An Assessment of the Impact of the Use of New Technologies on the Learning Quality: The Case of Tunisian National Post Office (NPO) E-Learning School

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ABSTRACT

Nowadays, new technologies and specially E-learning, offer an excellent opportunity to develop the educational systems in Arab universities. However, E-learning platforms are underdeveloped in these universities. Several factors were put to explain underdevelopment in the use of these new technologies in teaching and research in Arab universities. Indeed, E-learning was not completely a new thing to universities. Several teachers had created E-learning materials and courses in different Arab universities. However, studies that have attempted to assess and evaluate the impact of these tools on the quality of education in Arab universities are very rare. In this paper, we try to evaluate current E-learning practices by identifying the relationship between the use of new technologies and the quality of teaching in Tunisian universities. Our measurement protocol uses five key indicators: Goals, Costs, Student Satisfaction, Content and Training time. We constructed a research model that we tested on a sample of 110 students who took E-learning courses offered by the Virtual University of Tunis. In Tunisia, E-learning development was supported by the Virtual University of Tunis. This university has been developing-learning courses, thus it gained expertise in methodology and distance technology and E-learning course development that meet quality standards. In the first section of this paper, we examine success factors of introducing new technologies in higher education, which is the essence of the E-learning process. We focus on the advantages of E-learning compared to traditional learning approaches. In the second section, we present the different dimensions of quality in higher education. These components are: goals of learning and the skills that students should have at the end of the course, costs, student satisfaction, content and training time. In the third section, we report the results of an empirical study of a sample of 110 Tunisian students. This paper aspires to be a first step of collaboration with other researchers from Arab universities with the aim of surveying students in their respective universities across the Arab world. This study can be classified under Category 2 (issues and trends in learning outcomes assessment: methods of learning outcomes) of the 2nd ICA conference themes.

Keywords: Experience Capitalization, Knowledge Management, Project Memory, Project Management

LEARNING BY E-LEARNING

Learning is a concept increasingly studied in management science. In its most basic sense, learning is the acquisition of information, knowledge and new ideas that change the way people perceive and understand the world in which they act. It is a process of continually drawing new lessons from our own experiences as those of others. It is also a cumulative process in the sense that the new lessons reinforce or complete old ones. (Canadian Centre for Management, 2000). A distinction is made between individual and organizational learning. Accordingly, E-learning can be considered a new form of individual learning, which may be seen as a new individual learning tool likely to spread knowledge and thus promote organizational learning (FILLOL, 2004). Basing training on ICT is easily accessible, making the learner able to be trained at work or at any premises that have access to Internet. Thus, it is more easily adapted to the specific needs of each learner thanks to the interactivity offered by ICT.

Flexibility and customization put the learner at the heart of the training process. ICT-based materials used during training encourage or even force the learner to interact. This constant interaction with the tutor raises the attention of the learner and therefore promotes the acquisition of new knowledge. However, despite these advantages, the number of institutions that

have opted for E-learning remains relatively small. In this study, we will try to identify factors that facilitate moving from a "traditional" training model to E-learning.

E-learning creates new forms of individual learning, promotes collective learning in virtual teams and allows for knowledge management through virtual interactions that reinforce collective and cooperative work (Roussel, 2001). These forms of learning seek different goals such as acquiring or updating knowledge (refresher training) and development of a particular know-how. This type of training can be organized synchronically (real-time) in a classroom with networked computers to a training platform, in virtual classrooms, video conferencing facilities, remote tutorials, Cd- ROMs and online databases with phone meetings allowing for exchanging emails and scanned documents in a synchronic (chat rooms) and a synchronic modes (forum), with the presence of a trainer or on learners' work stations. The process can be well organized in the form of "chat rooms" which are meetings organized on fixed dates on the organization's intra or extra net (BELLIER, 2001).

E-learning integrates new learning methods reconciliation, on the one hand, the objectives of learning and development of skills required by any training process and, on the other hand, the services and opportunities offered by ICT (GUERRERO, 2001). E-learning also offers a number of other benefits for organizations.

