and timely information to make planning, monitoring, and evaluation decisions for the daily operating process. COVID-19 is pushing organizations to rapidly operate in new directions and information technology (IT) is being tested as never before because most countries have become dependent on learning and working from home. This requires the application of modern technology such as e-learning platforms and smart applications that help people obtain necessary goods and services without the need to leave home. Investment in new information technology is considered a type of technology activity that improves a product or service, provides value to an organizations' customers, and allows the value chain's primary activities to be performed efficiently and effectively (Romney & Steinbart, 2018). Based on the previous discussion to this variable, the third hypothesis can be formulated as follows:

H₃: There is a positive relationship between technological changes and cost system design in Jordanian manufacturing firms.

3.4 Triggered Exception Operational Losses

The concept of triggered exception operational losses can be defined as operational losses that result from the interruption of production processes, temporarily or permanently, due to internal or external triggered exception events result from economic, political, or health circumstances like coronavirus. The effects of COVID-19 will be significant in many industrial and service sectors. In the housing and accommodation sectors, quarterly revenue was decreased by 75%. Travel agents saw a 50% slow-down in reservations in March 2020. Airlines in most countries are expected to lose \$113 billion in revenue for 2020 (Maliszewska et al., 2020). The interruption of the operating process in most industrial companies after the spread of COVID-19 led to large operating losses, which challenged these companies to stop these losses through a set of corrective procedures, such as a programmed reduction of costs on a scientific basis. Based on the previous discussion of the results of the most important studies related to this variable, the fourth hypothesis can be formulated as follows:

H₄: There is a positive relationship between triggered exception operational losses and cost system design in Jordanian manufacturing firms.

4. Methodology

4.1 Research Method and Population

This research adopted the descriptive analytical approach to collect and analyze data and test hypotheses. A questionnaire, which was designed to accumulate enough information in parallel with the research objectives, was used as the main research tool, five questions were developed for each study variable with total number of 25 questions. There are many previous studies that relied on the questionnaire to study the issue of cost systems design, such as Schoute (2009) and Ismail and Mahmoud (2012). Participants were selected depending on their willingness and availability to be studied. Their selection was based on the convenience sampling procedure within the target population which was represented by industrial corporations listed in Amman Stock Exchange; the sample included 57 companies according to 2019 companies guide. Two hundred and eighty-five questionnaires were distributed electronically to the financial, operational and supervisory managers who are directly involved in making strategic decisions such as the decisions related to redesign the cost system, and 233 questionnaires were retrieved, representing 81.7% of the total distributed questionnaires.

4.2 Regression Model

To test the study hypotheses and investigate the relationship between environmental factors and cost system design, the following multiple regression was used:

$$CSD = \alpha_0 + \beta_1 PD + \beta_2 TC + \beta_3 RCF + \beta_4 TEOL + \varepsilon$$

4.2.1 Dependent variable

Cost system design (CSD) was measured by developing a set of questions that focused on the most important factors that contribute significantly to the design of the cost system, such as cost classification, pools, and cost drivers.

4.2.2 Independent variables

PD: Product Diversity

TC: Technological Changes

RCF: Relevant of Cost Information

TEOL: Triggered Exception Operational Losses

Five questions were developed to measure each of independent variables, using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

5. Descriptive Statistics

This section provides the findings and interpretations resulted from the various statistical methods used in the study.

5.1 The Stability of the Questionnaire

The stability of the questionnaire was confirmed by calculating the value of Cronbach's alpha. Table 1 shows that Cronbach's alpha for the final sample was 95.7% and the coefficient ranged between 79.7%–87.1%, so the study tool can be described as persistent and the data obtained with it are suitable for measuring variables and have a high degree of reliability (Sekaran & Bougie, 2016).

Table 1
The stability of the Questionnaire

Variable	Product Diversity (X1)	Relevant of Cost Information (X2)	Technological Changes (X3)	Triggered Exception Operational Losses (X4)	Cost Systems Design (Y)
Cronbach Alpha	0.797	0.830	0.833	0.827	0.871

Overall index of questionnaire items = (0.957)

5.2 Normal Distribution

The Kolmogorov–Smirnov test was used to test the normal distribution of data and if the Sig value for data is greater than 0.05, this means that the data is distributed naturally (Field, 2013). Table 2 shows that the distribution of data was normal, as the Sig value for all study variables reached values greater than 5%.

Table 2
Normal Distribution Test

Variable	Product Diversity	Relevant of Cost Information	Technological Changes	Triggered Exception Operational Losses	Cost Systems Design
N	233	233	233	233	233
Kolmogorov-Smirnov	1.206	0.982	1.117	1.205	0.836
Sig	0.109	0.290	0.165	0.109	0.487

5.3 Multicollinearity Test

The variance inflation factor and tolerance was used to test multicollinearity, and if the value of this test is less than 5, this indicates a low correlation between the independent variables and that it is suitable for performing multiple linear regression analysis (Hair et al., 2018). Table 3 shows that tolerance for independent variables was less than 1 and greater than 0.2 and the values of the variance inflation factor coefficient for all variables was less than 5.

