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The Potential Impact of Electronic Services to Rafah Municipality's Operational Excellence

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Abstract
This study investigates the potential impact of electronic services in achieving operational excellence, using the Rafah municipality as a case study. The ARIMA model was employed in the study to forecast changes in the municipal cost trend. Additionally, a questionnaire was designed, to collect data from the study population of 329 employees in the Rafah municipality, a descriptive-analytical technique using the least squares method was utilized to estimate the regression equation of the operational excellence components (time and cost). The results demonstrate that the anticipated costs will reduce, with a relative decline rate of 1% for the years 2023, 2024, and 2025. Furthermore, the statistical findings showed that a change in the level of software package measurement of one unit would result in a 0.50-degree improvement in the transaction time index and a 0.29-degree decrease in cost. According to the results cited, electronic services had a statistically significant impact on the municipality of Rafah's achievement of operational excellence. Therefore, this study recommends implementing digitization to achieve operational excellence and establishing a technology unit that would be entrusted with supervising all facets of managing and improving municipal systems.
Keywords: Electronic services, Digital transformation, Software packages, Knowledge management, Website, Operational excellence.
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1. Introduction

In a world that is characterized by a struggle for technical advancement and advancements, technology is seen as a lifeline for survival(Dedy Ansari Harahap, 2020; Laudon & Laudon, 2020; Samuel Godadaw Ayinaddis, 2023; Wenqi Wei, 2023). As a result, most businesses have been working to keep up with the rapid advancement of technology and the digital revolution(A. N. Alfarra & Xiaofeng, 2018; Jae-Eun Chung, 2022; Samuel Godadaw Ayinaddis, 2023). Technology-driven change has become more difficult than any historical issue, particularly for the impacted municipalities, because of rising electronic trends, where electronic management systems have assumed a significant role within governmental and semi-public enterprises(Samuli Pekkola, 2022). Municipalities that offer services to the public have worked to create service hubs where a variety of services can be obtained from a single point of contact to improve service delivery and performance(Cigdem Tarhan, 2019; Samuli Pekkola, 2022; Shahbaz Siddiqui, 2023). By providing all services in one location, citizens can save time and effort by not having to travel between various departments. Thus, to achieve excellence with more ability and higher performance, every transformation strives to shift an organization from its existing state of ability and performance to a new state(A. Alfarra, Xiaofeng, Hagag, & Eissa, 2017; Samuli Pekkola, 2022) Most of the research has verified that the success of institutions depends heavily on the quality of the services they offer, since the benefits they enjoy depend on offering the greatest service in the shortest amount of time and for the least possible cost.

The first village council in the city of Rafah was established on January 5, 1952 (A.D.). As a result of population development and the expansion of its authority and services, the village council was replaced by the first municipal council for the city of Rafah on September 27, 1972. Rafah is currently considered one of the five governors of the Gaza Strip[1]. According to a census conducted by the Palestinian Central Bureau of Statistics, Rafah's population increased by around 2.9% between the years 2020 and 2021, from 252703 to 267635, to reach 267635 at the end of 2022[2]. Therefore, the municipality must consider the rate of population growth as an indicator when creating its services and strategic goals in order to achieve operational excellence at different levels, including the quality of the service and its cost as well as the time to complete this service, which emphasizes the significance of the shift to digital. Consequently, the purpose of this study is to answer the question: What potential effects might electronic services have on Rafah Municipality's operational excellence?

[1] Rafah Municipality website https://murafah.ps/mun/topic/64.
[2] Palestinian Central Bureau of Statistics (2023), Projected Mid -Year Population for Rafah Governorate by Locality 2017-2026.

To answer this question, this study used the ARIMA model to forecast the changes in cost trends in the municipality. A questionnaire and a descriptive-analytical approach were also used in the study to collect data for the 329 employees who work for the Palestinian municipal of Rafah.

