

CONTRIBUTION OF INFORMATION AND COMMUNICATION TECHNOLOGY TO THE PERFORMANCE OF MALAGASY COMPANIES

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ABSTRACT

For several years, Information and Communication Technologies (TIC) have been experiencing a remarkable boom. The digital market is in great shape and all TIC users are confident about the future, especially in terms of the pace of renewal of models at the corporate level. But the problem that arises is to know how TIC impacts the performance of companies?

Starting from a hypothesis assuming that the use of TIC contributes to the improvement of the company's performance, the objective of this study is to analyze the contributions of TIC to this performance. The analysis of data from an opinion survey of a sample of 580 employees of Malagasy companies allowed us to affirm the effectiveness of TIC reflected by the evolution of turnover and productivity.

Keywords: *Company, TIC, digitalization, operation, evolution, performance.*

INTRODUCTION

No one escapes the evolution of information and communication technology. Computer scientists, entrepreneurs and the State are the actors who have participated in the integration of Madagascar in the world of TIC. The country is therefore in line with this new evolutionary trend by promoting a new form of information and communication.

The opening to digital is effective in Madagascar although the rate of dispersion is very low. For the moment, this connectivity is more concentrated in the big cities since it is a technology that depends a lot on electricity and that is still one of the big Malagasy problems. To accelerate the evolution, the Malagasy State has put in place some measures that give a better picture of the state of digital in Madagascar since 2016 thanks to the political will and commitment of the Malagasy government in the field (national policy of development of TIC, communication code, improving access to information and communication in rural areas).

The new technologies sector has been recognized as one of the most dynamic sectors of the first decade of this century in Madagascar, and many have said that this sector has been one of the few not to have been severely

affected by the crises that have shaken the country. Unquestionably to testify of the ambient dynamism, the actors of the TIC in Madagascar held through fairs and various forms of events to highlight the evolutions of the sector and thus to contribute to the revival of the national economy.

The Information and Communication Technology (TIC) has a preponderant role in the economy. Most of the Malagasy companies of today are forced to follow the environment that the evolution of the technology imposes to them. From there, the need to use the TIC becomes essential, the Malagasy companies turn more and more to this. The use of TIC appears to be a godsend for companies aiming at performance. But the problem that arises is to know in what way the TIC impacts the performance of companies?

The rapidity with which the use of TIC is spreading and the advantages it offers to its users, place it among the first occupations of any company concerned with its performance. It is recognized that the Information and Communication Technologies (TIC), are a vector of the evolution of the performance of the company. It is in this sense that the objective of this study turns on the analysis of the contributions of the TIC in the performance of the Malagasy companies.

It is currently almost impossible for Malagasy employees to work without TIC tools. TIC has become the most required tool in the execution of missions. It allows to pass information and to collect it, to communicate and to structure tasks.

Starting from a hypothesis assuming that the use of TIC contributes to the improvement of the performance of the company, the results of a survey by opinion poll near a sample of 580 Malagasy companies¹ will be analyzed from the tools and statistical techniques in order to be able to leave the place of TIC in the performance of these companies.

I-CADRE CONCEPTUEL

TIC refers to the set of technologies used in the operation, transformation and storage in the form of electronics, they include computer technologies and communications and the network that connects devices and other materials. It is generally common to associate TIC with the information society, which gives a societal dimension to the technologies given their widespread impact.

The term technology refers to the materials and techniques used in the enterprise for the purposes of production in the broad sense, distribution, and management. It includes everything that can be digitized and processed by the computer tool (texts, images, sounds, set combining several of these elements thanks to a multimedia tool).

The information is considered as the creation of the added value on the account of the data. It can be said that information is the framework which puts the information systems, the fabric of communications and the science of the computer following the development of practical sciences in the field of the information technology. The information constitutes at the same time the transmission of news and the device that gives a "form", a setting in order of the reality. However, information supposes a communication between a transmitter and a receiver, the first expecting in principle a reaction of the second. Information is a complementary system following 03 essential dimensions: Hardware, Software, Knowledge are. TIC includes first of all computer hardware, software and telecommunications equipment.

