

PROJECT, DESIGN AND MANAGEMENT

ISSN: 2683-1597



How to cite this article:

Serapiao, C. (2020). Models of Management of ICT Services in Private Schools in the City of São Paulo. *Project, Design and Management*, 2(1), -. doi: 10.35992/pdm.v2i1.359

MODELS OF MANAGEMENT OF ICT SERVICES IN PRIVATE SCHOOLS IN THE CITY OF SÃO PAULO

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Abstract. The use of standards or models for managing ICT services is not new in Brazil, however there is a lack of information about the applicability of these models. The main objective of the study was to conduct a survey of ICT service management models practiced in private schools in the city of São Paulo, and after data collection, cross-check information with internal customer satisfaction levels (in particular, coordinators) of each institution so that it is possible to understand the relationship between the high quality levels of schools and the ICT service management models applied in these institutions. For data collection, a questionnaire was applied to each professional profile, the ICT manager and the pedagogical coordinator, with the intention of deepening the knowledge about the sector. The selected sample consisted of 67 ICT managers and 69 pedagogical coordinators. Through the verification of the data it was possible to understand part of the relationship between the supply of equipment, wireless networks and technology support services, with the perception of quality of the pedagogical professional in the same elementary school. As a result of both researches, it was possible to understand the direct relationship between a well-equipped school and professionals trained in the daily care of the teacher.

Keywords: Technology application in schools, ICT service quality, ICT service management models.

MODELOS DE GERENCIAMENTO DE SERVIÇOS DE TIC EM ESCOLAS PARTICULARES NA CIDADE DE SÃO PAULO

Resumo. O uso de padrões ou modelos para gerenciamento de serviços de TIC não é uma novidade no Brasil, no entanto é notória a falta de informações sobre a aplicabilidade desses modelos. O objetivo principal do estudo foi realizar um levantamento dos modelos de gerenciamento de serviços de TIC praticados nas escolas particulares da cidade de São Paulo e após a coleta dos dados efetuar um cruzamento das informações com os níveis de satisfação dos clientes internos (em específico, os coordenadores pedagógicos) de cada instituição para que seja possível entender a relação entre os altos níveis de qualidade das escolas e os modelos de gerenciamento de serviços de TIC aplicados nessas instituições. Para levantamento dos dados foi aplicado a cada perfil de profissional, o gerente de TIC e o coordenador pedagógico, um questionário com a intenção de aprofundar o conhecimento sobre o setor. A amostra selecionada foi de 67 gerentes de TIC e 69 coordenadores pedagógicos. Através da apuração dos dados foi possível entender parte da relação entre a oferta de equipamentos, redes sem fio e serviços de suporte de

tecnologia, com a percepção de qualidade do profissional de pedagogia em uma mesma instituição de ensino básico. Como resultado das duas pesquisas, foi possível entender a relação direta entre uma escola bem aparelhada e com profissionais treinados em atendimento no cotidiano do professor.

Palavras-chave: Aplicação de tecnologia em escolas, qualidade de serviços de TIC, modelos de gerenciamento de serviços de TIC

Introduction

A major challenge for managers of information and communication technology (ICT) departments installed in private schools is balancing investment in technology infrastructure with the offer of a quality support service to keep the entire operation of the educational institution. This perception of quality, or value creation, is extremely difficult to measure, mainly due to the intangibility of the fact. It is up to the information and communication technology (ICT) manager to understand the most diverse needs, be they individual or corporate. However, meeting these demands, which are not always explicit, requires good processing between departments and, above all, a good relationship with their managers.

Rodrigues, Maccari and Simões (2009) found that ICT management is not adherent, mainly, in relation to the support of the business models in which it is inserted. For this reason, following the evolution of technology has proven to be a guide in the perception of quality by people who use the many services and tools available in a private educational institution. Digital literacy for teachers is gradually increasing and with each new offering of technology equipment or systems, the old model is immediately recognized as old and obsolete. It is a fact that modern private educational institutions, especially in the city of São Paulo, understood that their information and communication technology departments have a strategic alignment factor, as well as a highly profitable competitive differential. Many of these schools already offer technology-related subjects in their pedagogical curricula, such as: programming, robotics, and electronic game design classes.

Private schools (infant, primary and secondary education) in the city of São Paulo have different levels of infrastructure in information and communication technology and each has developed its own method of service management. Faced with this disparity, education professionals (pedagogical coordinators and other teachers) find a very complex academic universe in which they must act. These differences in the provision of the technological environment, the management of technological services and the service (support) can directly affect the perception of value and quality of the educational services provided to the schools in question. Infrastructure is very important for the performance of teacher activities and an environment with scarce resources is counterproductive for instructional activities (Mamedio and Santos, 2016) and can generate professional dissatisfaction.

On the other hand, the ICT manager hired by educational institutions, whether private or public, works more and more in a multidisciplinary way to offer their infrastructure and the maintenance of this ecosystem has turned out to be very complicated, due to the availability and integrity and reliability requirements of

educational environments, technological or not, are increasingly higher. This has been positively reflected in the profile of the ICT professional, since the demands for professional training increase considerably, Cunha (2007, cited by Salimo, 2017) anticipated the concept on the dynamics of society and technological development, which it also passes through educational institutions on a mandatory basis.