The result shows demonstrates that the forecasted costs for the years 2023, 2024, and 2025 are (45260.48), (44765.70), and (44342.45), NIS respectively. Additionally, the relative decline rate was 1%, almost the same from 2023 to 2025. This suggests that operational excellence will have an impact on costs generally. With the impact of other independent variables in the model held constant, the statistical results also showed that a change in the level of measurement of software packages by one unit would result in an improvement in the time index by 0.50 degrees to complete the transaction and a reduction in cost by 0.29 degrees. The study's findings have helped to clarify how electronic services affect the Municipality of Rafah's pursuit of excellence. As a result, this study urges the creation of a technological unit that will be tasked with overseeing all aspects of managing and developing municipal systems. This unit will also be in charge of creating a strategic plan for the development of municipal systems and the move to digitize in order to achieve operational excellence.

The remaining sections of the article are arranged as follows. The research methodology is described in Section 2. The ARIMA model is discussed. In addition, the statistical model is presented. The main findings are displayed, evaluated, and archived in Section 3, and the paper's final remarks are provided in Section 4.

2. Methodology

2.1 ARIMA Model

Among various econometric models, such as ARMA (Autoregressive Moving Average), MA (Moving Average), and AR (Autoregressive) models, the Autoregressive Integrated Moving Average (ARIMA) model is the best (GEORGE E. P. BOX, 2016). The Box-Jenkins Model (1960), which makes use of the previous characteristics to predict future estimates of temporal organization, is the foundation of the ARIMA model (A. N. Alfarra & Hagag, 2022b; GEORGE E. P. BOX, 2016). Model distinguishing proof, parameter evaluation, and symptomatic checking of the model are the three basic steps of the ARIMA modeling approach (A. N. Alfarra & Hagag, 2021; ArunKumar, Kalaga, Kumar, Kawaji, & Brenza, 2022; GEORGE E. P. BOX, 2016; Lihua Ma, 2018) Prior to parameter assessment, the time series for fixed and seasonality are determined during the model ID step. An autocorrelation function (ACF) plot can be used to determine whether a time series is fixed, and in the case of non-fixed time series, differencing change can be used to obtain fixed data. Plots of the midway autocorrelation function (PACF) and occasional differencing and recovering autocorrelation function (ACF) can be used to model seasonality. The distinction between the estimates of boundaries *p* and *q* can be made using these charts as well (A. N. Alfarra & Hagag, 2022a; Alizadeh, 2022; GEORGE E. P. BOX, 2016; Lihua Ma, 2018). Most extreme probability, a commonly used technique for assessment, is used to evaluate the model's parameter choices. Finally, the model's general suitability is examined to see whether more time series modeling is necessary. According to and Lihua Ma (2018), the ARIMA (*p, D, q*) model is essentially a combination of differential activity and ARMA (*p, q*) model (GEORGE E. P. BOX, 2016; Lihua Ma, 2018). The equation below results in the ARIMA (*p, d, q*) model:

$$\Delta^d y_t = \mu + \sum_{i=1}^{p} \emptyset_i y_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} \quad (1)$$

where Δ^d represents the *d* order difference, μ is constant, $\sum_{i=1}^{p} \emptyset_i y_{t-i}$ is the AR(*p*) model (i.e., lagged values of *y*), and $\sum_{j=1}^{q} \theta_j \varepsilon_{t-j}$ is the MA(*q*) model (i.e., lagged errors).

2.1.1 Data description

The Rafah municipality provides panel data on stationery cost from 2010 through 2022. This research used stationery cost data as a stand-in to investigate how electronic services effect operational excellence in the Rafah Municipality.

