

EVALUATION OF THE ELECTRONIC PORT RIGHT OF WAY PAYMENT INFORMATION SYSTEM

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Abstract:

In a connected and uncertain world, where almost two thirds of the world's population are now online, the integration of digital tools in the social and economic context is becoming a priority and an imposed choice for any organization. As a result, the strategic position of the Information System (IS) in these organizations is necessarily linked to performance. The creation of added value or net benefits through the use of these platforms becomes an ultimate and strategic objective for any organization. This study evaluates the success of the information system (IS) for electronic payment of port fees. From a quantitative approach of a hypothetico-deductive nature and using partial least squares structural equation modeling (PLS-SEM), we found that the success of the IS implies a quality of the electronic payment system, as well as the information produced influences the use and satisfaction of the users and finally these last two findings impact the individual and organizational performance of the organizations. (Net benefits).

Key words: evaluation of the information system, electronic payment, information system

INTRODUCTION

Since the sixties, the evaluation of Information Systems (IS) has taken the first place in the field of IS research with the adoption of several treatment angles [1]. The IS discipline is a cross-cutting function that uses several disciplines, namely management, business organization, and operations research [2].

The common thread of previous research on the evaluation issue is the complexity of the IS evaluation process, which leads us to break down this research question into sub-research questions [3].

The world of port logistics will not escape this context of evaluation of IS used in the port passage as well as the payment of port passage fees, in this context we will highlight the issue of evaluation of IS in the port field in Morocco knowing that studies in this area are limited.

Table 1 summarizes these evaluation questions starting with the reason for evaluation, the level of evaluation (unit of evaluation), and the time (static or longitudinal) and timing (ex-ante or ex-post) of evaluation [4, 5].

The evaluation question first emphasizes the level of analysis from the micro level through the sector and organization to the Marco level [6].

Table 1
Summary of the different evaluation questions

Main questions	Main responses	Our positioning
The Level of Analysis?	Macro Sector The organization Application Stakeholders.	Organization: Investment banks
What should be evaluated?	Investment Project Implementation An IS	An IS
When to evaluate?	Static or longitudinal Ex ante or ex post	Static Ex Post
Who should evaluate?	Designer/Developer Decision maker Users IS Department Manager Multiple stakeholders	Users

Source: [7].

LITERATURE REVIEW

Based on the general introduction to this paper, our choice of analysis methodology is based on the socio-technical approach. In what follows, we will discuss the principles, contributions and limitations of the main currents of IS evaluation. We would like to specify the corpus studied in terms of periods, of journals, the objective being to delimit our scope of study. We have covered a broad period, from the founding articles of Lucas, Bostrom and Heinen [8], which really places this literature review in a longitudinal approach [9]. We present the main journals in the table below, distinguishing between Anglophones and Francophones [9].

According to Markus and Robey, we can speak of two main streams of IS evaluation: causal approaches and processual approaches [9, 10]. These two approaches show the link between IS and organizations [8, 9]. The causal approach, as its name suggests, always looks for the direct cause between the IS and the performance [4], while the processual approach comes to palliate some of the criticisms addressed to the first approach. The Table 2 summarizes the main approaches to evaluating the success of an information system. We have adopted the socio-technical approach to evaluate the information system because it contains two angles of measurement, namely the social [11] part and the technical part of evaluation [4].

Table 2
Summary of the different evaluation questions

APPROACHES TO INFORMATION SYSTEMS EVALUATION		
CAUSAL APPROACHES		
Issues	Main Currents	Benefits and Limitations
How to measure the impact of the IS on the company's performance?	Evaluation based on economic theory: - The productivity paradox [12] - Consumer surplus. - The economic theory of information and decision [13].	Inputs: Partial confirmation of the positive impact of IS on performance Limitations: - Absence of actors in the evaluation process - Measurement Methodology - Unstable results - Problem of lack of organizational variables
	Evaluation based on competitive analysis: Strategic Alignment The Value Chain The extended competition	Inputs: - Expansion of the IS evaluation issue Limitations: - Impact measurement issues
PROCESSUAL APPROACHES		
How to evaluate the performance of the IS or the success of the IS?	Evaluation Resource-Based View RBV:	Inputs: - Valorisation of technological resources Limitations: - Problem of defining resources
	Structuration's approach	Contributions - Overcoming the deterministic view of technology. Limits - Problems in determining the status of the technology
	The Sociotechnical approach	Contributions - Systemic and dynamic SI is considered a socio-technical body, Limits Feedback problem between subsystems

Source: [4].

