

What's about performance to University? Role and influence of Information Technology

*Peut-on parler de performance à l'Université ?
Rôle et influence des technologies d'information*

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ABSTRACT

Information technology (IT) is a real strategic issue. It can improve the performance of an organization. This paper draws on stakeholder theory and the resource-based view to explain how IT can appear as one of the determinants of performance in public

organizations such as France's university institutes of technology.

Key-words

Stakeholder value, performance, resources, information technology, university

RÉSUMÉ

Les technologies de l'information sont au cœur de notre problématique et elles revêtent une importance stratégique. En effet, celles-ci permettent d'améliorer la performance d'une organisation. L'objectif de cet article est par conséquent de chercher à comprendre et à expliquer comment, à travers la théorie des parties prenantes et la théorie

basée sur les ressources, les TI peuvent apparaître comme l'un des déterminants de la performance au sein d'une organisation publique telle qu'une composante universitaire.

Mots-clés

Création de valeur partenariale, performance, ressources, technologies de l'information, université

INTRODUCTION

In France, recent legislation on university governance (*loi libertés et responsabilités des universités*), the revised status of teaching and research staff, and budget cuts are all current concerns calling for reflection on performance and its determinants in universities and more specifically in university institutes of technology. The legislation provides for changes in university governance involving the introduction of a supposedly comprehensive and coherent information system and a greater role for information technology (IT). While it is commonly accepted that IT contributes to improving organizational performance, we look to go beyond the classical conception based solely on financial criteria in for-profit organizations.

To what extent, then, can one really speak of performance within universities? And in what ways does the introduction and operation of IT impact that performance?

This paper examines the issue of performance in universities, and more specifically at the *Institut Universitaire de Technologie Dijon-Auxerre* (France) and analyses the role of IT as one of the determinants of performance. We begin by reviewing the concept of performances and its dimensions, in particular through the idea of stakeholder value. Then we examine IT as a set of resources owned and used by the IUT. Finally we attempt to identify links between the use of IT and performance at the IUT via a dual qualitative and quantitative method.

1. PERFORMANCE AND STAKEHOLDER VALUE

Under the legislation on university governance, IUTs, as component entities of universities, are required to sign an undertaking on objectives and resources with their parent university. This sets out objectives for them to achieve over a period of at least one year and requires them to improve their performance, that is, to create value. The idea of performance is very much an issue then. But who does the IUT create value for? And how can such value be measured?

1.1. *Measuring value created by the IUT by means of stakeholder value*

Khouatra (2005) argues that an organization's system of governance determines the type of value it creates. In other words, if the value created is meant for the shareholders then the organization must opt to maximize shareholder value. This is an oversimplified vision of performance given that it takes account of the shareholder/management relationship only. This limitation leads us to use another conception of value that encompasses the various stakeholders. In this case, the creation of value results not just from the input of capital but also from the combined efforts of all stakeholders. Charreaux (2003) shows that stakeholder value, based on stakeholder theory, is "fertile ground" for measuring the efficiency of universities and for constructing criteria for their governance.

The stakeholder conception of value measurement rests directly upon the representation of the organization as a nexus of contracts. Through its educational activity, the IUT manages various contracts with its stakeholders (companies, teachers, teaching-research staff, administrative staff, students) to create value. Value can be created by the two activities (missions) of establishments of this kind, namely teaching and research. These two endeavours entail different problems with respect to how they can be evaluated¹. They do not share one and the

¹ The tools and indicators used in evaluating research and research projects are more bibliometric tools concerning the scientific production of knowledge (or patents filed in science and technology fields).

same purpose, since they are addressed at different actors with diverging expectations. Accordingly, to simplify the research, we shall consider teaching alone.

Moreover, Charreaux (2003) also claims that the teaching side of things may be represented by two competing models. The first of these models views the IUT as a service provider in terms of education purchased by students. The second considers that the IUT turns out students in order to satisfy demand from firms or other organizations, whether it be with an objective of fitting them for a particular vocation or of making them employable more generally.