The term communication refers to the set of techniques that allow the almost immediate transmission and reception of information, audio (telephony) written and digitized (fax, email, visual - video conferencing or videoconferencing). The processing of the received information can be more or less automated (transfers, automatic response, automatic filing).

The international definition retains as field of the TIC the economic activities which contribute to the visualization, to the treatment, to the storage and to the transmission of the information by the electronic means.

The technologies produce meaning and significance whatever the form and nature (natural language, visual languages, audiovisual, scriptovisual, etc.). They are, to use the expression of **P. Schaeffer**², the musician and theorist of the concrete music, machines to communicate. They contribute, by their technical configuration and through a network of determinations that it will be necessary to study, to the elaboration of the sense and to the construction of the representations that they convey. In other words, if TICs convey messages, they contribute to their meaning by imposing form and structure on them.

¹ Characteristics in table 10 in annex

² **P. Schaeffer**, « *La Face cachée de la musique française contemporaine* », La Revue musicale, Paris, éditions Richard Masse, 1978.

The definition d'**Herbert Simon**³ which is based on the characteristics of TIC seems the most accepted. According to this author these technologies help to make all information accessible to men, in verbal or symbolic form, will also exist in computer-readable form; books and memoirs will be stored in electronic memories.

Thus the information and communication technologies can be defined as the whole of the computer and telecommunication technologies, they are the results of a convergence between technologies. They allow the exchange of information as well as their treatment. They also offer new means and methods of communication.

All these technologies revolve around the Internet network, which has allowed the shortening of delays in the dissemination and sharing of information. Information technology refers to electronic data processing techniques, allowing the collection, processing, storage and distribution of information. According to **Charpentier**⁴: TIC is a set of technologies used to process, modify and exchange information, more specifically digitized data.

Information and communication technology has evolved considerably over the last few decades, having a significant impact on daily life as well as on the functioning of the company. Generally speaking, the impact of TIC on the company has notably materialized through :

- a better structuring of work: tools and software have made it possible to improve the organization of work and to obtain a better rationalization whatever the professional field concerned,
- more flexible work: TICs, especially through the development of remote work tools and mobile devices, make it possible to work in a less rigid way. For example, it is possible to work remotely via videoconferencing systems or to access a work environment even if you are not physically in your workplace
- cost reduction: dematerialization, automation of certain aspects or work processes can reduce a company's operating costs,
- an improvement in the quality of work and performance: TICs provide tools to better regulate the flow of work and to have a more in-depth analysis of the work produced, whether the result is material or not.

According to **Brousseau et Rallet (1997)**⁵, TICs bring to companies a "communication" dimension to information processing, while freeing themselves from geographical and temporal boundaries. In addition to its ability to transmit and receive information, TICs bring a new dimension: the information exchanged (voice, data, images) remains available for later reuse and can be enriched. **Don Tapscott**⁶, president of the Alliance for Converging Technologies, noted that through new technology networks, small businesses can overcome the major advantages of large companies: economies of scale and access to information. At the same time, they do not suffer from the major drawbacks that plague large companies: crippling bureaucracy, stifling hierarchy and inability to change. Moreover, thanks to the evolution of TIC, the company has an additional means to market its products and services. Also called electronic commerce or e-commerce, online sales correspond to the various electronic transactions that are carried out through computer networks.

These theories justify the idea that TIC becomes an essential management tool for the functioning of the company and perhaps for its performance.

II-RESULTS

Aware of the importance of the new technologies, most companies have hurried to adopt them, each one at its own pace and needs, offering employees new communication and exchange channels. The following results give an overview of the position of Malagasy companies in relation to the development of TIC.

