

The Impact of the Complexity of Information Systems on User Performance: Case of Moroccan Companies

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Abstract

The objective of this paper is to assess the influence of the degree of complexity of information systems on the frequency of their use and to examine the impact of this frequency on the overall work performance of information system users. We conducted quantitative research on a sample of 49 companies by using a questionnaire and SPSS software for testing and verifying research hypotheses. The results prove the significant impact of the degree of complexity of information systems, defined by the quality of its functionalities, its outputs and its flexibility, on the frequency of use. They also demonstrate the influence of this frequency on user performance, defined by speed, productivity and response to work needs. Understanding our results in different cultural areas with more qualitative devices and with a larger sample can show the study limitations that open research perspectives in the future.

Keywords: Complexity of information systems, User performance, Frequency of use of information systems

1. Introduction

Work aimed at determining the factors of adoption of information systems emerged in the 1970s, trying to find the answer to the following question: - To what degree the specificities of the structure and context of organizations are able to influence the adoption and complexity of information systems? In this regard, we can cite the pioneering work of (Sathe, 1975) and (Bruns & Waterhouse, 1975).

In the current context, the business environment is known by an increasing complexity, under the influence of technical, economic and institutional conditions. In this context, the emergence of information systems seems to have a major impact on the development and success of organizations (Meysonnier & Pourtier, 2006) and (Dechow & Mouritsen, 2005).

The objective of our research is to assess the influence of the degree of complexity of information systems on the frequency of their use, and to examine the impact of this frequency on the work performance of system users' information. However, we conducted a questionnaire survey sent and from which we were able to analyse just 49 responses.

Given the objective of our study and in order to confirm or refute our research hypotheses, we relied on IBM SPSS Statistics 25.0 software to analyse the existence of relationships between our qualitative variables.

After presenting the literature review and the research hypotheses, we will present the methodology adopted and then we will present the results obtained. We will discuss in conclusion the results and we will highlight the contributions and limitations of this study and avenues for future research.

2. Literature Review and Research Hypothesis

2.1. Degree of complexity of information systems and frequency of use

Several studies prove the existence of a relationship between the structure of organizations and the traits characterizing the situations in which they operate. It must adapt to a set of contingent variables such as the size of the organization (Mintzberg, 2006), the age of the organization (Ngongang, 2007) and the environment in which it operates (Santin & Van Caillie, 2008). Indeed, not all companies have the same information needs. Some more than others need the timely, reliable information to make decisions. However, the integration of information systems in the company can raise organizational problems likely to jeopardize its successful implementation (Meysonnier & Pourtier, 2004).

According to the life cycle theory of the firm, organizations passing through different stages of development have different conceptions of information systems (Moores & Yuen, 2001). Many studies have shown that the more the size of the company grows, the more resources and skills it will have to make its information system more complex. Thus, having a management controller who masters management accounting impacts the degree of complexity of the information system according to (Abdel-Kader & Luther, 2008) and (Al-Omiri & Drury, 2007).

In the same way, and according to the growth phase model of (Holmes & Nicholls, 1989) the age of the organization impacts its management practices. Thus, the past and the history of events that have marked the management practices of the company provides time for the organization to learn, improve and make its information system more complex (Davila, 2005).

In addition, the ownership structure impacts the information system which shows the complexity of the accounting information system increases with the decrease in the percentage of family shares (Lavigne, 2002).

From the above, we formulate our first hypothesis:

H1: The degree of complexity of information systems influences the frequency of their use.

2.2. Frequency of use and user performance

Competitive pressure requires greater responsiveness, which relies on decentralization and timely dissemination of information. Information systems are one of the factors of this decentralization thanks to the potential offered in terms of capturing, processing and communicating information. They thus offer managers the possibility of monitoring in real time the management of their business and the management of their activities. But massive investments in information technology (IT) infrastructure alone cannot have an impact on work performance without strengthening the degree of connection between Human – Technology – Organization (Devaraj & Kohli, 2003).