In this paper, we go with the first of these conceptions because one of the criteria for evaluating performance within the IUT that we adopt is the valuation of the diplomas awarded (two-year DUT, vocational degree, sandwich courses). In this case, the IUT is a provider of educational services purchased by students as customers or users. The IUT will therefore attempt to improve its performance (we might speak of its academic performance) by way of its various stakeholders with respect to the “end consumers”, the students. The stakeholder value thus created is meant to enhance the value of the diploma awarded and consequently the worth of graduates in terms of their vocational training and inclusion in the world of work. Students are both actors and stakeholders in their own career paths and in their own success.

1.2. *The stakeholder concept applied to the IUT*

Freeman (1984) states that “a stakeholder is any group or individual that can affect or be affected by the realization of an organization’s purpose” (p. 26). Many typologies can be constructed to identify the various stakeholders of the IUT (Freeman, 1984; Mercier, 1999; Friedmann and Miles, 2002; Pesqueux, 2002). We have opted to identify two categories of stakeholders in terms of their action with respect to IT:

- first order stakeholders²: who use and have access rights to modify and update the component parts of IT,
- ordinary users³: who have a simple right of consultation.

After defining performance at the IUT through the creation of stakeholder value, we shall attempt to show that the creation and appropriation of value by the various stakeholders involve the use of IT.

2. IT AS ONE OF THE DETERMINANTS OF PERFORMANCE

We shall begin by returning to the definition of IT via resource-based theory. Then we shall show how IT can prove a determinant of actual performance.

2.1. *IT through resource-based theory (RBV)*

Resort to the resource-based view (Penrose, 1959; Wernerfelt, 1984) makes it possible to consider the internal organization of the IUT directly and to justify the possibility of the organization performing well on the basis of the specificity of its resources and therefore on the specificity of its IT. IT is defined as a tangible resource because it refers to everything falling within the realm of the techniques used in processing and transmitting information. It covers all the organization’s areas of activity, from monitoring teaching to the various domains of management (human resources, finances, accounting, promotional work, etc.). IT cannot of itself influence the value of the organization, it is the way individuals use it that creates value.

The IUT is therefore an organization that mobilizes a set of resources, in particular IT, it has at its disposal. It uses them, combines them as specific skills through organizational processes that are specific

² Administrative staff, “directors of study” or “heads of teaching”.

³ Students and teachers with no administrative responsibilities.

to it and make it possible to make decisions and to control processes in order to create value. This value creation specifically involves the enhanced value of the diploma awarded and consequently the enhanced value of the graduates themselves. Hence hypothesis H1:

H1: A positive connection arises between IT use and Dijon-Auxerre IUT performance.

The effects of the use of IT are of different orders. We shall characterize them as being more potential effects than sure and certain effects as there are numerous factors that influence organizational processes.

2.2. The potential effects of IT at the IUT

This question has been the subject of several studies with various and mixed results (Jomaa, 2004; Missaoui, 2009). The framework that seems best adapted to our research is that which examines the effect of IT on organizational processes and its impact on individuals and on the workforce as a whole in order to evaluate performance and consequently the organization's creation of value. To understand the role of IT at the IUT, we refer to the comprehensive framework of analysis proposed by researchers in IT management in which account is taken of the organization's structure, its activity, and its strategy.

As Zuboff (1988) points out, IT is characterized by a basic duality: automation and information. The use of IT has made possible smoother and faster communication at lower cost and better data exploitation thereby facilitating decision-making that creates greater value added. This is concomitant with improved coordination that involves the formalization and standardization of procedures (Bharadwaj, 2000; DeLone and McLean, 2003). Moreover, by modifying the conditions of access to information, IT impacts the definition of roles in the organization. The use of IT goes along with an enhancement of tasks with an aspect of self-regulation.

Even so, as Caseau (2007) indicates, the use of IT also has its negative points. IT users may find themselves confronted with difficulties with respect to hardware, software, security, and so on. Moreover, IT operation may be slowed by mandatory controls such as the introduction of access rights to applications. The purpose of these is to enforce compliance with a legal framework involving various rules and regulations.

Furthermore, these developments induce changes in the dynamics, the content, and the meaning of work and such changes may be decisive for the end result, namely performance in the present study (Elie-Dit-Cosaque, 2011). This may frustrate end users, who are no longer sought out as people with knowledge and skills and who practise a craft but as users who must integrate the technology into their practices in ready-determined ways (Lamb and Kling, 2003). This might be referred to as dis-possession of knowledge. In this event, the structuring of tasks using IT is experienced as a threat; it limits autonomy and contributes to the depletion of work. These difficulties may be the source of a fall in productivity and therefore negatively influence performance. This leads us to propose hypothesis H2:

H2 : A positive connection arises between IT performance and Dijon-Auxerre IUT performance.