2.1 Use of TIC in Malagasy companies

Although the use of TIC is considered unavoidable by the 43.2% of business leaders surveyed, according to Table 1, and that the twenty-first century is described as the digital age given the technological advance of materials and work tools in our daily lives, it is clear that the economic situation of our country, which generates a low purchasing power, is a major obstacle to the use and adaptation of TIC.

³ **Herbert Simon**, « *le journal des professionnels : la révolution des NTIC* », prix Nobel des sciences économiques 1998.

⁴ **P. Charpentier**, « *économie et gestion de l'entreprise* », 2000.

⁵ **Brousseau et Rallet**, « *Le rôle des technologies de l'information et de la communication dans les changements organisationnels* », 1997.

⁶ **Don Tapscott**, « *digital capital* », 2000.

Table 1: The TIC that is essential to business development

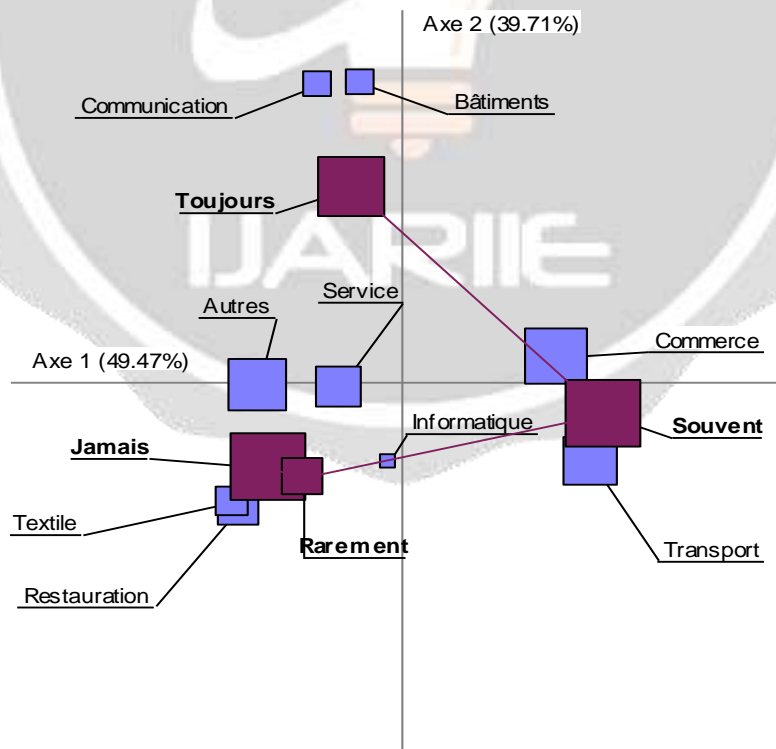
Business Development	Fréquence
Not at all essential	36,6%
Not a must	20,2%
Not to be missed	21,5%
Definitely a must	21,7%
TOTAL QUOTE	100%

Source: Authors, 2021

If we refer to the use of TIC according to the sectors of activity of the companies, the factorial analysis of the correspondences (AFC) of the data of surveys allow us in a first time to translate according to the results of the test of associated chi-deux which provide a p-value (0,001) lower than 5% the dependence between the two studied characters. Thus, we can say that the use of TIC by companies varies according to their activities.

Figure 1, where the factorial axes represent the % of variation of the information, establishes that: the construction sector is the most user of TIC; trade and transport are beginning to become familiar with TIC; catering and textiles are the least users of IT.

Figure 1: TIC users by sector



Source: Authors, 2021

The TIC as it was evoked previously is used by its objective to the optimization of the function or the activities of the company. The orientation of our analyses in this direction identifies in a first step the attributes of the field of use of the TIC. The analysis of reliability by the value of the Coefficient of Alpha of Cronbach of these

attributes in table 2, produced a value of 0,872 close to 1, which assures the fact that the domains of use of the TIC within the companies are: production, administration, distribution and finance.