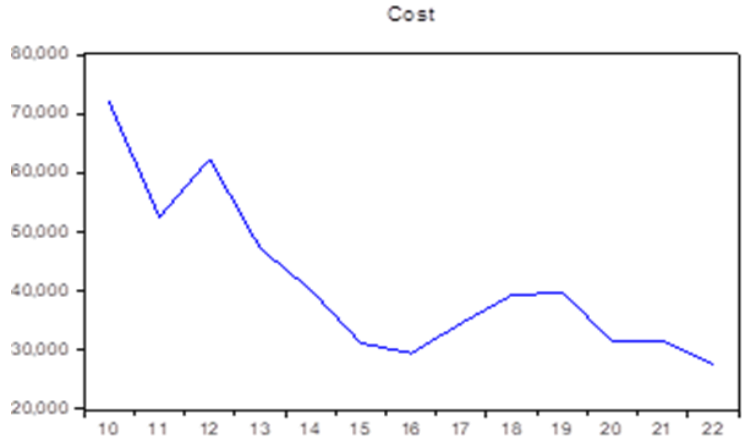

Figure 1. The Stationery Costs data from 2010 to 2022.

The ARIMA Model recommended that the model's input variables are stationary. Our model's input variables have time series properties. It has been noted that the mean of the relevant variables does not remain constant throughout time. It was decided to use the natural logarithm to keep them constant. Figure 1 shows the stationery costs series from 2010 to 2022. Table 1 displays the outcome of the stationary test (ADF test) performed on the data.

Table 1. Augmented Dickey-Fuller unit root test on COST

Null Hypothesis: COST has a unit root				
			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			-2.565363	0.1260
Test critical values:	1% level		-4.121990	
	5% level		-3.144920	
	10% level		-2.713751	

*MacKinnon (1996) one-sided p-values.

Results of the Augmented Dickey-Fuller test statistic are reported in Table 1. the ADF= -2.565363 is greater than the critical value of the significance level of 0.01, 0.05 and 0.1, and the P value is grater than 0.05, that is to say, the original CGDP sequence is non-stationary.

Table 2. Augmented Dickey-Fuller unit root test on DLCOST

Null Hypothesis: D(LCOST) has a unit root				
			t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic			-3.470287	0.0026
Test critical values:	1% level		-2.792154	
	5% level		-1.977738	
	10% level		-1.602074	

*MacKinnon (1996) one-sided p-values.

After taking the natural logarithm of the Costs data to remove its non-stationary and gaining the Lcosts sequence. The ADF test results for the DLCOST sequence is provided in Table 2 above. The ADF= -3.470287 less than the critical values and, the P value = 0.0000 < 0.05. Which implies the Dcosts sequence after the logarithmic change and the first-order variance is a stationary series.

2.1.2 Model Identification

When the slack demand is one, progression is practically non-zero, as shown by the autocorrelation coefficient of the Lcost in Table 3.

Table 3 shows the main model series' autocorrelation and partial autocorrelation function tables.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |**** |	. |**** |	1	0.528	0.528	4.5379	0.033
. |***. |	. |* . |	2	0.413	0.186	7.5609	0.023
. | . |	.***| . |	3	0.020	-0.367	7.5688	0.056
. *| . |	. *| . |	4	-0.091	-0.082	7.7501	0.101
. *| . |	. |* . |	5	-0.128	0.143	8.1476	0.148
. *| . |	. | . |	6	-0.097	-0.007	8.4120	0.209
. *| . |	. *| . |	7	-0.078	-0.114	8.6104	0.282
. *| . |	. *| . |	8	-0.150	-0.176	9.4856	0.303
. *| . |	. *| . |	9	-0.203	-0.088	11.493	0.243
. **| . |	. *| . |	10	-0.317	-0.154	18.037	0.054
. **| . |	. |* . |	11	-0.205	0.100	22.145	0.023
. *| . |	. | . |	12	-0.192	-0.053	29.300	0.004

The autocorrelation coefficient of the Lcosts in Table 3 Shows succession is fundamentally non-zero when the lag demand is one. Additionally, it is essentially in the certainty band when the lag request is more noteworthy than one, so q can be considered one. The midway autocorrelation coefficient is nonzero when the lag order is equal to one, it is also different in relation to zero when the lag order is two, therefore p=1 can be supposed of. To consider that the verdict is subjective, to establish a more exact model, the scope of valuations of p and q is appropriately loose, and dissimilar ARMA (p, q) models are proven.