IT is therefore no longer a mere medium for activity but a basic instrument in strategy. Higher educational establishments and consequently IUTs are looking increasingly to be part of an approach involving continuous improvement (from the missions of teaching to research, from education to inclusion in the world of work, from students' living and studying conditions to relations with the socio-economic world). Consequently for IUTs, the use of IT has as its purpose more to structure the activities of the establishment, to make it more attractive, to improve the quality of service in particular to students, to better control costs, to redefine the positions and missions of staff, to facilitate the sharing and circulation of information, and so on. In other words, it is about

local exploitation associated with internal integration within the meaning of Reix *et al.* (2011).

Having developed the foundations of our conceptual framework, we now turn to the methodological approach.

3. IT AS A LEVER FOR IUT PERFORMANCE

First we shall present and expound the method employed. Then we shall set out the results and the discussions arising from the analyses.

3.1. The research protocol

As the purpose of this study is primarily to better understand and explain performance and its determinants within an organization like the IUT, we look to test our theoretical framework through a hypothetical-deductive approach based on a two-part methodology.

Given the diversity of results in various domains (Jomaa, 2004) and since no study has yet been made of the impact of the use of IT on performance at the IUT, we chose first to make a qualitative analysis based on focus groups for several reasons:

- the difficulty in measuring concepts such as performance,
- the fact that IT undergoes constant change,
- and consequently the complexity of relations between IT and performance.

This analysis has made it possible to generate the dimensions of our different variables, namely IT and performance, so that our hypotheses can

subsequently be tested⁴. Let us look at the roll-out and the results from the qualitative analysis.

3.2. Group interviews: roll-out and results

We conducted two interviews⁵ based on guidelines structured around four topics: IT, performance, IUT objectives, and the identity of the respondents. The responses were processed⁶ by content analysis (Giannelloni and Vernet, 2001). This was done using a grid divided into three topics (perception of IT, dimensions of organizational performance, and IUT objectives). The most significant anonymous verbatims were used to support our argument (Cf. Appendix 1).

Results were similar between the two groups (whether our respondents were information producers or ordinary users). Participants considered that IT generally provided both advantages and drawbacks. Even so, the positive points were more numerous. This assessment did not change when the idea of the use of IT at work was introduced. The negative aspects were curbs on proper operation and consequently on efficiency.

There is indeed a notion of performance, even if the term itself is not always used as such. Several criteria were advanced (speed, time saving, user-friendliness, productivity, and so on) and all respondents agreed on the concepts of effectiveness and efficiency by drawing a distinction between IT performance and IUT performance. The two dimensions proved besides to be interdependent.

The objectives of the IUT are primarily to train students and provide them with a university level education. They will then be able to join the world of work or to continue their education with greater intellectual maturity and professional skills. There is more talk therefore of objectives, general policy, and public service than of overall strategy. The concept of strategy at the IUT is not perceived in quite

⁴ The two analyses prove complementary therefore because, as Thiéart (1999) emphasizes, if “a qualitative approach is often a prerequisite to any quantitative study”, sample analysis via a questionnaire is designed to improve the validity of our findings.

⁵ Each interview was with uniform groups, “information creators” on the one side (department heads, secretaries, directors of study, heads of teaching, administrative personnel) and ordinary users on the other (teachers, students). They lasted 2 hours for the former and 90 minutes for the latter. The groups comprised seven and six members respectively.

⁶ All exchanges were recorded and transcribed in full.

the same way as the strategy of a private company. What takes precedence is the notion of assigned objectives, which leads to a common rationale and a common line of conduct: that of transmitting knowledge.

To conclude, the analysis produced a list of several variables for identifying the dimensions of IT and of performance (cf. Appendix 2). These variables were used in drawing up a questionnaire for testing our hypotheses in a quantitative phase.

3.3. The quantitative phase

The aim of the statistical study is not just to confirm and bolster the plausibility of our conceptual framework but also to palliate the limitations arising from the conduct of group interviews (such as respondents' subjectivity). Accordingly the use of the questionnaire enabled us to interview all of the actors in the value creation process (students and personnel of Dijon-Auxerre IUT).