The adoption of the information system allows operational managers, who have become complete managers of responsibility centers, to be more efficient by collecting and processing, more frequently and in a short time, data in order to be able to analyse and ensure an adequate link between local objectives and the overall performance of the company. This allows information asymmetry in large groups that have adopted an external growth strategy (Brangier & al, 2010).

To assess the impact of the frequency of use of information systems on the performance of users, we considered it relevant to rely on subjective measures that call on the evaluation of users of the information system adopted. In this sense we were inspired by the Technology Acceptance Model (TAM) which is considered one of the most widely used theoretical models in information system research and innovation adoption studies. The TAM identifies two determinants of the attitude and intention of users to accept the technology: perceived usefulness defines as the degree of belief that the user has that the technology increases its effectiveness and ease of use; perception defines as the degree to which a person believes that using a system will save them a great deal of effort (Davis, 1989).

We have therefore proposed three items to assess the influence of information systems on user performance, namely: the speed of work, work productivity and the ease of meeting business needs.

From the above, we formulate our second hypothesis:

H2: The frequency of use of information systems impacts the performance of their users.

Thus, we can design our research model, deduced from our literature review and hypotheses, as follows:

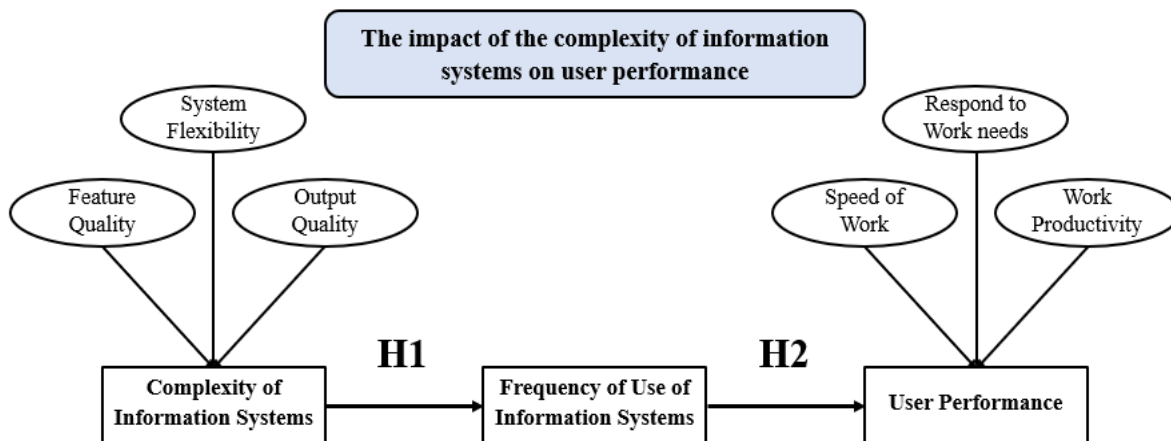


Figure 1: Theoretical research model

3. Research Methodology

3.1. Data gathering

To test the hypotheses of our research, we conducted a questionnaire survey that includes a variety of questions and is organized mainly into two question forms: closed and multiple-choice. This questionnaire was sent to management controllers and accounting managers. It was sent by post and e-mail to the region of Rabat-Salé-Kénitra in the Kingdom of Morocco.

Of the 108 questionnaires administered, 59 questionnaires were returned initially. After a second e-mail reminder, we received 13 more responses. With a total of 72 returned questionnaires representing a response rate of 66.67%, only 49 of them ultimately proved usable.

3.2. Statistical tool

To analyze the influence of structural contingency factors on the degree of complexity of the information system and its contribution to the performance of management controllers, we proceeded by an analysis of descriptive data by the IBM SPSS Statistics 25.0 software.

The objective of our research is to determine the relationships of independence between the qualitative variables. To confirm or refute our research hypotheses, we relied on the chi-square independence test. This test, which is used to determine the existence of a relationship between two categorical variables, assumes that the variables are not related. It measures the overall difference between the cell numbers observed and the numbers expected if the proportions were identical (Laurencelle, 2012), (Van Cuyck, 2005).