Even though the appropriate ARMA model is typically selected using the AIC and SC esteems, it should be emphasized that this is not always the case. However, the lower AIC and SC values do not meet the requirements for the ideal ARMA model. This work first created a model with the lowest AIC and SC values, after which the assessment results were subjected to a parameter significance test and a residual randomness test. If the test is successful, the model can be the ideal model. If the test is unsuccessful, the second-smallest AIC value and SC esteem are selected, and the relevant factual test is carried out. Up until the ideal model is picked, that is. The model that passed the parameter significance test and the residual randomness test was the ARMA (1, 0) model.

2.1.3 Model establishment and inspection

Estimation results of the ARIMA model are shown in Table 4. The Lcosts sequence is an ARIMA (1, 1, 0) as was previously demonstrated. Additionally, equation (2) depicts the model's stated shape. Additionally, all the model variables' t-Statistic values are significant, and their P values are less than 0.01. The t-test statistic of the appropriate gauge esteem is provided in the material in brackets below the equation.

$$\Delta LCOST = 10.6464029558 + [AR(1) = 0.86492020064] \quad (2)$$
$$(37.56762) \quad (4.421526)$$

The variance of the associated mistake is shown in equation (3) as estimated as follows:

$$\hat{\sigma_a} = 0.208295 \quad (3)$$

Table 4. Estimation results of the ARIMA model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.64640	0.283393	37.56762	0.0000
AR (1)	0.864920	0.195616	4.421526	0.0013
R-squared	0.596124	Mean dependent var		10.58953
Adjusted R-squared	0.515349	S.D. dependent var		0.299202
S.E. of regression	0.208295	Akaike info criterion		0.005502
Sum squared resid	0.433868	Schwarz criterion		0.135875
Log likelihood	2.964234	Hannan-Quinn criter.		-0.021295
F-statistic	7.380041	Durbin-Watson stat		1.982733
Prob(F-statistic)	0.010746			
Inverted AR Roots	.86			

Figure 2. shows the LCOST sequence's actual series, fitted series, and residual series.

The model that was used to fit the LCOST data is shown in Figure 2. It appears that the strong line and the top give show the real data, while the lower dashed lines appear to be more accurate and last longer than the fitted attributes and lingering of the model.

The test results for the ARIMA (1, 1, 0) model are shown in Table 5. The residual is shown to be white noise on the graph of the autocorrelation and partial autocorrelation function. The model is adequate because the Q-Stst test values are significant as well.

Table 5. Autocorrelation and partial autocorrelation function graphs of the residual series.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. **| . |	. **| . |	1	-0.250	-0.250	1.0186	
. |** . |	. |* . |	2	0.237	0.186	2.0176	0.155
.***| . |	.***| . |	3	-0.429	-0.370	5.6121	0.060
. *| . |	.***| . |	4	-0.162	-0.433	6.1781	0.103
. *| . |	. *| . |	5	-0.080	-0.104	6.3339	0.176
. | . |	. *| . |	6	0.010	-0.145	6.3368	0.275
. |** . |	. | . |	7	0.238	-0.037	8.1717	0.226
. | . |	. *| . |	8	0.004	-0.101	8.1723	0.318
. |* . |	. |* . |	9	0.199	0.086	10.100	0.258
. **| . |	. *| . |	10	-0.241	-0.122	13.867	0.127
. | . |	. | . |	11	0.074	0.010	14.397	0.156
. *| . |	. |* . |	12	-0.100	0.175	16.333	0.129

2.1.4 Data forecasting

The Stationery Costs numbers for the years 2022 to 2025 have been predicted using the EViews software's dynamic prediction. The results are shown in Table 6 as follows:

Table 6. The Stationery Costs forecast from 2012 to 2025.