We were able to collect 450 questionnaires, representing a response rate of approximately 20%. The data from the questionnaires required operationalizing in order to be processed (cf. Appendix 3).

Descriptive statistics show that the sample is made up of students for close to 80% of respondents. The remaining 20% fall into three categories: teachers with administrative responsibilities (9%), teachers without administrative responsibilities (6%), and administrative personnel (5%). Our sample therefore appears to be representative as this distribution reflects the population of Dijon-Auxerre IUT 2010–2011.

Moreover, in light of the findings from the questionnaires, it appears that our study is meaningful because 69% of respondents think it possible to speak of performance at the IUT. This performance has three aspects: performance of graduates (61%), performance of teachers (58%), and economic performance (28%).

The use of IT no longer needs to be demonstrated. It is virtually an everyday occurrence both at the place of work or study and at home for all respondents. The tools most commonly used are the Internet and e-mail, timetable software (consultation), and various software items such as Microsoft Word and Acrobat/pdf. Such use proves to involve few constraints and is straightforward, user-friendly, and necessary as well as compulsory despite the difficulties encountered by 23% of respondents. These respondents refer essentially to two types of difficulty: difficulties with software (unfamiliarity with software and changes to software for 42% and 14% respectively, differences in operating systems for 15%) and technical difficulties (slow equipment for 32%). Other reasons more of an organizational kind are cited such as the shortage of equipment and unavailability of workstations. Respondents experiencing difficulties wish to put in place a number of actions: training (60%), better dissemination of information and better communication among actors (approximately 30%). There is virtually no reluctance about using new software since 90% of respondents accept to do so.

Consequently IT is used ubiquitously. This brings us to evoke the performance of IT which, for 97% of respondents, must comply with all the following criteria: time saving, respond to a need without creating other needs, crash-free, user-friendly, easy to use, essential, provide fast access to information, and economical (save waste).

As for the objectives of the IUT, it seems that providing a "public service" is far from unanimous, which is unexpected. Only 14% of respondents see the IUT's role in this way. The study reveals that the IUT's primary objective is to teach vocational skills (52%), then to provide higher education (24%), and lastly to prepare students for further study (14%).

After setting out the results of the qualitative phase, we looked to test our hypotheses. Our variables were processed essentially by constructing a measurement scale⁷. Consequently, to structure the information obtained we conducted principal component

⁷ We made the assumption that points are equidistant from each other, in other words that the scales used are equivalent to metric scales.

analyses (PCAs)⁸ using SPSS software (version 17), so as to reduce the number of variables.

The results, set out in Appendix 4, lead us to extract two new factors for the variable “Use of IT”: the positive perception and the negative perception of the use of IT. The variable “IT performance” is apprehended through two factors: efficiency and technical effectiveness. Finally, the variable “Overall performance at the IUT” is defined through social performance and economic performance.

After assessing the reliability of our initial variables, we tested the relations between:

- IT use (explanatory variable) and IUT performance (response variable)
- IT performance (explanatory variable) and IUT performance (response variable) using two canonical analyses⁹.

The computations (cf. Appendix 4) did not yield any significant canonical pair for either of our two hypotheses. It turns out that performance of Dijon-Auxerre IUT does not seem to be related, at least in a linear way, either to IT use (H1) or to IT performance (H2). Hypotheses H1 and H2 cannot be validated therefore.

3.4. Discussion

Several reasons may account for this absence of significant results. Even if the concept of performance is indeed found within the IUT, the organization remains a public-sector one above all in the way it operates and in the mindset found there. Its primary objective, as the qualitative analysis reveals, is to disseminate knowledge. Nevertheless, its traditional mission is broadening since IUTs must increasingly “meet requirements as to training and integration in

the world of work via a reactive network across administrative regions” (AG ADIUT, 2015), a response that is formalized by the provision of education and training that is constructed as blocks of skills, especially for an audience involved in in-service training.

There is an ambition to “promote the IUT system”. And it is “important that IUTs remain centres of budgetary responsibility” (AG ADIUT, 2015). Financial and profitability constraints are therefore very much present with “the introduction of costing of training and of quality audits”.