1 THE BENEFITS OF E-LEARNING

1-1 E-Learning as a Tool For Customized Training

New educational technologies take individuals as the main focus. However, the possibility of establishing autonomous and distant training devices through networks does not necessarily break norms. Teleconferencing and videoconferencing experiences and information exchange through emails, chats or forums testify to this fact.

While new technologies offer greater independence in how to manage training time, yet one cannot deny the relational potential of online technologies that inform training by giving it a social dimension through connected devices. The contribution of networks is to link remote people working on the same project, allowing them sharing in real or deferred time. This exchange potential facilitates coordination and cooperation. The concept of group, group cohesion and group membership pushes individuals to adopt values of the group as well as knowledge, methods and tools, facilitating thus adaptation and change.

E-learning allows other learners a large scale exchange using forums or chats, and gives them the opportunity to value their achievements. To achieve a successful group training, again, conditions for exchange should be put in place bringing thus everyone to build and adjust their learning, using the group.

In fact, individuals can easily adjust knowledge of their peers because they identify with them. The debates, the different positions, discussions that may emerge are very rewarding and promote learning because they allow learners to become aware of what they have learned, to store additional or different knowledge and to value their achievements (MARC 1996). Moreover, the concept of synergy is very important in this context and that the resulting interaction of the whole is greater than a separate additional learning for each individual. Internet and intranet systems are highly interconnected, in which autonomy and customization are added to sharing applications and cooperative work.

1-2 E-Learning and Reduced Training Costs

"Studies on the impact of training policies on financial performance confirm the positive returns of new technologies on profitability." (D'ARCIMOLES, 2003). In fact, E-learning is a solution that can significantly reduce costs compared to a face-to-face training by eliminating various fees that sometimes exceed half of the total cost. Companies "hope to achieve substantial savings on travel costs because they face constraints related to the geographical dispersion which needs rapid mastery of know-how to be competitive." (BAUJARD, 2005).

By 2000, Arthur Andersen's study predicted 30% reduction in costs. The savings relate primarily to travel costs, hotel accommodation, animation costs and administrative clearances, etc.

Furthermore, E-learning enables profitability of applications when shared by a greater number of learners. Additionally, the new skills that learners have acquired foster their contribution to business results. However, many experts agree that developing E-learning may be costly than a traditional face-to-face training (investment in machinery, equipment, purchase or development
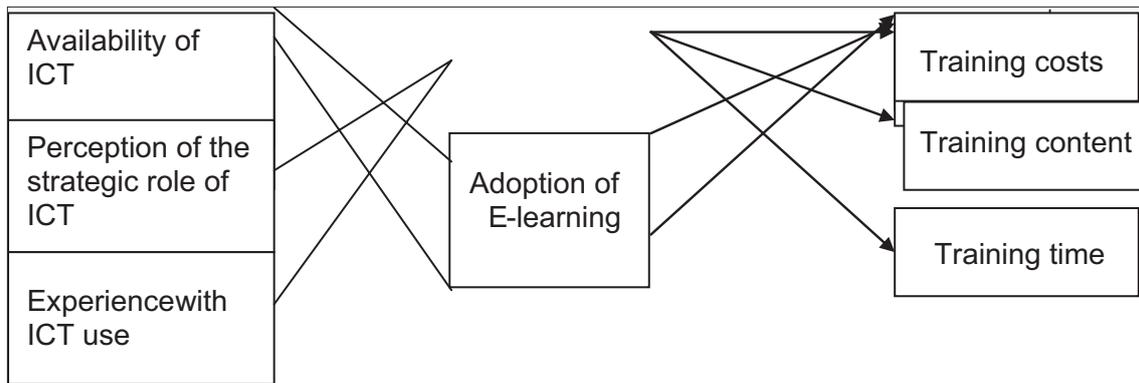
of technological media.,). However, they stress that over time and to a sufficient number of learners, E-learning systems can be profitable from an economic point of view.