Theoretical models of evaluation

The theoretical foundations and models for evaluating the success of IS are varied and depend on the type of IS being evaluated. Table 3 summarizes, in a non-exhaustive way, the main models that come from the theoretical basis.

Table 3
Summary of the different evaluation questions

Types of Models	Models
Balanced ScoreCard analysis.	Relationship between the four perspectives of the BSC adapted to the IS
IS usage models	- Davis' model - ATM model - Model ATM 3 - Goodhue and Thompson's model
Models of user satisfaction	- Bailey and Pearson model - Doll and Torkzadeh's model
Individual and organizational impact models	- Process model of IS value creation - Process model of IS value creation - Updated model of Delone and McLean [14]

Source: [4].

During this work, we will opt for a processual evaluation approach that adopts the sociotechnical method as a method of evaluating IS success and with an Individual and Organizational Impact Model that is the updated Delone and McLean Model [14].

We recall that we are in a rather complex working context characterized by a quasi-mandatory use of the IS, or even totally mandatory in the case of crisis contexts, as the case of the period of the health crisis in 2020. Therefore, among the most significant variables according to the state of the art already carried out on this research topic we find:

Variables related to quality

Among the independent variables or variables to be explained are the quality variables of the IS (of the system, service and information) that can be considered as basic variables in the process of evaluating the success of the IS, explaining the satisfaction and use of the IS.

To keep in mind, the contextualized operationalization of these variables, we will make an operationalization attached to the logistics and port passage context [15].

Attitudinal variables: Use and Satisfaction

Among the most important variables under this heading is the use variable, which is criticized by researchers insofar as this use remains compulsory in different contexts and no longer voluntary, which induces the relationship between use and acceptance of use. In the same sense of reasoning, the intention to use a system can be integrated as a mediating variable (the TAM model in its first version) between an explanatory variable and a variable to be explained [16], and can play as a variable the role of a precursor of use, knowing that for other researchers state that the intention to use can be conditionally removed without impacting the results [17].

Since our study context is port passage, which forces users to use the IS in a total or near-total way, we will not consider intention as a condition of behavior. It should also be noted that these variables can be considered as outputs of several models [18].

The final dependent variable: net profits

Our output, or final dependent variable, contains two types of net benefits, namely the individual and organizational performance of the parties using the IS, and then we seek to measure the perceived impacts of the IS on these users.

METHODOLOGY

Based on the literature review, we will be able to formulate our research questions as well as the main relationships between the variables of our study in order to facilitate the development of the conceptual model.

Problem and research questions

Our problem is to know how to evaluate the success of the information system of electronic payment of port fees [19]. To do this, we presented a theoretical corpus on the main approaches to evaluating an IS and then we chose to adopt the current socio-technical analysis, which is based on the technical and social aspects. Our study seeks to determine the social reasons (satisfaction, usage, individual qualities, etc.) as well as the technical factors (system qualities, information quality, etc.) for the success of the electronic payment IS and what the relationship is between these two factors. Our central research question is:

"How to evaluate the success of electronic payment IS with users?"

In order to answer this central question, we are oriented towards processual evaluation models and specifically the updated model of Delone and McLean [14], to do this we have deconstructed the said question into research sub-questions namely:

Q1: "What are the key variables in evaluating the success of the electronic Port of Entry fee payment IS?"

Q2: "What are the relationships between these variables leading to the success of the Port of Entry electronic payment IS?"

Q3: "Do Individual Qualities impact the perception of IS?"

To answer these research questions, we will mobilize an epistemological paradigm adapted to the question of IS evaluation.

CONCEPTUAL RESEARCH MODEL

The conceptual research model is presented in the Figure 1. We seek to test the correlation between the technical variables and precisely the quality of the service, the quality of the information ... as well as the social variables namely the satisfaction, the use ... (cause and effect relationships) as well as the socio-demographic variables that influence the other variables of the model (influence relationships) [15, 16].

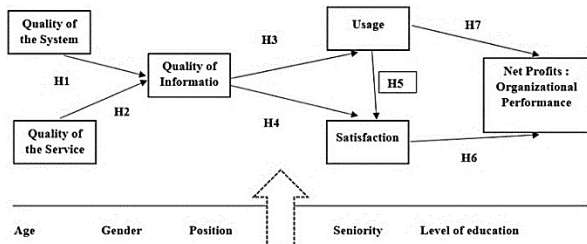


Fig. 1 Conceptual research model

Sample

Certainly, after the launch of the PORTNET single window (SI adopted by the Moroccan Port Authority) in 2008 by the national ports agency (ANP), the latter established relationships with the entire port community, the port authority, relevant organizations and operators [20]. In our case, we worked with a sample of 144 operators interviewed from the port community, namely: declarants and forwarders, importers, and exporters. Figure 2 summarizes the main operators in the "port logistics" link.