Moreover, concepts such as those of performance and IT are of a dynamic nature and continually changing. For IT, dematerialization is accelerating (applications, registration, creation of templates for circulating and sharing procedures, etc.), as are e-learning and the development of numerous applications (e.g. enabling the joint management of students’ marks, absences, timetables) designed to optimize resource management. Accordingly, the IUT should be considered rather through a systemic vision. This means therefore that it is not possible to clearly isolate the impact of IT use and IT performance on the organization’s performance.

Moreover, as the IUT increasingly finds itself in an uncertain and shifting universe, the conduct of this study over a single year fails to capture the changes in practices in the use of IT over time.

Finally, the non-validation of our hypotheses may be related to the very nature of IT which is perceived as essential while generating additional needs and constraints (e.g. learning time).

⁸ We used the Kaiser-Meyer-Olkin criterion, for which the extracted factor-item correlation is at least greater than 0.5, and the Bartlett sphericity test, which must be significant. As Kaiser recommends, we performed PCA with Varimax rotation. This method of orthogonal rotation minimizes the number of variables strongly projected on each factor. It simplifies their interpretation and generates uncorrelated factors.

We also tested the internal reliability of each of the dimensions selected by calculating Cronbach’s alpha. We consider that α is insufficient below 0.5 and becomes acceptable above 0.7.

⁹ Canonical analysis is used to determine whether two groups of variables are dependent on one another and if so to measure the importance of the relations between the two groups using the canonical correlation coefficient. The square of this coefficient (R^2) represents the percentage variance common to both vectors.

CONCLUSION

We have sought in this paper to better understand and explain the concept of performance and to analyse how IT can contribute to the organizational performance of establishments like the IUT.

This topic is innovative, complex, and central to research on IT management and leads to mixed results.

Although findings from the qualitative phase suggest IT use might be one of the determinants of organizational performance, proving such a connection is a more intricate matter. Empirical studies do not necessarily show significant relations between the use of IT and the performance of the IUT.

These results may be explained initially by a problem with measuring the variables. There is no single agreed definition of performance. The dynamic character of IT but also the changing context of the IUT appear to be factors that can justify the absence of significant results. IT is not an independent variable and cannot be thought of as the sole factor in explaining performance.

Accordingly several points to think about are raised. If organizational performance does not arise from IT alone, might it not also depend on the users themselves, on their skills and their motivation? Might not poorer performance be explained by the absence of skills and the presence of curbs associated with the use of IT and related above all to its continuous development that overthrows established mindsets? Should we not examine the connection between these two factors and performance, and consequently the means to be implemented to remedy them?

To end, as evoked at the beginning of this paper, the research aspect has been voluntarily set aside so as to restrict and simplify the study. Even so, performance at the IUT (especially with the readiness to develop and sustain the IUT National Research Congress, for example) also rests upon the work of teaching-research staff, which we will be able to explore in future work.