Table 2: Reliability statistics for TIC use function attributes

Alpha Cronbach	Alpha Cronbach based on standardized elements	Number of elements
,872	,872	4

Source: Authors, 2021

The table of average scores attributed to each attribute in Table 3, however, allow us to identify the function of the company that employs TIC the most.

Table 3: Area of TIC use in the company

Area of use of TIC	Mean value
TIC in production	2,48
TIC in administration	2,49
TIC in distribution	2,58
TIC in financial management	2,29
All	2,46

The parameters are set on a scale of 1 (Never) to 4 (Always).

Source: Authors, 2021

The results show that TIC is often used within a company in administration and in distribution, the associated average scores or values are the highest.

2.2 Importance of using TIC

TICs are a factor in the evolution of social relations, jobs and professions. They accompany a series of transformations concerning company strategy, work organization, forms of management, consultation and negotiation. In fact, according to Table 4, 72.8% of company managers agreed during the survey that the use of TIC is more than necessary because they are also trying to control it.

Table 4: Mastery of TICs essential to the accomplishment of tasks

Necessity of TIC in the accomplishment of tasks	Frequency
Not at all	15,2%
Less	12,0%
As much	3,9%
A lot	68,9%
TOTAL	100%

Source: Authors, 2021

In addition, the results of our surveys show that the impact of the use of TIC, which logically constitutes the determinants of the use of TIC, is based on four attributes: communication, access to information, work organization and staff development. In Table 5, the value of Cronbach's Alpha equal to 0.918, very close to 1, confirms the reliability of the attributes of the impact of TIC use.

Table 5: TIC Impact Reliability Statistics

Alpha Cronbach	Number of elements
,918	4

Source: Authors, 2021

III- DISCUSSION

The rapidity with which the use of TIC is spreading and the advantages they offer to their users, place them among the first occupations of any company concerned with its performance. It is recognized that Information

and Communication Technologies (TIC) are a vector for the evolution of the company's performance. But on which criteria this assertion can be verified for the case of the Malagasy companies.

3.1 TIC: an efficient working tool

It is currently almost impossible for Malagasy employees to work without TIC tools. TIC has become the most required tool in the execution of missions. It is used to transmit and collect information, to communicate and to structure tasks. The result presented in Table 16 in the appendix confirms the rate of use of information and communication technologies by Malagasy companies.

In order to assess the impact of TIC use in the areas of production, administration, distribution and financial management on the performance of companies in terms of achieving objectives, we will also establish a multiple regression model that describes the contribution of TIC in the various functions of the organization for the achievement of results or performance.

The endogenous variable or variable to be explained is thus the achievement of results which translates the performance of the company (Y).

The explanatory variables are none other than the level of use of TIC in the functions of production (X1), administration (X2), distribution (X3) and financial management (X4).

The model is of the type: $Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + \varepsilon$, the different terms having the same meanings.

First of all, the first results show the existence of the model through the value of the coefficient of determination R2 equal to 0.624 meaning that 62.4% of the variation in performance or achievement of results are explained by the variation in the use of TIC in the production, administration, distribution and financial management functions.

Subsequently, Table 6, Fisher's test analysis results giving a p-value of 0.000 less than 5% justifies the overall significance.

Table 6: Overall validity of the performance model through the use of TIC in the production, administration, distribution and finance functions

Model	Edit statistics				
	Variation of R-deux	Variation of F	ddl1	ddl2	Sig. Variation of F
1	,324 ^a	51,329	4	429	,000

Source: Authors, 2021

Finally, Table 7 provides the values of the coefficients of the exogenous variables of the model and the p-values of the Student's t test on the nullity of the coefficients, all of which are low in relation to the 5% risk of error, make it possible to deduce the equation of the model and the significant explanatory effect of the use of TIC in the functions of production, administration, distribution and financial management in the performance