Fig. 2 Quality of respondents to the Questionnaire

Confirmatory Factor Analysis: Testing the Structural Equation Model

Evaluation of the measurement model: reliability of the measurement scales

To evaluate this model, we will calculate the reliability of the measurement scales by means of the Outer loadings.

Table 4 Purification results of the items

Net profits	Quality of information	Quality of service	Quality of the system	Satisfaction	Usage
PRIN 1 (Organisational performance) 0.736	QUIN 1 (Quality of information) 0.897	QUSE 1 (Quality of service) 0.758	QUSY 1 (Quality of the system) 0.819	SATI 1 (Satisfaction) 0.862	UTIL 1 (Usage) 0.887
PRIN2 0.871	QUIN 2 0.782	QUSE2 0.751	QUSY2 0.730	SATI2 0.916	UTIL2 0.698
PRIN3 0.832	QUIN 3 0.829	QUSE3 0.777	QUSY3 0.844	SATI3 0.866	UTIL3 0.659
PRIN4 0.904	QUIN 4 0.766	QUSE4 0.861	QUSY4 0.673	SATI4 0.806	UTIL5 0.749
PRIN5 0.910	QUIN 5 0.755	QUSE5 0.798	QUSY5 0.792	SATI5 0.739	UTIL6 0.892
PRIN6 0.839	QUIN 6 0.813		QUSY6 0.794		
PRIN7 0.935			QUSY7 0.817		

Source: own study based on the results of the SMART PLS software.

These standardized loadings must be greater than or equal to 0.7 [20, 21]. In practice, only those items with loadings greater than or equal to 0.7 should be retained in the measurement model; those with loadings strictly below 0.7 are therefore eliminated from the model.

Table 4 presents the results after the measurement of the reliability of the instruments for measuring the latent variables.

After the operation of purification of the items or of the measurement variables of the latent variables, the SMARTPLS software gives us the Figure 3 [22, 23].

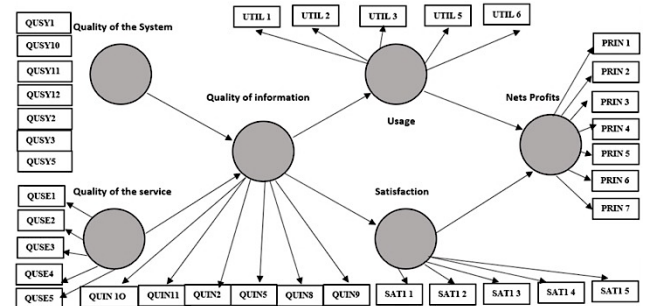


Fig. 3 Search model after item cleaning

Source: own study based on the results of the SMART PLS software.

Path coefficients

These coefficients correspond to the relationships between the LV, the variables in the structural model. They are simply the standardized "Beta" coefficients in the multiple linear regression. The more these coefficients increase, the greater the relationship and the impact of the independent LV on the dependent LV, and vice versa.

Cronbach's alpha and composite reliability

Table 5 presents the results in the form of two indicators that assess the internal reliability of the measuring instruments. They must be greater than 0.7 [24].

Table 5 Summary of Construct Reliability

	Cronbach's Alpha	Compound reliability
Net profits	0.945	0.953
Quality of information	0.896	0.919
Quality of service	0.860	0.892
System Quality	0.896	0.917
Satisfaction	0.894	0.923
Usage	0.847	0.886

Source: own study based on the results of the SMART PLS software.

Convergent and discriminant validity

Convergent validity is assessed using the Average Variance Extracted (AVE) [25]. This criterion is defined as the grand mean value of the squared loadings of the indicators associated with the construct (i.e., the sum of the squared loadings divided by the number of indicators) [26]. To say that the convergent validity is verified, all the AVE values must be well above 0.50. For the discriminant

validity (DV), we note that to measure this DV, we will work with the Fornell-Larcker criterion. Table 6 will compare the square root of the AVE of each construct (or LV) with its correlations with all the other constructs of the model.