Table 3
Variance Inflation Factor and Tolerance

Independent Variables	VIF	Tolerance
Product Diversity	1.413	0.708
Relevant of Cost Information	1.702	0.588
Technological Changes	1.806	0.554
Triggered Exception Operational Losses	1.247	0.802

5.4 Descriptive Statistics of the Study Variables

Table 4 shows the mean, standard deviation, and the level of respondent's answers to the study variables. The values of the arithmetic mean for the independent variable ranged between 3.62–4.22, where the variable (technological changes) achieved the first order with an average of 4.22, with a standard deviation of 0.376, while the variable (product diversity) achieved the last ranking with an average of 3.62 with a standard deviation of 0.660. It is clear that the general trend of the individuals in the study sample has achieved a high degree of approval. Finally, the dependent variable (cost systems design) achieved a high degree of approval from the point of view of the study sample individuals, where the mean was 3.72 and the standard deviation was 0.625.

Table 4
Descriptive Statistics

Variables	Mean	Standard Deviation	Degree of Approval
Technological Changes	4.22	0.376	high
Product Diversity	3.62	0.660	medium
Relevant of Cost Information	3.83	0.572	high
Triggered Exception Operational Losses	4.13	0.448	high
Cost Systems Design	3.72	0.625	high

6. Hypotheses Tests and Discussion

Table 5 reports the results of regression analysis for the study model. The F-statistic value was 23.43 with a P-value of 0.00, and was greater than its tabular value, which was 2.37. This indicates fitness and statistical significance of the model at a degree of freedom (4/228). The R-square was 0.208 which indicates that all the explanatory variables in the model jointly explain the extent of 20.8% variation in the dependent variable.

Table 5
Regression Results

Model Summary		ANOVA			Coefficient					
R	R ²	F	F Sig	D.F	Ind. variable	B	Std. Error	Beta	T	T Sig
0.456	0.208	23.43	*0.00	228/4	PD	.0130	0.069	0.211	1.641	.0112
					TC	0.341	0.058	0.360	5.873	*0.00
					RCF	0.241	0.093	0.145	2.595	*0.010
					TEOL	0.331	0.073	0.237	4.517	*0.00

* (Significant at $0.05 \geq \alpha$)

Table F value = (2.37)

Table T value = (1.96)

Regarding the hypotheses test, we found technological changes had the greatest positive effect among the dimensions in the dependent variable (cost system design), as the value of the beta coefficient was $\beta = 0.360$. The calculated value (T) of 5.873, which was greater than its tabular value (1.96), at a significant level (Sig = 0.00) reinforces this effect. Consequently, the third hypothesis is accepted; which means that companies are obliged at the present time, especially after the COVID-19 pandemic, to adopt any technological development that can serve the interests of the company and strengthen its competitive position within the market. This leads to incurring additional costs that cannot be avoided in the short term. The triggered exception operational losses variable came second in terms of effect, as the value of the beta coefficient was $\beta = 0.237$ and the calculated value (T) was 4.517 which is greater than its tabular value and at a significant level (Sig = 0.00). These results prove the importance of exception operational losses that have a positive significant relationship with cost system design, which means that most industrial companies dealt with large operating losses after the spread of the COVID-19. This requires the development of appropriate solutions in the short term that mostly focus on reducing costs as much as possible to overcome this pandemic, which will affect the cost system previously used within companies. Furthermore, the results reveal that relevant cost information has a significant positive relationship with cost systems, as the value of its beta coefficient reached $\beta = 0.145$ and the (T) value was 2.595, which is greater than its tabular value, and at a significant level (Sig = 0.010). This result is consistent with many prior studies like Baird et al. (2004) and Pavlatos and Paggios (2009) found that the adoption of the cost system within companies is affected by the administration's needs for accurate data for strategic decision-making and cost reduction, and Ismail and Mahmoud (2012) who indicated that highly sophisticated cost systems are required to obtain more accurate cost information. Finally, the study has concluded that there is no statistically significant relationship between cost systems and product diversity, as the value of its beta coefficient reached $\beta = 0.211$ and the (T) value was 1.641, which is less than its tabular value, and at a significant level (Sig = 0.112). Consequently, the first hypothesis is rejected due to the decrease in market demand for products and services in general after the COVID-19 pandemic. Demand has become concentrated on basic products and services. This result is consistent with many prior studies like Al-Omiri and Drury (2007) and Ismail and Mahmoud (2012) who found that, it's unnecessary for companies to maintain a highly sophisticated cost system due to highly diversified products and a complex production.

7. Conclusion

This study has been distinguished from previous studies since it was prepared after a global crisis (COVID-19) that affected all sectors, including the industrial sector, and added new variables (technological changes and triggered exception operational losses) that affected the design of the cost system. According to the researcher's knowledge, this study is the first of its kind to deal with these variables within the Jordanian environment. The results of this study revealed that cost system design applied in industrial corporations listed on the Amman Stock Exchange was positively affected by technological changes, triggered exception operational losses, and relevant cost information, while no relationship was found with product diversity. One of the most important recommendations of this study is the necessity for industrial companies to redesign the costing systems applied in a manner consistent with the current situation and to focus on reducing costs in the short term to mitigate

the economic effects resulting from the COVID-19 pandemic. These costs include reductions in salary, salary freezes, compensation reductions or deferrals, eliminating unnecessary overtime, offering voluntary retirement to employees, reducing travel and marketing costs and reliance on rent, not purchase of fixed assets.

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