4. Results

The objective of this section is to present the analysis of the results obtained from our research.

4.1. Degree of complexity of information systems and frequency of use

Table 1 shows the distribution of the frequency of use according to the perception of the flexibility of the system.

Table 1 : System Flexibility * Frequency of use Crosstabulation

	System Flexibility			
Frequency of use	Very good	Good	Moderately good	Total
Very frequented	12	4	6	22

Frequently	3	6	4	13
Moderately frequented	1	4	9	14
Total	16	14	19	49

The analysis of the data aimed at studying the influence of the users' perception of the degree of flexibility of the system on the frequency of their use, shows that 75% of the users who perceive a very good flexibility of the system use very frequently the information system, 42.86% who perceive a good flexibility of the system use it frequently. While 47.37% who perceive average flexibility have an average frequency of use of the information system.

Table 2 presents the result of the Chi-square test measuring the relationship between the perception of the degree of flexibility of the system and the frequency of its use.

Table 2 : System Flexibility * Frequency of use Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11,937	4	,018
Likelihood Ratio	12,358	4	,015
Linear-by-Linear Association	8,343	1	,004
N of Valid Cases	49		

With a Chi-square value = 11.937, a degree of freedom $df = 4$ and a significance $p = 0.018$ the relationship between the perception of the degree of flexibility of the information system and the frequency of its use is very significant.

Table 3 shows the distribution of the frequency of use according to the perception of the feature quality of the system.

Table 3 : Feature Quality * Frequency of use Crosstabulation

	Feature	Quality	Total
Frequency of use	Very good	Good	Total
Very frequented	28	0	28
Frequented	5	1	6
Moderately frequented	3	12	15
Total	36	13	49

The analysis of the data aimed at studying the influence of the users' perception of the feature quality of the system on the frequency of their use, shows that 77.78% of the users who perceive a very good feature quality use the information system very frequently and 13.89% of them use it frequently. While 92.31% who perceive a good feature quality use the information system with an average frequency.

Table 4 presents the result of the Chi-square test measuring the relationship between the perception of the feature quality of the system and the frequency of its use.

Table 4 : Feature Quality * Frequency of use Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	32,412	2	,000
Likelihood Ratio	36,278	2	,000
Linear-by-Linear Association	30,327	1	,000
N of Valid Cases	49		

With a Chi-square value = 32.412, a degree of freedom $df = 2$ and a significance $p = 0.000$, the influence of the perception at the level of feature quality of the information system on the frequency of their use turns out to be very significant.

Table 5 shows the distribution of the frequency of use according to the perception of the quality of the outputs of the system.

Table 5 : Output Quality * Frequency of use Crosstabulation

	Output Quality	Total	
Frequency of use	Very good	Good	
Very frequented	28	0	28
Frequented	5	1	6
Moderately frequented	3	12	15
Total	36	13	49

The analysis of the data aiming to study the influence of the users' perception on the quality of the output of the information system on the frequency of their use, shows that 77.78% of the users who perceive a very good quality outputs show very frequent use of the system and 13.89% of them have frequent use. While 92.31% who perceive a good quality of output have an average frequency of use of the information system.

Table 6 presents the result of the Chi-square test measuring the relationship between the perception of the outputs quality of the system and the frequency of its use.

Table 6 : Output Quality * Frequency of use Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-	32,41	2	,000

Square	2		
Likelihood Ratio	36,278	2	,000
Linear-by-Linear Association	30,327	1	,000
N of Valid Cases	49		

With a Chi-square value = 32.412, a degree of freedom $df = 2$ and a significance $p = 0.000$, the influence of the perception at the level of output quality of the information system on the frequency of their use turns out to be very significant.

From this analysis we underline the significant impact of the flexibility of the system, the quality of its functionalities and the quality of its output on the frequency of use of the information system. Thus, we can deduce, while basing ourselves on the results of the chi-square tests, that the perception of the degree of complexity of the information systems impacts the frequency of use. And we can then confirm our first research hypothesis.