Table 6
Summary of convergent

	Average Variance Extracted (AVE)
Net profits	0.745
Quality of information	0.654
Quality of service	0.624
System Quality	0.613
Satisfaction	0.705
Usage	0.613

Source: own study based on the results of the SMART PLS software.

Constructs ("Information Quality," "Service Quality," In our example, the entire AVE value of the "Net Benefits" construct (0.863) is greater than the correlation coefficients of "Net Benefits" with the other "System Quality," "Satisfaction," and "Utilization") in the model (0.657; 0.293; 0.499; 0.568; 0.304. The results in Table 7 test the discriminant validity of the concepts that appeared in the theoretical corpus. We have retained 6 components: perceived quality, which is broken down into information quality, service and system quality, satisfaction, use and net benefits.

All values of the AVE roots (on the diagonals) are greater than the correlations of the respective construct with the rest. Hence the establishment of the discriminant validity of the measurement model, except for the construct "quality of the system" which failed the test of discriminant validity, but it should be noted that its value (0.783) is close to the highest value recorded (0.800) for the construct "satisfaction".

Table 7
Summary of discriminant validity

	Net profits	Quality of information	Quality of service	System Quality	Satisfaction	Usage
Net profits	0.863					
Quality of information	0.657	0.808				
Quality of service	0.293	0.331	0.790			
System Quality	0.499	0.562	0.576	0.783		
Satisfaction	0.568	0.488	0.675	0.800	0.840	
Usage	0.304	0.053	0.199	0.450	0.440	0.783

Source: own study based on the results of the SMART PLS software.

The overall quality of the model: the goodness-of-fit test (Gof)

This index (Gof) of adequacy is obtained on the basis of the average of the constructs of the explained variance and the community, knowing that is not calculated for the

exogenous constructs. The value of the Gof index must be greater than 0.30. This index is obtained by the following formula: $Gof = \sqrt{[(Average\ community) \times (Average\ R^2)]}$. Table 8 summarizes the results of the convergent and discriminant validity tests to ensure better construct validity again addresses how well the regression model explains the observed data through the variation in the R2 value between 0 and 1.

Table 8
Summary of convergent validity and discriminant validity

	R2 (explained variance)	Communality
Net profits	0.326	0.745
Quality of information	0.316	0.653
Quality of service		0.624
Quality of the system		0.613
Satisfaction	0.409	0.705
Usage	0.003	0.612
Total	1.054	
Average	0.263	0.661
Gof	0.417	0.30

Source: own study based on the results of the SMART PLS software.

RESULTS

Our objective during this study is to evaluate the IS of electronic payment means for port fees. For this purpose, we proposed a conceptual research model that contains both a structural model of evaluation of the IS, as well as the socio-demographic variable that can positively or negatively impact the perception of success of the IS [27]. To do this, we will first test the relationships of the conceptual model, and then we will interpret the results already found as well as the limitations and avenues for future research.

Flat analysis

According to the univariate analysis of the data, and Figure 4 we found that almost half of the operators interviewed (40%) are between 30 and 39 years old, which means that young people occupy these positions more than other age groups.

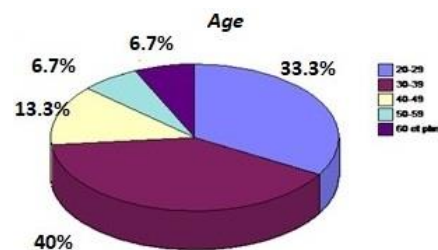


Fig. 4 Age range of respondents

For the education level of the respondents, Figure 5 shows that almost half of the respondents have a BAC+3 and almost 27% have a Bac+5.

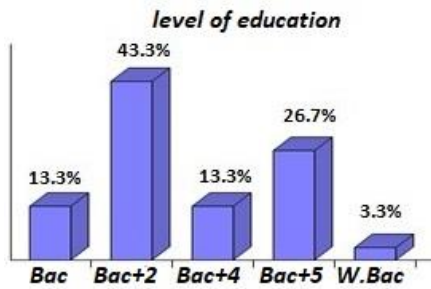


Fig. 5. Respondents' educational level

From Figure 6 below, we found that 33.3% of the operators in the field of international trade have significant experience in the field of port passage and 23.3% of these respondents have experience in the field of less than a year, something that helps us to have fairly reliable answers and fructify the analysis.