Equation of model : $Y = 1,742 + 0,11X_2 + 0,99X_3 + 0,205X_4 + \varepsilon$

Table 7: Coefficients of variables

Model	Non-standardized coefficients		Standardized coefficients	t	Sig.
	B	Ecart standard	Bêta		
1 (Constant)	1,742	,110		15,786	,000
Does your company use TIC in production	,011	,051	,012	,221	,825
Does your company use TIC in administration	,099	,053	,108	1,852	,065
Does your company use TIC in distribution	,260	,052	,292	4,956	,000
- Is your company using TIC in finance	,205	,053	,234	3,829	,000

Source: Authors, 2021

The dependence between the use of TIC in distribution and the need for TIC mastery is significant (p-value = 0.000). Thus, the double entry table between the two variables studied and the factorial map that describes the different correspondences between the modalities, in table 8, allow us to state that the managers of companies

working in distribution surveyed declare in majority (71.8%) that they use TIC and also estimate (72.8%) that the mastery of TIC is more than necessary in the accomplishment of their tasks.

Table 8: Dependence between the use of TIC in distribution and its mastery in the performance of tasks

TIC in distribution/	Not at all	Less	As much	Many	TOTAL
Mastery of TIC in the performance of your job	50,5%	37,1%	6,2%	6,2%	100%
Never	2,9%	11,8%	11,8%	73,5%	100%
Rarely	1,9%	2,7%	0,8%	94,6%	100%
Often	23,9%	10,9%	10,9%	54,3%	100%
All the time	15,2%	12,0%	3,9%	68,9%	100%

The dependence is very significant. $\chi^2 = 284,67$, $ddl = 9$, $1-p = >99,99\%$.

Source: Authors, 2021

In view of the results of the use of TIC in the distribution function and the need to master it, we can say that companies that do not use TIC much do not see the value of TIC in their activities, while those that use it often do see the need for TIC in the performance of their tasks.

The results of the analysis of the survey data in Table 9 show that in terms of performance level, the vast majority (75.69%) of the companies that have noted a growing sales volume, more than half (55.1%) of them use TIC in the distribution function often and many of them find the need for TIC in the performance of their tasks. For those companies with a very high sales volume, the use of TIC is permanent in the distribution for one out of two companies. These results show the importance of the use of TIC to improve performance in terms of sales situation.

Table 9: State of sales in relation to the use of TIC in distribution, and its necessity in carrying out the tasks

TIC Sales status	Use in distribution	Necessity in the accomplishment of tasks
Growing (75.69%)	Often (55.1%) Never (8.9%) Always (5.2%)	A lot (64.7%) Less (7.5%) As much (0.9%)
Very growing (2.06%)	Always (50.0%) Never (16.7%) Rarely (16.7%)	Not at all (25.0%) Less (25.0%) As much (25.0%)

Source: Authors, 2021

The majority of Malagasy companies have exploited the new opportunities offered by TIC. According to table 10, 67.5% find a fast or even very fast advancement of their companies in front of the TIC world.

Table 10: TIC Advancement of Companies

Advancement of companies in TIC	Fréquence
Very slow	11,7%
Slow	20,9%
Fast	52,4%
Very fast	15,1%
TOTAL QUOTE	100%

Source: Authors, 2021

In addition, the results of analysis of the level of impact of the performance of companies in terms of turnover (C.A) in relation to the situation of their advancement in the world of TIC whose dependence is significant in relation to the results of the chi-square test (p-value at 0.001), we can draw from table 11 the following trends:

- Overall, the level of performance is fairly constant for companies that have some very slow (63.2%) or slow (53.7%) progress in the TIC world;

- The companies which integrate quickly in the use of the TIC realize positive performances reflecting on increasing turnovers (C.A) for 34,8% or very increasing for the 59,2% of the companies.

However, it is to be noted from the results obtained that the very fast integration of the companies in the world of the TIC can carry them prejudices. Indeed, one out of two companies (50%) has a very decreasing level of performance and just two out of ten companies (20.3%) achieve positive performance (growing or very growing turnover).