1-3 E-learning and its Impact on Training Content

The transition from traditional training to E-learning brings about a change in training content. Change may affect content modularity as well as interactivity. Training content is created to measure, in respect of individuals' will and prerequisites, their learning level and pace. Indeed, learning pace is proper to each, it can change the length of training by speeding up or rescheduling an activity. Learning content can be adapted to the needs of the learner, taking into account their level and learning pace. This content modularity, therefore, allows offering short modules that catch learners' attention. The learner will be influenced by the form that should be enjoyable, attractive and readable eliminating thus dissatisfaction risk (FILLOL, 2004).

When focused on interactivity, E-learning content is an addition compared to traditional training. Distance learning is for a single person with specific and unique needs and focuses on the individual. Indeed, it favours the adequacy of the training content to learners' request and does benefit only the learner. As networking grows, or when companies intensify their international presence, E-learning is an effective solution to train a large number of geographically dispersed employees at the same time and with the same training.

E-learning offers flexibility in dematerializing training location. This advantage is particularly interesting for companies present at the International level and whose employees are located worldwide. It ensures that training content and transmitted messages are identical. The company can develop training courses which will enable employees to exchange their "best practice", to access a shared knowledge base and to develop their skills. The trainer can expand dynamically training content, changing teaching methods to foster acquisition of knowledge.

1-4 E-learning and its Impact On Training Time

The assumption that E-learning is a liberator of temporal and spatial constraints is unanimously accepted (FILLOL, 2004). A first specificity of online training devices is to reduce time, thus creating an opportunity to train faster. Indeed, personal learning time is reduced, since the learner focuses only on the aspects he/she wishes to deepen.

In addition to the possibility of customizing training, modularity of this pedagogical device facilitates training and provides greater flexibility. The learner does not need to spend long hours or days to be trained. He/she can access to his/her training on the workplace or at home. E-learning allows to balance the time spent on training with the demands of job activities. In companies, staff replacement and interruption of customer service issues are handled more flexibly. It is less restrictive as E-learning significantly reduces learners' unavailability.

The benefits of E-learning for the individual seem more numerous than for the company. Learners may find themselves limited in a process where the organization offers them a training focused on immediate performance useful to the organization and does not allow for the development of their personal potential. Moreover, accessing to training where resources are cut and are available for very short periods may offset individuals' capacity to deepen, analyse and synthesize subject.

2 – RESEARCH HYPOTHESES

2-1 The Strategic Role of Ict and Adoption Of E-learning

A training strategy is crucial to the development of E-learning in view of developing skills and improving business efficiency. Absence of a strategy slows the adoption of E-learning as this latter fosters efficiency.

The adoption process can be deliberate or anticipated. In both cases, "the perception of the tool is always an indicator of the adoption environment, an important factor of integration"(BAUJARD, 2004). Indeed, when companies and their affiliates services give an important role to ICT tools and consider them to be a strategic asset, this may facilitate its adoption by employees. The recognition of ICT as a source of competitive advantage or as a strategic asset improves its implementation. This presupposes availability of resources to the integration of ICT in business strategy and process, ensuring the continuity of investment in time (POWELL AND DENT MICALLEF, 1997).

More companies give importance to these technologies and they therefore opt for E-learning projects. Hence, we formulate the first hypothesis:

Hypothesis1: Perception of the strategic role of ICT promotes the adoption of E-learning and positively influences its components.