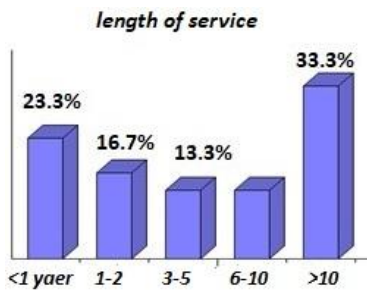


Fig. 6 Respondents' length of service in years

Results of hypothesis testing

The hypothesis test measures the degree of significance of the estimation parameters (path coefficient) between the latent variables, This test is based on a bootstrapping simulation with a sample size of 500 [23].The Table 9 shows the hypothesis test with the explanation of the P values and the Student's T.

Table 9
Results of Research Hypothesis Testing

Assumptions	Relationships	T statistics	P Value	Results
H1	System quality-> Quality of information	3.632	0.000	Validated
H2	Quality of service -> Quality of information	0.050	0.960	Rejected
H3	Information quality -> Usage	0.201	0.841	Rejected
H4	Quality of information -> Satisfaction	2.659	0.008	Validated
H5	Usage -> Satisfaction	1.658	0.098	Rejected
H6	Satisfaction -> Net benefits	2.063	0.040	Validated
H7	Usage -> Net benefits	0.357	0.721	Rejected

Source: own study based on the results of the SMART PLS software.

From the above Table, we can see that not all direct effects between the LV (the constructs) are significant at the 5% level. Indeed: The direct effect of "System Quality" on "Information Quality" is significant at the 5% level, as P-value = 0.000 and T-statistics = 3.632, Validated hypothesis. We find that information quality is explained by system quality on the basis of statistically significant relationships while service quality does not explain information quality (H2). The direct effect of "Quality of service" on "Quality of information" is not significant at the 5% level, as P-value = 0.960 and T-statistics = 0.050, Hypothesis not validated. The direct effect of "Information Quality" on "Usage" is not significant at the 5% level, as P-value = 0.841 and T-statistics = 0.201 Hypothesis not validated. The direct effect of "Information quality" on "Satisfaction" is significant at the 5% level, as P-value = 0.008 and T-statistics = 2.659, Validated hypothesis. We hypothesized that use (H3) and satisfaction (H4) would have a positive impact on the quality of information, but after testing these two hypotheses. We also found that there are no statistical links between use and satisfaction, as use is almost mandatory in the port passage sector in Morocco, especially with the uncertain context of health crises [28]. The direct effect of "Usage" on "Satisfaction" is not significant at the 5% level, as P-value = 0.098 and T-statistics = 1.658, Hypothesis not validated. In the port passage area. This hypothesis (H5) is rejected, the statistical tests are not significant (t = 1.658; p = 0.098) so satisfaction is not impacted by the use of the electronic payment IS. The direct effect of "Satisfaction" on "Net Profits" is significant at the 5% level, as P-value = 0.040 and T-statistics = 2.063, Hypothesis validated. The direct effect of "Utilization" on "Net Profits" is not significant at the 5% level, as P-value = 0.721 and T-statistics = 0.357, Hypothesis not validated.

Figure 7 summarizes the key results of the electronic payment IS success model for port fees.