BIBLIOGRAPHY

- ASSEMBLÉE GÉNÉRALE ADIUT (Assemblée des Directeurs d'IUT), Compte rendu, Septembre 2015.
- BHARADWAJ, A. (2000). "A resource-based perspective on information technology capability and firm performance: an empirical investigation". *MIS Quarterly*, vol. 24, n° 1, pp. 169-196.
- CASEAU, Y. (2007). *Performance du système d'information*, Édition Dunod, 246 pages.
- CHARREAUX, G. (2003). "La création de valeur par l'université: une perspective partenariale". *Cahier du FARGO*, N° 1030301.
- CHARREAUX, G.; DESBRIERES, P. (1998). "Gouvernance des entreprises: valeur partenariale contre valeur actionnariale". *Revue Finance-Contrôle-Stratégie*, n° 2, juin, pp. 57-88.
- DELONE, W.; MCLEAN, E. (1992). "Information Systems Success: The Quest for the Dependent Variable". *Information Systems Research*, vol. 3, n° 1, pp. 60-95.
- DELONE, W.; MCLEAN, E. (2003). "The DeLone and McLean model of information systems success: A ten-year update". *Journal of Management Information Systems*, vol. 19, n° 4, pp. 9-30.
- ELIE-DIT-COSAQUE, C. (2011). "Les technologies de l'information et de la communication (TIC) et le contenu du travail". *Annales des Mines – Réalités industrielles*, 2011/1, pp. 35-39.
- FREEMAN, R.E. (1984). *Strategic Management: A stakeholder approach*, Pitman, Ballinger, Boston.
- GIANNELLONI, J.-L.; VERNETTE, E. (2001). *Études de marché*, Éditions Vuibert.
- JOMAA, H. (2004). "Valorisation de l'usage des TIC: démarche d'évaluation de la contribution des TIC à la création de valeur pour l'entreprise". *La recherche au Cigref*, Cahier n° 1, pp. 39-60.
- KHOUATRA, D. (2005). "Gouvernance de l'entreprise et création de valeur entrepreneuriale". 16^e Conférence de l'AGRH Paris Dauphine.
- LAMB, R.; KLING, R. (2003). "Reconceptualizing Users as Social Actors in Information Systems Research". *MIS Quarterly Executive*, vol. 27, n° 2, pp. 197-235.
- MASON, R.O.; MITROFF, J.-L. (1973). "A Program for Research on Management Information Systems". *Management Science*, vol. 19, n° 5, janvier, pp. 475-487.
- MERCIER, S. (1999). *L'éthique dans les entreprises*, La Découverte.
- MISSAOUI, I. (2009). "Valeur et performance des systèmes d'information". *La recherche au Cigref*, Cahier n° 5.
- PENROSE, E.T. (1959). *The theory of the growth of the firm*, New York, John Wiley.
- PESQUEUX, Y. (2002). *Organisations: Modèles et représentations*, PUF.
- REIX, R.; FALLERY, B.; KALIKA, M.; ROWE, F. (2011). *Systèmes d'information et management des organisations*, Éditions Vuibert, 6^e édition, 472 pages.
- SCOTT MORTON, M.S. (1991). *The Corporation of the 1990s; Information Technology and Organizational Transformation*, Oxford University Press.
- THIETART, R.-A. et coll. (1999). *Méthodes de recherches en management*, Dunod.
- WERNERFELT, B. (1984). "A resource-based view of the firm". *Strategic Management Journal*, vol. 5, n° 2, pp. 171-180.
- YIN, R.K. (1994). *Case study research, sign and methods*, Sage publications, London.
- ZUBOFF, S. (1988). *In the Age of the Smart Machine*, Basic Books, New York.

APPENDIX 1 A FEW CHARACTERISTIC EXAMPLES OF VERBATIMS

Topics		Verbatim	Interviewees' initials
PERCEPTION OF IT	IT use	Its crucial, there are many things I couldn't do without IT	LB
		<i>It's everywhere, it's a step forward</i>	SR
		<i>It's a tool, or even a whole host of tools, above all and not an end in itself, for doing things better and faster</i>	CG
		<i>It can make things simpler but more complex, it is something that requires learning</i>	RB
		<i>It means new tasks can be created</i>	AG
	Difficulties in using IT	<i>There a problems with it being slow</i>	LB
		<i>Yes, of course, but haven't we become more demanding?</i>	J-L B
IT performance	<i>High-performing IT must meet a need, without creating others, and repeatedly each time and quickly</i>	AG	
ORGANIZATIONAL PERFORMANCE	Economic performance	Performance means a very good response to an expectation	CG
		<i>Performance is measured in the pairing effectiveness/efficiency because it rests on the capacity to achieve an objective while limiting waste and so by streamlining resources</i>	JV
	Graduate performance	<i>Yes, we can speak of performance at the IUT because young graduates are able to get on in the world of work and in their further studies</i>	CG et LB
		<i>Our students contribute to and improve corporate procedures especially in their placements and especially through the use of computing tools</i>	LB
	Teacher performance	<i>IUT performance is related to the performance of teachers that can be measured through their involvement because the IUT is a small organization, their close relations with students and among teaching staff</i>	SS
IUT'S OBJECTIVES	To prepare competent young people	LB	
	<i>To provide university-level higher education so they attain a high level of performance</i>	AG	
	<i>We don't speak of an overall strategy</i>	LP	
	<i>We can speak more of a general policy to fulfil our mission: making students successful in the sense of finding employment</i>	AG	
	<i>The director's objective is to open up new courses because it's a performance indicator for him. It's true in the sense that it makes the site more attractive</i>	JV	