2-2 Availability of ICT and Adoption of E-learning

As any other approach, learning involves certain prerequisites, such as the need for the necessary technological infrastructure and certain skills for the development of online learning. (DEALER, N.LAUZON, 2004). In other words, a company that seeks to establish an E-learning project among its learning practices for the purpose of developing human capital skills should acquire an appropriate technology platform that takes into account the specificities and the nature of the activity. "It's essentially
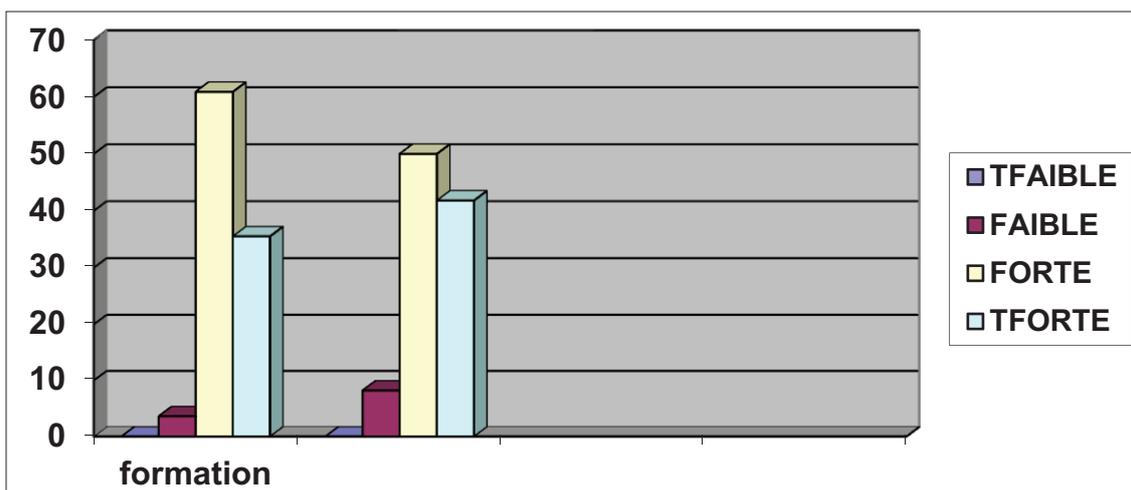

Figure 1: Importance of training and technological modernization

Total variance explained									
Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	1.456	36.388	36.388	1.456	36.388	1.322	33.045	33.045
2	1.077	26.936	63.325	1.077	26.936	1.211	30.279	63.325
3	0.952	23.789	87.114						
4	0.515	12.886	100.100						
Extraction Method: Principal component analysis									

Figure 2: SPSS output, total variance explained

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,511
Bartlett's Test of Sphericity	Approx. Chi-Square	13,812
	df	6
	Sig.	,032

Figure 3: SPSS Output, KMO and Bartlett's test

	Component	
	1	2
maitcout	,654	,456
dispocout	-,673	,364
importcout	,676	,078
expercout	,120	-,879

Figure 4: SPSS output, component matrix

	Component	
	1	2
maitcout	,749	-,273
dispocout	-,557	-,525
importcout	,674	,099
expercout	-,110	,881

Figure 5 : SPSS output, rotated component matrix

about computer tools including hardware and software, Internet, intranets, extranets and other ICT (ANDERSON, 2000; GILBERT AND JONES, 2001; Rich, 2001). This technological infrastructure has to contain computer and communication tools facilitating information exchange and encouraging the acquisition and sharing of knowledge to enable E-learning to achieve its development objectives in terms of individual knowledge and collective learning.

Hypothesis2: Availability of technological resources favors the adoption of E-learning and positively influences its components.

2-3 Past Experience with ICT-based Projects and Adoption of E-learning

Opportunities to use information technologies are developing rapidly and should increasingly condition the structure and functioning of organizations. Accordingly, companies have advanced their IT equipments, in particular by developing Intranets and opening their networks to external networks such as Internet. As networks, Internet and Intranet allowfor connect distant people, improving their capacity to exchange in realand deferred time via e-mails, forums, video conferencing, etc.

The main advantage of ICT tools is the ease of cooperation between individuals or services whose objective is to achieve a common task or project.