4.2. Frequency of use of information systems and user performance

Table 7 shows the distribution of the frequency of use according to the perception of the improvement of the speed of work.

Table 7 : Frequency of use * Speed of work Crosstabulation

	Speed of work			
Frequency of use	Very good	Good	Moderately good	Total
Very frequented	20	2	0	22
Frequented	5	6	2	13
Moderately frequented	0	0	14	14
Total	25	8	16	49

The analysis of the data aimed at studying the influence of the frequency of use of the information system on the improvement of the degree of speed of work, shows that 90.91% of the users who use the information system very frequently affirm its very good contribution in improving the speed of their work, 46,15% who frequently use the system claim a good contribution. While 100% of users with an average frequency affirm an average contribution of the information system in improving the speed of their work.

Table 8 presents the result of the Chi-square test measuring the relationship between the frequency of use of the system and its contribution to improving the speed of work.

Table 8 : Frequency of use * Speed of work Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	52,298	4	,000
Likelihood Ratio	58,73	4	,000

	6		
Linear-by-Linear Association	37,210	1	,000
N of Valid Cases	49		

With a Chi-square value = 52.298, a degree of freedom $df = 4$ and a significance $p = 0.000$ the relationship between the frequency of use of the information system on the improvement in the degree of speed of work turns out to be very significant.

Table 9 shows the distribution of the frequency of use according to the perception of the improvement of the work productivity.

Table 9 : Frequency of use * Work productivity Crosstabulation

		Work	Productivity	
Frequency of use	Very good	Good	Moderately good	Total
Very frequented	15	7	0	22
Frequented	3	9	1	13
Moderately frequented	0	3	11	14
Total	18	19	12	49

The analysis of the data aimed at studying the influence of the frequency of use of the information system on the improvement of the degree of work productivity, shows that 68.18% of the users who use the information system very frequently affirm its very good contribution in improving their productivity at work and 69.23% who frequently use the system affirm its good contribution. While 78.57% of users with an average frequency affirm an average contribution of the information system in improving their productivity at work.

Table 10 presents the result of the Chi-square test measuring the relationship between the frequency of use of the system and its contribution to improving the work productivity.

Table 10 : Frequency of use * Work productivity Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39,802	4	,000
Likelihood Ratio	43,202	4	,000
Linear-by-Linear Association	29,595	1	,000
N of Valid Cases	49		

With a Chi-square value = 39.802, a degree of freedom $df = 4$ and a significance $p = 0.000$ the influence of the frequency of use of the information system on the improvement of work productivity turns out to be very significant.

Table 11 shows the distribution of the frequency of use according to the perception of the system's ability to respond to work needs.

Table 11 : Frequency of use * Respond to work needs Crosstabulation

	Respond to work needs			
Frequency of use	Very good	Good	Moderately good	Total
Very frequented	6	12	4	22
Frequented	4	6	3	13
Moderately frequented	2	4	8	14
Total	12	22	15	49

The analysis of the data aimed at studying the influence of the frequency of use of the information system on its ease of responding the users' work needs, shows that 27.27% of them who use the system very frequently of information affirm its very good contribution in the ease of responding to their work needs and 46.15% who frequently use the system affirm its good contribution. While 57.14% of users with an average frequency affirm an average contribution of the information system in its ease of responding the needs of their work.

Table 12 presents the result of the Chi-square test measuring the relationship between the frequency of use of the system and its degree of responding to work needs.

Table 12 : Frequency of use * Respond to work needs Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6,737	4	,150
Likelihood Ratio	6,471	4	,167
Linear-by-Linear Association	3,719	1	,054
N of Valid Cases	49		

With a Chi-square value = 6.737, a degree of freedom $df = 4$ and a significance $p = 0.150$ the relationship between the perception of the improvement in the ease of responding to work needs and the frequency of use does not prove to be significant.

From this analysis we underline the significant impact of the frequency of use of information systems on the speed of the work of the users and on the improvement of their productivity at work. Except that this impact has no influence on improving the ease of responding to work needs of users. Thus, while basing ourselves on the results of the chi-square tests, we deduce that the frequency of use of information systems influences, in a limited way, the performance of their users. And we can then partially confirm our second research hypothesis.