Year	Forecast Cost	Variation	Percent (%)
2022	46202.77	-	-
2023	45617.40	-585.37	-1.267
2024	45117.09	-500.31	-1.097
2025	44688.79	-428.30	-0.949

Table 6. above demonstrates that the forecasted stationery costs for the years 2023, 2024, and 2025 are (45617.40), (45117.09), and (44688.79), NIS respectively. Additionally, the relative decline rate was 1%, almost the same from 2023 to 2025. Which suggests that operational excellence will have an impact on costs generally and stationery costs as a support activity in the Rafah municipality specifically.

2.2 Second: Statistical model

2.2.1 Data Collection and Analysis

The descriptive analytical method was used to conduct the study and collect data by creating a questionnaire. This study gives predictions on how Rafah Municipality might attain operational excellence through the use of electronic services. Using a random sample methodology, 200 questionnaires were distributed to the study's 329 employees, and 190 of those were later retrieved, making up 95% of the total number of questionnaires distributed. The questionnaire also included inquiries concerning experience and educational background, as

shown in Table 7.

Table 7. Descriptive Statistics of Research Respondents.

Measure	Item	Frequency	Percentage %
Education level	Diploma	46	24.21%
	Bachelor	107	56.32%
	Master's degree	35	18.42%
	PhD degree	2	1.05%
Experience	Below 5 years	49	25.79%
	5-10 years	38	20.00%
	10-15 years	77	40.53%
	Above 15 years	26	13.68%

The following statistical model was created by estimating the regression equation for the operational excellence criteria (time, cost) using the least squares method:

$$OE = \alpha_1 + \beta_{1j}\, ES + \varepsilon_1 \quad (4)$$

$$TI = \alpha_2 + \beta_{21} KM + \beta_{22} WS + \beta_{23} PA + \varepsilon_2 \quad (5)$$

$$CO = \alpha_3 + \beta_{31} KM + \beta_{32} WS + \beta_{33} PA + \varepsilon_3 \quad (6)$$

where *OE* stands for operational excellence and includes (Time *TI* and Cost *CO*), and *ES* for electronic service and includes (knowledge management *KM*, website *WS*, and software packages PA), and ε is the error. The constants are represented by α, and β_{ij} are parameters which (i = 1, 2, and 3 for OE, CO, and TI, respectively) & (j = 1, 2, and 3 for KM, WS, and PA, respectively).

2.2.2 Statistical results

The measurement tool's validity in terms of discriminant, convergent, and reliability was evaluated. Cronbach's alpha values, which are used to assess construct dependability, are higher (0.7) than the cutoff point outlined by Nunnally and Bernstein (1994), as seen in Table 8. This suggests that the measurement tool is highly reliable.

Table 8. Cronbach's Alpha test to confirm the stability of the research tool.

Variables	Factors	Number of paragraphs	Cronbach's α (CA)
The independent variable: electronic services	knowledge management	9	0.905
	website	9	0.942
	Software packages	12	0.929
		30	0.963
The dependent variable: operational excellence	The time	8	0.893
	The cost	8	0.920
		16	0.938
All paragraphs		**46**	**0.971**

The least squares method was used to estimate a regression equation for time (one of the operational excellence components) on the knowledge management, the website, and software packages axis to investigate the impact of electronic services on those components. In Table 9. the outcomes are displayed.

Table 9. Regression Results

	A. Time as dependent variable		
Variable	**Coefficient**	**t-Statistic**	**Prob.**
C	0.894	4.575	0.000
KM	0.223	3.184	0.002
WS	0.063	0.853	0.395
PA	0.500	5.730	0.000
R-squared	0.526		
F-statistic	68.731		
Prob(F-statistic)	0.0000		
	B. Cost as dependent variable		
Variable	**Coefficient**	**t-Statistic**	**Prob.**
C	1.580	7.099	0.000
KM	0.120	1.499	0.136
WS	0.237	2.835	0.005
PA	0.291	2.929	0.004
R-squared	0.388		
F-statistic	39.354		
Prob(F-statistic)	0.000		

3. Main finding and Discussion

Table 9 displays two panels (A and B), with the first panel (A) prepared to report the regression's findings with Transaction Time as the dependent variable. The R-square for panel A is 0.52, which indicates that the independent variables in the model account for 52% of the change in the time variable, one of the elements of operational excellence. It's also important to highlight the relevance of the F-statistic, which validates the model's importance. The two variables with the greatest t-values for factors influencing operational excellence are software packages (PA) $(t = 5.730,\ p > 0.05)$ and knowledge management systems (KM) $(t = 3.184,\ p > 0.05)$, respectively. Furthermore, the findings imply that software packages (PA) are the most crucial component of operational excellence.