APPENDIX 2

OPERATIONALIZATION OF VARIABLES

Initial variables	Measures/indicators	Variable characteristics	Processing
IT use at the IUT	Three modalities for evaluating IT use: <ul style="list-style-type: none"> • Frequency (3 dimensions): daily, several times per week, weekly • Location (3 dimensions): IUT, home, public places • Perception of use (8 dimensions) : constraining, user-friendly, straightforward, essential, difficult, compulsory, necessary, against your will 	Nominal variable Nominal variable Likert scale	Descriptive statistics Descriptive statistics PCA
IT Performance	One modality: <ul style="list-style-type: none"> • Performance criteria (8 dimensions): time saving, respond to a need without creating others, crash-free, user-friendly, easy to use, essential, provide easy and fast access to information, economical (avoid waste) 	Likert scale	PCA
Difficulties in using IT	Two modalities: <ul style="list-style-type: none"> • Difficulties experienced (3 dimensions): difference between operating systems, slow equipment, changing software, unfamiliarity with software • Reluctance (1 dimension): use of new tool 	Ordinal variable	Descriptive statistics
Actions reducing difficulties	One modality: <ul style="list-style-type: none"> • Actions wished for (8 dimensions): training, better circulation of information, better communication among actors 	Ordinal variable	Descriptive statistics
IUT's missions	One modality: <ul style="list-style-type: none"> • IUT's objectives (4 dimensions): Provide public service, teach vocational skills, prepare for further study, provide higher university level of study 	Likert scale	Descriptive statistics
Overall performance at the IUT	Three modalities: <ul style="list-style-type: none"> • Performance of our graduates (2 dimensions): success rate, further study rate • Teacher performance (2 dimensions): supervision, involvement • Economic performance (2 dimensions): creation of new vocational degrees, make organization attractive 	Likert scale	Descriptive statistics

APPENDIX 3 PCA RESULTS

PCA	Initial variables	Extracted factors	R	KMO	Bartlett	Vp	Rotation	σ	
1	IT use at IUT	Factor 1: Positive perception		0,645	0,000	2,339	<i>Varimax</i>	0,689	
		User-friendly	0,499						
		Straightforward	0,422						
		Essential	0,784						
		Compulsory	0,666						
		Necessary	0,833						
		Factor 2: Negative perception					1,698		0,557
Constraining	0,704								
Difficult	0,765								
2	IT Performance	Factor 1: Efficiency		0,757	0,000	2,692	<i>Varimax</i>	0,652	
		Easy to use	0,682						
		Essential	0,672						
		Quick access to information	0,715						
		Economical	0,679						
		Factor 2: Technical effectiveness					1,088		0,640
		Time saving	0,770						
Respond to need without creating others	0,840								
Crash-free	0,625								
3	Overall performance at IUT	Factor 1: Social performance		0,721	0,000	4,035	<i>Varimax</i>	0,937	
		Students' success rate	0,893						
		Rate of students continuing	0,885						
		Involvement, presence of teachers	0,893						
		Supervision, monitoring by teachers	0,892						
		Factor 2: Economic performance					1,270		0,966
		Creation of new vocational degrees	0,953						
Attractiveness	0,957								

r = correlation coefficient of each item with extracted factor; **KMO** = Kaiser-Meyer-Olkin criterion; **Vp** = eigenvalue; **σ** = Cronbach's alpha

APPENDIX 4
HYPOTHESES AND RESULTS OF CANONICAL ANALYSES

Explanatory variables – dimensions	Response variables – dimensions	Canonical axis pairings	Canonical R	R ²	Chi ²
H1: A positive connection arises between IT use and Dijon-Auxerre IUT performance					
One variable: IT use	One variable: IUT performance	1	0.084	0.007	3.808
2 Factors: Positive perception and Negative perception	2 Factors: Social performance and Economic performance	2	0.038	0.001	0.643
H2: A positive connection arises between difficulties in using IT understood as IT non-performance and Dijon-Auxerre IUT performance					
One variable: IT Performance	One variable: IUT Performance	1	0.144	0.020	10.806
2 Factors: Efficiency and Technical effectiveness	2 Factors: Social performance and Economic performance	2	0.057	0.003	1.448