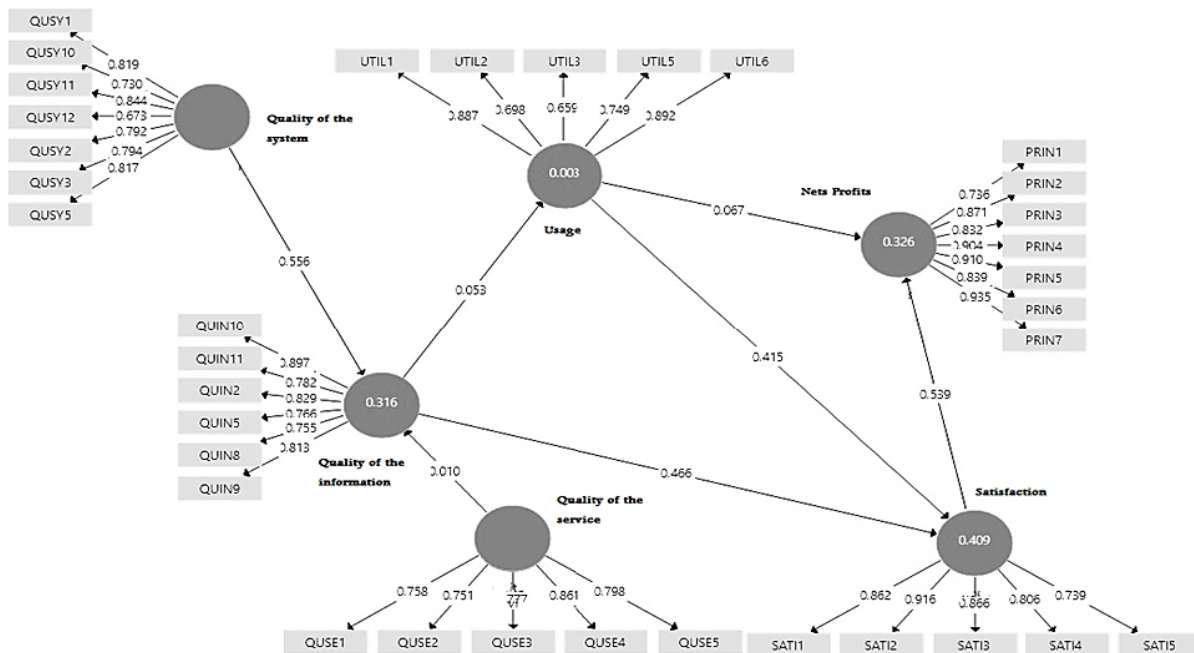


Fig. 7 Results of the success model of the electronic payment IS for port fees. Source: own study based on the results of the SMART PLS software.

DISCUSSION

From the results of the success model of the electronic payment IS for port fees, we find that the quality of the system has an impact on the quality of the information, and that the latter is an important predictor of user satisfaction [28, 29]. The satisfaction variable ensures that users benefit from these platforms in terms of individual operator performance as well as organizational performance [30, 31]. It should also be noted that the variable "Use" is a variable that does not directly impact the variable "Satisfaction" thing that has not been verified through the variable "Quality of information" [32, 33], which confirms that there is a direct positive relationship between the Quality of the system and the quality of the information, so that it ensures satisfaction that generates individual and organizational benefits [34]. Based on the recommendations of several researchers, and our results, information quality appears to be a pivotal variable that plays a role as both an explanatory and an explanatory variable [14, 34, 35,]. Comparing the results with the theoretical corpus, we found that these results expand the literature and largely confirm previous work [35, 36] which requires three conditions for the success of the IS, namely certain technical characteristics of quality, users use it and are satisfied with the information produced and finally this information influences the quality of the work as well as the performance of the entire organization [37]. Delone and McLean add the quality of service rendered by the platform as an explanatory variable, as well as the intention to use, which comes from the TAM model [37, 38, 39, 40]. In our study, the quality of the service rendered does not impact the quality of the information, and the "use" variable does not impact satisfaction, since

the use of the electronic payment IS is becoming almost compulsory in the area of port passage, something that declares the question of acceptability of the electronic payment technology, especially in the last COVID-19 crisis [26, 27].

CONCLUSIONS

To conclude this research work, it is essential to recall the main research question which seeks to evaluate the success of the IS of electronic payment of port fees knowing that this evaluation operation is very complex. For that, we presented a review of the literature on the main approaches of evaluation of an IS and then we chose to adopt the current of sociotechnical analysis with a hypothetical-deductive approach for the methodology of work. Thus, our quantitative study, allowed us to note that the results confirm that the success of an IS requires three levels borrowed from Shannon and Weaverest [35, 41] namely the effectiveness of the information, technical level and semantic level of the information, in the same sense we noted during this study that the quality of the system impacts the quality of information as well as the quality of the information improves the satisfaction of the users of these electronic payment platforms which ensures net benefits for the users [24, 29]. These net benefits can be translated into individual user performance through time savings in order to track and report information within a short time frame, which minimizes user workload and also promotes the adoption of quantitative evaluation criteria and work simplification[42]. This was confirmed during this study, knowing that 85% of the users consider that the IS ensures the quality of work, as well as decision making in order to

reduce uncertainties, in the same sense the use of the IS improves communication within the company with a satisfaction rate of 75.5% of users [43].

All of this leads us to believe that these user benefits ensure the transition to organizational benefits for the entire organization in order to increase the capacity for organization and structuring in an optimal manner with the ultimate objective of ensuring operational performance in order to avoid redesigning the IS [44]. As with any study, this study has limitations that primarily affect external validity or the extrapolation of findings to the entire field, or would these results be valid in another statistical universe? Second, our research had methodological limitations in that the sample size was not convincing and the interviewees' responses were not actual behaviours but statements.

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