Adoption decision depends not only on the constraints resulting from the organizational context but also the streamlining of work practices enabled by information technology. The enthusiasm of the company to adopt E-learning closely

relates to the success or failure of technology previously adopted in other projects within the organization (BAUJARD, 2004).

Hypothesis3: Past experience with ICT-based projects promotes the adoption of E-learning and positively influences its components.

2-4 Mastering ICT and E-learning

E-learning allows to develop training and adapt it to individuals' new working environment. This is especially true in a changing context where how to do the job continues to evolve. However, current trends in business organization needs everyone to
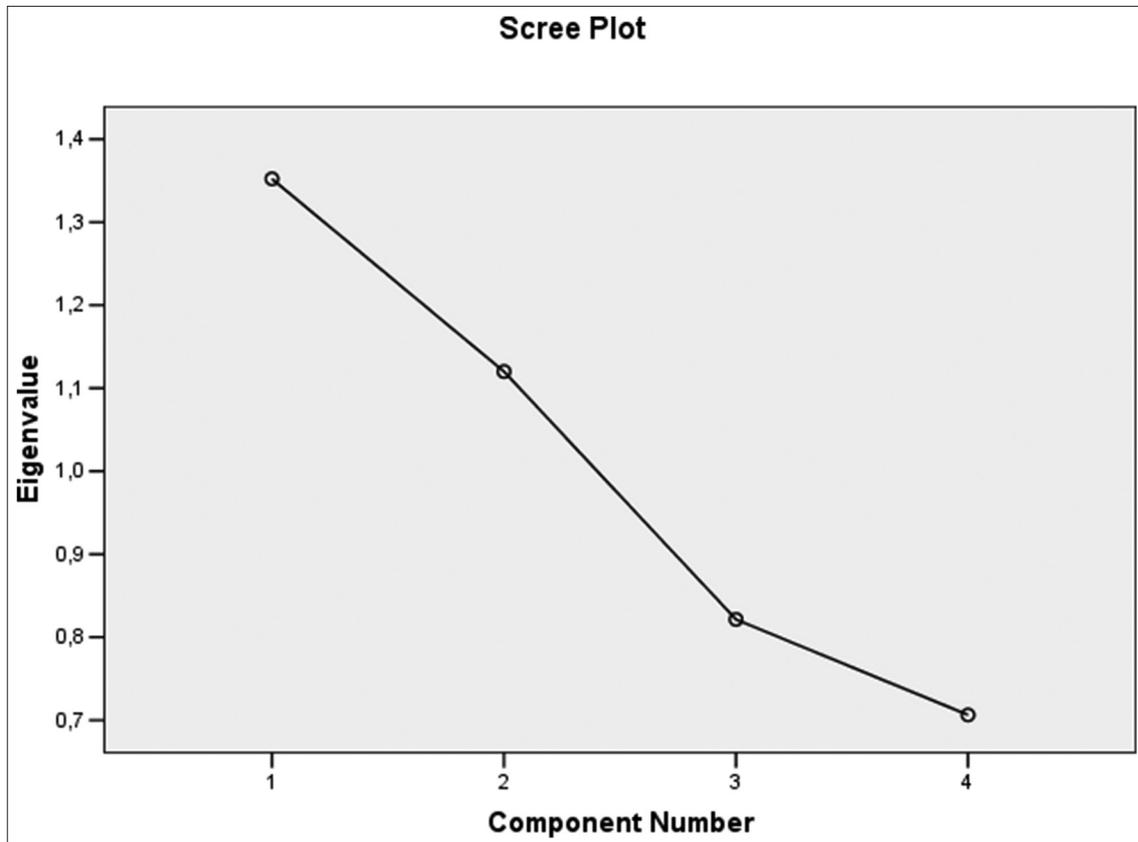

Figure 6: Output SPSS, scree plot

Table 1: Availability of ICT in the organization and adoption of E-learning				
	Frequency	**Percent**	**Valid percent**	**Cumulative percent**
Valid				
0.00	63	57.3	57.3	57.3
1.00	47	42.7	42.7	100.0
Total	110	100.0	100.0	