Despite the importance of the result of the regression equation in Panel A, the t-test $(t = 0.853, p > 0.05)$ showed the lack of importance and influence of the website variable (WS). The website may lack some features, such as the electronic payment service, or it may not be well-designed to fulfill the expectations of the end user. Furthermore, the municipality might not be able to provide electronic services because its knowledge management systems are still being developed. One of the factors that adversely impacted the impact of the site on the time variable, was the limited Internet network, as well as the citizens' lack of awareness of the significance of electronic services and the inability of the responsible authorities to foster this culture and raise awareness.

The findings of the regression, which employed the stationery cost as its dependent variable, are shown in panel B. The importance of the model is supported by the F-statistic in the table above, which indicates that $p < 0.05$. Additionally, panel B's R-square is 0.291, which suggests that the Rafah Municipality's degree of electronic services accounts for nearly 29% of the variation in the cost component of operational excellence. As indicated in Table 9, a variety of variables influence the cost to complete the transaction, with the website (WS) component coming in second $(t = 2.835,\ p < 0.05)$ and the software packages factor having the highest t-value $(t = 2.929,\ p < 0.05)$. Despite the significance of the regression equation's result in Panel B, the knowledge management (KM) variable had to be removed because the t-test $(t = 1.499,\ p > 0.05)$ showed that it had no importance or influence.

Given that knowledge management systems are still in their infancy and are expensive, particularly at the foundational stage, it is not surprising that they have had little effect on lowering transaction costs. Additionally, these systems call for employee training, a trial period, and ongoing maintenance, all of which raise costs. Moreover, the savings resulting from the application of knowledge management did not appear because the fiscal year did not end to determine these savings after implementing this system, which are represented by a decrease in storage and printing, a reduction in the number of employees, and an increase in the number of subscribers, which will significantly affect the cost decrease.

4. Conclusion

This study predicts the potential impact of electronic services in achieving operational excellence in Rafah Municipality. The study used the descriptive analytical approach. A questionnaire was designed to collect data. The random sample method was used for the study population of 329 employees in Rafah Municipality. 200

questionnaires were distributed to them, and 190 questionnaires were returned with a percentage of 95 % of the total number of distributed questionnaires, with an increase of 12 questionnaires by 6.7% over the required sample of 178 questionnaires.

The results of the study also revealed the presence of a statistically significant effect at the level of significance $\alpha \leq 0.05$ for electronic services in the municipality of Rafah in achieving operational excellence, using the method of least squares to estimate the regression equation for the components of operational excellence (time, cost), where the value of the determination coefficient R^2 equal 0.52 for the model The time variable, which means that 52% of the change in the time variable as a component of operational excellence is explained by the independent variables (knowledge management, website, and software packages), and the value of the (F) test less than $\alpha \leq 0.05$ indicates the significance of the estimated model (from Where the relationship is linear, and in terms of choosing the level of the independent variables mentioned to explain the change in time). According to the findings, developing software packages (PA) is the most significant factor of operational excellence, and measuring one unit of a software package would lead to a 0.29-degree drop in cost and a 0.50-degree increase in the transaction time index.

This study recommends the need to establish a technological unit to which all operations of managing and developing the municipality's systems are entrusted, and which ensures the development of a strategic plan for the transition to digital, which is leading to provide e-services to achieve operation excellence. The need to promote and develop the municipality's website, which is a vital component and an integral part of the electronic services provided by the municipality of Rafah, as well as the need to provide an application program that works on citizens' cellular devices to enable them to request electronic services from the municipality.

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