5. Discussion

Information systems now assist men in their professional tasks and can even replace them in some of them.

They ensure, however, the collection, storage, processing and dissemination of information provided by management control and which is crucial to making the right decision. The information system is at the heart of value creation. Any organization is therefore required to monitor and converge its impacts to ensure the performance of the company. The adoption of information technology is thus a strategic tool that allows men to improve their performance at work.

(Araz & al, 2020) point out that the coronavirus epidemic is considered one of the most critical disruptions of recent decades, as it ravages a large part of businesses around the world. (Lopes de Sousa Jabbour & al, 2020) for their part, show that supply chains are directly influenced by epidemics such as COVID-19, since they constitute sources of external risks that can harm the functioning of chains of supply and therefore negatively impact the satisfaction of customer needs. Thus, the manufacturing and service sectors may need more new information and communication technologies (NTIC), which may lead to an increase in demand on information systems (Govindan, 2020).

Our results highlight the impact of perceived usefulness and perceived ease on the use and acceptance of information systems by management controllers, which reinforces the TAM model chosen in this study, and joins the set of works whose objective is to understand the behavior of the individual with regard to ICT since users seek to maximize their satisfaction by using information systems, as well as (Chenhall, 2003) with their theory that usage and satisfaction influence each other and are jointly determined by the quality of the information and the quality of the system.

The modifications at the level of the individual appear in relation to those of organizational efficiency and vice versa, our research thus shows the impact of the degree of complexity of the information system, on the quality of its functionalities, the quality of its output and the degree of improvement in the work performance of management controllers. Use and satisfaction generate their own impacts, and can have an individual (user behavior) or organizational (work performance) form (Scapens & Jazayeri, 2003).

6. Conclusion

Information systems ensure the collection, storage, processing and dissemination of information provided by management control and which is crucial to making the right decision. The information system is at the heart of value creation, its implementation is a strategic choice and it is conditioned by technological developments. Any organization is therefore required to monitor and converge its impacts to ensure the performance of the company's users.

The objective of our research was to assess the influence of the degree of complexity of information systems on the frequency of their use, and to examine the impact of this frequency on the work performance of users of the information system. information. Among the most popular theoretical models for studying the adoption of innovations, we have chosen the technology acceptance model "TAM Model".

To test the hypotheses of our research, we conducted 16 interviews with management controllers and accounting managers before distributing a questionnaire to 108 people and only 49 of the responses were usable. And to test the validity of our research hypotheses, we used a descriptive data analysis by IBM SPSS Statistics 25.0 software to perform the Chi-square test.

The results of our study prove the significant impact of the flexibility of the system, the quality of the functionalities and the quality of the outputs, like our items defining the degree of complexity of the information system, on the frequency of use of the information system. It also highlights the influence of this frequency of use of the information system on the improvement of the degree of speed of work, the ease of meeting the needs of the trade and the improvement of the degree of productivity at work, as our items defining user performance.

Beyond these contributions, our study has limitations that open research perspectives and that can be removed by future research. First, our study presents a sample of (49 observations analyzed) and only captures structural contingency factors. It would therefore be interesting to understand the behavioral and/or cultural contingency factors in future studies with a larger sample. Secondly, taking into account the national aspect of our study, it would be appropriate in future research on the subject to verify the relevance of our results by carrying out the same study in different cultural areas with more qualitative devices and which can be inspired by works sociologists or anthropologists to help understand how managers manage

to adapt the information system to their needs, their skills, the structural context and the culture of their country, thus benefiting from effective management of their company .