Table 2: Investment in ICT				
	Frequency	**Percent**	**Valid percent**	**Cumulative percent**
Valid				
1,00	2	1.8	1.8	1.8
2,00	5	4.5	4.5	6.4
3,00	66	60.0	60.0	66.4
4,00	37	33.6	33.6	100.0
Total	110	100.0	100.0	

know and understand these new practices, assume them, and use them to interact with employees as well as customers. Thus, technological progress in the fields of information and communication affects the whole organization and processes. However, E-learning is a practice that is entirely based on ICTs which suggests that successful implementation depends heavily on the level of mastery of ICT tools. Capacity to use information technology is a key factor that determines the use of E-learning. Indeed, and according to VENKATECH AND DAVIS (1996),mastery of a technology refers to a person's perception ofhis/her ability to use information technology and communication tools like microcomputers, Internet, intranets, extranets or e-mails. This perception therefore means the ability to deploy the skills acquired to use any technological tool.

Hypothesis4: Mastery of ICT promotes the adoption of E-learning and positively influences its components.

As a summary to this theoretical analysis and the hypotheses on the links between our variables, we propose the following model:

To empirically validate our research hypotheses, we chose to conduct a survey of an innovative Tunisian institution in the use of new information technologies and communication namely the National Post Office (NPO)[1]. Indeed, in recent years, the Tunisian Post has implemented a strategy based on innovation, the development of technology-based applications and online solutions in order to make the most significant contributions out of information and communication technologies. In addition, and as part of the interest shown by the Tunisian post towards its human capital, several training cycles were conducted based on the use of information and communication technology in collaboration with the Virtual School of the Tunisian Post Office. Indeed, nearly 1,100 workers or 12% of all staff use Internet from home and outside working hours to follow the courses of the Virtual School.

3 - RESULTS AND DISCUSSION OF THE RESULTS

To empirically test our model, we chose to conduct an explanatory study, which tries to explain a theoretical concept through a theoretical model that we seek to operationalize in the field. Surveying employees of the Tunisian Post is part of a process seeking to validate the relationship between information technology and communication and training policy, operationalized mainly by the organization's adoption of E-learning (Virtual School of the Tunisian Post Office).

In this study, we try also to determine the impact of ICT's different dimensions, namely availability of technological resources, ICT skills, the strategic role given to ICT, past experience with technology in the company, on training policies and the contribution of these dimensions to the adoption of E-learning in Tunisian companies.

We opted for the Tunisian Post Office because it is among the first Tunisian companies to integrate ICT in the learning process.

3-1 Data Collection Methodology

A questionnaire was administered to post office's employees who followed a training in the virtual school. The purpose of this questionnaire is to examine the device's efficiency and learners' satisfaction with such a device, on the one hand, and to identify perceived differences between face-to-face and online training, on the other hand. The opinions of the participants were measured on a 4-point Likert scale of 1 (strongly disagree-strongly agree). Given the relatively small size of the sample (110 participants), only descriptive statistics were included in the analysis. Two open-ended were included in the questionnaire to enable learners to express qualitative opinions on the most positive and most negative aspect of this experience. These qualitative data are incorporated in the analysis of the quantitative results. The first part of the questionnaire seeks to assess participation in this virtual school by referring to the five dimensions of the use of ICT and to the acquisition of online dialogue mechanisms during the learning phase. Appropriation of the tool is assessed as well as the effectiveness of the educational device. The questions cover essentially availability of ICT, ICT skills, experience with ICT use, ease of use of ICT and the perception of the strategic role of ICT. The second part of the questionnaire deals specifically with learner satisfaction with the adoption of E-learning and with the experience of the Post Office with virtual training.

3-2 Factors Explaining-Learning Adoption

We notice from frequency distribution that most interviewees place a very high importance to training and to technological modernization.