Table 11: Level of performance in terms of sales by advancement in the TIC world

Performance level (C.A) Advancement of the company in TIC	Very decreasing	decreasing	Constant	Croissant	Very croissant	TOTAL
Very slow	2,1%	13,2%	63,2%	16,2%	5,3%	100%
Slow	0,7%	22,2%	53,7%	21,0%	2,2%	100%
Fast	2,7%	1,6%	1,6%	34,8%	59,2%	100%
Very fast	50,0%	12,1%	13,6%	9,1%	11,2%	100%

Source: Authors, 2021

According to the information gathered during the interviews, this has brought a clear improvement in their performance and they are currently trying to collaborate with computer specialists to create new software adapted to their needs.

The trend of dependency characterized by the state of improvement of the results obtained by the companies are presented in Table 12 and allow us to raise that :

- For the companies that did not have improvements in results, 94.5% declared to be able to develop their businesses without using TIC and do not see the need to work with professionals in the field (84.8%).

- Among the managers of the companies that have seen a lot of improvement in their results, the vast majority (96.2%) find it impossible not to use TIC in our era on the one hand and not to work with professionals (95.4%) on the other hand to ensure the development of the company and its success.

Indeed, we note a dependence between the opinion of the leaders of the companies on the inescapability of the TIC vis-a-vis the development of their companies and the need to work with specialists or professionals of the field. This validates the participation of TIC in the performance of the company.

Table 12: Usefulness of TIC in Development - Collaboration with Specialists - Improved Results

Status of improvement in results	Utility of TIC in development	Spécialistes TIC
Not at all (51.1%)	Not at all essential (56.5%) Not essential (38.0%) Very much a must (4.3%)	Never (84,8%) Often (6.5%) Rarely (4.3%)
Moderate	Not essential (69.2%) Absolutely essential (17.9%)	Rarely (56.4%) Never (17.9%)

	Unavoidable (10.3%)	Often (12.8%)
A lot	Not at all essential (68.9%) Not a must (24.4%) Unavoidable (3.9%)	Often (91,1%) Rarely (3.3%) Never (2.8%)

Source: Authors, 2021

3.2 An evolution of the turnover since the use of the TIC

The direct impact of TIC use on performance can be measured by the change in the company's turnover. Table 13 shows the trend in the opinions of the company managers interviewed

Table 13: Improved outcomes through TIC

Improving results through TIC	Frequency
Many	71,5%
As much	19,0%
Less	8,3%
Not at all	11,2%
TOTAL QUOTE	100%

Source: Authors, 2021

From the results of the table we can see the positive effects of the use of TIC on the improvement of results. 71.5% of the managers declare the state of improvement of their results during the survey. The p-value of 0.001 less than 0.05 of the chi-square test of independence justifies the significance of this proportion.

In addition, the managers stated that the return on their TIC investment (hardware, software, personnel) is not only felt in terms of cost reduction but especially in terms of increased sales.

These statements are confirmed by the results of the chi-square test of independence between the fact that companies are computer users, investment indicators and the evolution of turnover. The associated p-value of 0.0001 less than 0.05 confirms the dependence and allows us to draw through table 14 that :

- For non-users of computers, in other words, companies that do not invest, 76.2% of them do not improve their situation because their sales are still in a phase of decline.

- This situation of growth of the CA sign of performance are met by the 94,5% of the users and the 88,6% of the very users of the computers.

Table 14: Computer Users and CA Performance

Computer Users/Performance Level	Decreasing	Constant	Croissant	TOTAL
No user	76,2%	16,6%	7,3%	100%
User	4,0%	1,5%	94,5%	100%
Very user	6,3%	5,1%	88,6%	100%
TOTAL	5,2%	15,7%	79,1%	100%

Source: Authors, 2021

TIC provides tools to better regulate the work flow and to have a more in-depth analysis of the work produced, whether the result is material or not. Moreover, according to the results of analyses, TIC brings an improvement in turnover.