7. References

1. Abdel-Kader, M., & Luther, R. (2008). The impact of firm characteristics on management accounting practices : A UK-based empirical analysis. *The British Accounting Review*, 40(1), 2-27.
2. Al-Omiri, M., & Drury, C. (2007). A survey of factors influencing the choice of product costing systems in UK organizations. *Management Accounting Research*, 18(4), 399-424.
3. Araz, O. M., Choi, T-M., Olson. D., & Salman. F. S. (2020). Data analytics for operational risk management. *Decision Sci*, 51(6), 1316-1319.
4. Brangier, E., Hammes, S., & Bastien, J. M. C. (2010). Analyse critique des approches de l'acceptation des technologies : de l'utilisabilité à la symbiose humain-technologie organisation. *Revue européenne de psychologie appliquée*, 60, 129-146.
5. Bruns, W. J., & Waterhouse, J. H. (1975). Budgetary control and organization structure. *Journal of Accounting Research*, 13(2), 177-203.
6. Chenhall, R. H. (2003). Management control systems design within its organizational context : findings from contingency-based research and directions for the future. *Accounting, Organization and Society*, 127-163.
7. Davila, T. (2005). An exploratory study on the emergence of management control systems : formalizing human resources in small growing firms. *Accounting, Organizations and Society*, 30(3), 223-248.
8. Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, 319-340.
9. Dechow, N., & Mouritsen, J. (2005). Enterprise resource planning systems, management control and the quest for integration, *Accounting, Organizations and Society*, 30, 691-733.
10. Devaraj, S., & Kohli, R. (2003). Performance Impacts of Information Technology: Is Actual Usage the Missing Link ?. *Management Science*, 49(3), 273-289.
11. Govindan, K., Mina, H., & Alavi, B. (2020). A decision support system for demand management in healthcare supply chains considering the epidemic outbreaks: a case study of coronavirus disease 2019 (COVID-19). *Transportation Research Part E: Logistics and Transportation Review*, 138.
12. Holmes, S. & Nicholls, D.(1989). Modelling the accounting information requirement of small business. *Accounting and Business Research*, 19(74), 143-150.
13. Laurencelle, L. (2012). La représentativité d'un échantillon et son test par le Khi-deux. *Tutorials in Quantitative Methods for Psychology*, 8, 173-181.
14. Lavigne, B. (2002). Association entre le SIC des PME et leur performance financière. *6 ème Congrès Internationale francophone sur la PME*.
15. Lopes de Sousa Jabbour, A. B., Jabbour, C. J. C., Hingley, M. K., Vilalta-perdomo, E. L., Ramsden, G. P., & Twigg, D. (2020). Sustainability of supply chains in the wake of the coronavirus (COVID-19/SARS-CoV-2). *pandemic: lessons and trends*.
16. Meysonnier, F., & Pourtier, F. (2006). Les ERP changent-ils le contrôle de gestion ?. *Comptabilité Contrôle Audit*, 1(12), 45-64.
17. Meysonnier, F., & Pourtier, F. (2004). ERP, changement organisationnel et contrôle de gestion. *Congrès annuel de l'Association Francophone de Comptabilité*, Orléans.
18. Mintzberg, H. (2006). Le manager au quotidien : les dix rôles du cadre. *Edition Organisation*.
19. Moores, Y., & Yuen, S. (2001). Management accounting systems and organizational configuration: a life-cycle perspective. *Accounting, Organizations and Society*, 26(4), 351-389.
20. Ngongang, D. (2007). Analyse des facteurs déterminants du système d'information comptable et des pratiques comptables des PME tchadiennes. *Revue des Sciences de Gestion*, 49-57.

21. Santin, S., & Van Caillie, D. (2008). Le design du système de contrôle de gestion des PME : une quête de stabilité adaptative. *29 ème Congrès annuel de l'Association Francophone de Comptabilité*.
22. Sathe, V. (1975). Contingency theories of organizational. *Managerial Accounting : The Behavioural Foundations*, 51-63.
23. Scapens, R. W., & Jazayeri, M. (2003). ERP systems and management accounting change : opportunities or impacts ? A research note. *European Accounting Review*, 201-233.
24. Van Cuyck, A. (2005). Tests du Khi-deux, Corrélations, variabilité... Pour une méthodologie quantitative, réflexive et structurale de l'étude des champs, des liens et des relations. *HAL Id : sic_00001500*.