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1   www.poste learning.tn

The emphasis on technological modernization, on the one hand, and training, on the other, shows a strong interest in E-learning. What we need to know is the real motives for the adoption of this new form of training?

According to our model, we assumed that E-learning depends on factors related to ICT:

3-2-1 Availability of ICT

We found that all interviewees agreed that their organization has a website, 86.4% say they access Internet while 79.1% access the intranet from the Tunisian Post's premises.

Adoption of E-learning needs installing the required technological infrastructure, which consists essentially of computers and network tools, including Internet and Intranet.

However, despite the fact that employees access Internet at the Tunisian post's premises, access to the training platform is made only possible outside work hours, at home or in any other place that has an Internet access. We should therefore point out that the organization's disposal of Internet and Intranet networks is not really a reason to adopt this new form of training. This latter assumption is indeed confirmed by 57.3% of respondents, as only 47 people among the 110 respondents believe that availability of ICT promotes the adoption of E-learning. Our hypothesis H2 is rejected.

3-2-2 Mastery of ICT by learners.

Several dimensions of mastery have been studied in this training experience and especially the fact that such a device encourages or not participation in online discussions (HOWELL-RICHARDSON, MELLAR, 1996; WALSH K.R., 1996; KLEIN AND RALLS, 1995). We could measure this variable by a direct question on the judgment participants made on their skills to use technological tools. It seems that employees have no difficulty in controlling the tool and have developed an expertise in this area as computerization of the post office's tasks was made a long time ago. In addition, Internet-based technological tools are considered easy to use. 55.5% believe that they are competent and can easily manipulate computers and access Internet and 20.9% say they are more highly qualified in this area.

We can conclude that 76.4% of respondents have good or very good skills against 21.8% who have low skills and are not proficient in computer skills. Our hypothesis H4 is accepted because most employees who are part of our survey (101 people from 110) argue that ICT literacy is crucial to engage in an ICT-based training project. Then, we conclude that mastery of technological and ICT is a major determinant of the adoption of E-learning.

3-2 -3 Perception of the strategic importance of ICT

Most respondents, 78.2%, think that the Tunisian post invested in ICT to improve the competitiveness of their organization. We can infer that ICTs are perceived by employees as a token of competitiveness and represent a competitive advantage for the organization which confirms our theoretical analysis.

The perception of the strategic importance of ICT integrates continuity of investment in technology over time (POWELL AND DENT MICALEFF, 1997). This is confirmed by 83.6% of employees who state that the budget for ICT is growing continuously. We note in this context that according to employees the Tunisian Post Office gives importance to ICT. Indeed, most respondents (60.0% of total sample) believe that their organization made a strong investment in ICT and 33.6% consider rather that the investment made is very important.

Although the investment in new technologies is very high and it is still growing, employees do not associate perception of the importance of ICT with adoption of E-learning. We can say that our hypothesis H1 is rejected.

3-2-4 Past experience with an ICT-based project

All of the respondents said they have experience with a technology project and that their organization has already launched ICT-based projects. One example is the project "e-management in the post", which is launched to drive the change of organization's management into a modern business administration. In addition, to support electronic transactions and develop a virtual economy, the Tunisian Post Office has put into place over the years a varied package of payment solutions via the Internet (e-payment). In addition, we can mention the instant electronic transfer of money (e-finance) and electronic processing solutions for individuals and businesses (e-post).

These electronic solutions have encouraged the adoption of electronic training which adds to the number of ICT-based projects, and particularly Internet-based. Employees are used with such projects and have sufficient experience and will not resist the

adoption of E-learning. 58.2% of employees note that past experience with a project based on ICT can motivate training through these technologies. Therefore, our H3 hypothesis is accepted. These results are consistent with those of Wheeler who found that no significant relationship between experience with an ICT-based educational device and performance (REINIG, B.A, 1997).