CONCLUSION

Computers, software and the Internet, the fruits of the technological revolution, have stimulated productivity in all businesses, leading to strong growth.

In Madagascar, companies are permanently exposed to competition. In this context, they have been able to rationalize, optimize and automate their processes by relying on TIC. This would allow them to gain in productivity differential and profitability by the same occasion increased turnover. The TIC thus participates in the performance of the company not only by being an effective working tool but also by improving the turnover.

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ANNEX

Table 15 : Table of sample characteristics

Legal status	Family business	Size of your company	Sector of activity	Age of your company	Capital
SARL (55,2%) S.A (22,7%) Individuel (18,9%)	Non (50,3%)	Moins de 50 (75,2%) 101 à 150 (19,2%) plus de 200 (3,1%)	Commerce (30,4%) Service (13,3%) Transport (12,2%)	11 à 15ans (48,3%) 6 à 10 ans (30,4%) Plus de 15 ans (18,9%)	10 à 50 millions AR (69,9%) 51 à 100millions AR (19,2%) Moins de 10millions AR (8,7%)
Individuel (40,6%) SARL (37,7%) S.A (19,8%)	Non (87,7%)	Moins de 50 (83,0%) plus de 200 (5,7%) 101 à 150 (4,7%)	Transport (34,9%) Autres (31,1%) Commerce (12,3%)	11 à 15ans (89,6%) 6 à 10 ans (4,7%) Moins de 5 ans (2,8%)	51 à 100millions AR (84,0%) Plus de 100millions AR (8,5%) Moins de 10millions AR (4,7%)
SARL (58,8%) S.A (21,9%) Individuel (17,6%)	Oui (53,5%)	Moins de 50 (59,4%) 51 à 100 (32,1%) 151 à 200 (4,3%)	Autres (29,9%) Commerce (18,2%) Restauration (18,2%)	Plus de 15 ans (61,0%) 11 à 15ans (30,5%) 6 à 10 ans (4,8%)	10 à 50 millions AR (85,6%) 51 à 100millions AR (5,9%) Moins de 10millions AR (5,3%)
SARL (308) Individuel (130) S.A (127)	Non (324) Oui (255)	Moins de 50 (414) 51 à 100 (67) 101 à 150 (63)	Commerce (134) Autres (107) Transport (96)	11 à 15ans (330) Plus de 15 ans (181) 6 à 10 ans (51)	10 à 50 millions AR (363) 51 à 100millions AR (155) Moins de 10millions AR (40)

Source: Authors, 2021

Table 16: General behavior of companies in the use of TIC in their environment.

	Axe 1 (+25.49%)		Axe 2 (+22.82%)	
CONTRIBUTIONS POSITIVES	Jamais TIC	+12.43%	Faible COMP	+16.70%
	Très Faible EQPT	+11.89%	Faible EQPT	+16.00%
	Jamais PRO	+11.45%	Rarement PRO	+13.49%
	Très Faible COMP	+11.16%	Souvent TIC	+8.27%
	AMBATOLAMPY	+1.28%	ANTANANARIVO	+3.28%
	Faible EQPT	+0.84%	Rarement TIC	+2.31%
	Faible COMP	+0.78%	Elevé COMP	+0.04%
	ANTANANARIVO	+0.32%	Elevé EQPT	+0.01%
	Elevé COMP	+0.21%		
CONTRIBUTIONS NEGATIVES	Moyen EQPT	-12.11%	Jamais TIC	-6.95%
	Moyen COMP	-11.49%	Très Faible EQPT	-6.75%
	Souvent PRO	-10.86%	Très Faible COMP	-6.68%
	Toujours TIC	-10.41%	AMBATOLAMPY	-4.46%
	ANTSIRABE	-4.47%	Souvent PRO	-3.32%
			Toujours TIC	-3.28%
			Moyen EQPT	-2.71%
			Moyen COMP	-2.61%
			Jamais PRO	-2.48%

Source: Authors, 2021