3-3 E-Learning And Its Impact On The Performance Of The Company's Training Module

3-3-1 The impact of ICT on learning objectives

According to the table of variance explained, these are the two main components that have eigen values greater than 1.0 and therefore they are retained in the analysis. Indeed according to KAISER (1960), extraction of components should stop as soon as a proper value falls below 1.0. The two selected factors alone explain 63.325% of total variance (100%).

Rotation factors redistributes explained variance, while the overall explained variance remains unchanged and only the first factor becomes smaller.
We can see that experience with an ICT-based project highly correlates with the first component. Availability of ICT and importance of these technologies rather correlate with the second component.

3-3-2 The impact of ICT on training costs

A review of individual variables is greatly facilitated by calculating measures of sampling adequacy of Kaiser Meyer -Olkin. They can take values between 0.0 and 1.0. To be kept in a PCA, a variable should achieve a KMO measure exceeding 0.5. (Kaiser, 1974).

In the table of explained variance, we find that the first two components have eigenvalues greater than 1.0. These two components alone explain 61.807% of total variance (100%). This table shows the factor solution before rotation. The higher loadings are, the better they define a component.

In our case, we find that ICT skills, availability of ICT and the importance of these technologies rather correlated with the first component, while experience with an ICT-based project strongly correlates with the second component.

Ideally, a variable should correlate with one component and less with the others. However, we found that the first variable, namely (ICT skills), correlates with the two components.

In this case, the results cannot be optimally interpretable. In order to reach more relevant results, it seems necessary to run a preliminary Varimax rotation. This is an orthogonal rotation, which is made to simplify the structure of the factor solution, maximizing the variance of the components.

After rotation, the first three items heavily load on the first component. ICT skills best define the first component while the last item defines the second component.

3-3-3 The impact of ICT on training content

The variance accumulation test commonly known as scree test is a graphical method proposed by Catell (1966) and used to decide on the number of components to extract.

It is relevant to compare the different criteria for choosing the number of components that explain the most a factor rather than applying the only criterion or rule of Eigen value> 1 KAISER. We notice a sudden decrease invariance explained after the second component as observed on the scree plot. Then, we can extract the first two components, which also have eigen values greater than 1.0 and explain 62.855% of total variance.

We notice that ICT skills and availability correlate more with the first component whereas importance of ICT strongly correlates with the second factor. However, we are not able to decide on the correlation of the variable "experience with an ITC-based project".

To refine our results, we used a Varimax rotation. After running the rotation, we found that ICT mastery and availability correlate more with the first component whereas importance of ICT and experience with an ITC-based project strongly correlate with the second component.

3-3-4 The impact of ICT on training time

The results indicate that the first two components, with eigen values greater than 1.0, almost contribute equally to explain56.918% of total variance. Even after rotation, loadings have not significantly changed.

Our Principal Component Analysis shows that ICT skills and availability are strongly associated with the first component i.e. importance of ICT. While experience with an ICT-based project rather correlates with the second component. These results were confirmed by the Varimax rotation. These obtained results are consistent with the first results before rotation, but with different values.

3-3-5 Impact of ICT on learners' satisfaction

The overall learner satisfaction was measured on a scale of 1 to 10. The mean score is 7.14. This confirms the high overall satisfaction of the participants with such a training device. However, satisfaction may likely be explained more by their mastery of a new communication tool, which they may find an effective new training tool.

CONCLUSION

Experience of the Tunisian Post Office with E-learning is rich with lessons on the use of information technology in business and especially in training. We can distinguish two types of education: learners-focused and company-focused. For learners, ICT use did not impoverish participants' training and did not negatively affect their participation. However, availability of ICT and experience with its use are factors that promote the adoption of E-learning. However, perception of the strategic importance of these technologies does not have a significant effect on the ease of adoption of these tools by the organization's employees.

The lessons of this experience for the company are also very instructive. The main lesson is the critical importance of ICT in reducing training costs and especially in achieving training objectives. Far from eliminating the face-to-face training model, such tools will only improve learners' satisfaction and organization's profitability and competitiveness.

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