According to Gil-Flores, Rodríguez-Santero and Torres-Gordillo (2017), the increase in the supply of equipment only increases the teacher's perception of value in relation to the ICT environment for pedagogical use, due to the characteristics related to affinity, in some cases, are more important than the infrastructure itself. However, due to the complexity of measuring an intangible concept such as perceived value, the rigor of the research instrument in relation to the scale must be taken into account. Baş, Kubiato and Sünbül (2016) understand that improving the instrument is vital to generate opinions that are often empirical and demonstrate that teachers' pedagogical beliefs influence the evaluation of the use of associated ICT in the classroom. For Bai, Mo, Zhang, Boswell and Rozelle (2016), the application of a structured program for the use of ICT in the classroom can improve the teacher's opinion regarding the technological ecosystem offered by the educational institution, while for Vanderlinde, Aesaert and Van Braak (2014) the school curriculum that uses ICT must have objectives for its implementation and insertion. Comi, Argentin, Gui, Origo and Pagani (2017) sought the relationship between the different ICTs used in the classroom and the possible improvement in school performance. However, it is a fact that little is known about the practices of teaching subjects. The technology is really effective in the long term.

The scientific community studies at length the understanding that only the provision of quality ICT infrastructure is not sufficient to improve student learning, but the relationship between the use of support services and technological equipment by the teacher, such as: interactive projectors, computers and educational software, and the result of the application of these resources in academic life, for both teachers and students, is still little explored. Comi et al. (2017) understood that students or teachers will not only benefit from the indiscriminate increase in the ICT infrastructure in the educational institution. The determining factor in this topic is the figure of the teacher, because it is of little use for a school to offer state-of-the-art infrastructure if the teacher does not know, or shows no interest, in using the resources. Therefore, students may not benefit from the entire ecosystem offered, which certainly thwarts any investment initiative by the high school administration. Scherer, Siddiq and Teo (2015) emphasize that the decisive action for the integration of ICT in the classroom is the utility perceived by the teacher and, certainly, this perception of the use of technology has a relationship directly proportional to the ecosystem offered by the Institution and effective use depends on how the teacher is comfortable with the equipment and services in the school where he/she works.

According to Davis (1989, cited by Scherer, Siddiq and Teo (2015)) because the teacher's perception of the usefulness of ICT is linked to the same belief system that he has, this makes it difficult to measure satisfaction and see opportunities for improvement, as some topics can be preconceived and even discriminated, without the possibility of careful evaluation. From this perspective, the implementation of ICT service management models can help increase the perception of quality and added value by prescribing standards and procedures for certain activities. Meléndez, Dávila and Pessoa (2016) discuss excellence in service through the use of ICT service management models. Certainly, a high quality of service for its internal clients is a great differential as well as a competitive advantage among private schools in the city of São Paulo, and little by little

the majority of these institutions are approaching a type of standard in the provision of infrastructure and services. However, in the case of ICT, the quality has not yet reached the true competitive and strategic operational capacity, highly desired by the management of these companies. Scherer, Siddiq e Teo (2015))

Method

The main objective of the work was to develop the proposal of a conceptual model for the management of ICT services that can be used in private schools in the city of São Paulo. For this, it was necessary to understand what are the main problems facing pedagogical coordinators, related to the reception of services from the support area. It was still necessary to understand what are the existing resources in each educational institution analyzed, both as a team and in the technical knowledge of the ICT team responsible for supporting the operation. Above all, it became necessary to understand how the ICT equipment and services offered by the technology department interfere positively or negatively in the quality perception of the pedagogical coordinator. Most of the existing research attempts to find the relationship between technology and its influence on learning, that is, how the application of certain systems with a focus on education improves (or not) student performance in certain subjects.

In the case of this research, the intention of the analysis was centralized in the role of the pedagogical coordinator, since this professional has characteristics of knowledge diffusion in the institutions in which he/she works, therefore, his/her perception of the quality and usefulness of the ICT ecosystem present in schools can be perpetuated for teachers, positively or negatively, without being able to form an opinion based on their own experiences. Therefore, the work is an applied research with a quantitative approach, based on bibliographic procedures and data collection through the application of two questionnaires and the scope of the study is descriptive. The research concern, as proposed by Terence and Escrivão Filho (2006) was to measure and analyze the causal relationships between the variables in a multivariate way, in an environment in which the installed infrastructure and the ICT services provided by the departments of Technology of the schools are positively related to the level of satisfaction of the pedagogical coordinators.

The population's choice for this work was to seek answers about the ecosystem of ICT technology and services offered in private schools in the city of São Paulo and to counter the responses of ICT professionals, the opinion of the pedagogical coordinators regarding the ICT infrastructure and services received through the schools' ICT departments. Directly, the population involved in this research are the ICT administrators (or equivalent positions) of private schools in the city of São Paulo and the pedagogical coordinators (or equivalent positions) of the same institutions that participate in the research..

As the sample size is small, 67 ICT managers and 69 pedagogical coordinators, the author was able to interact with part of the professionals with the aim of witnessing the situation of the ICT infrastructure of the schools involved in the study. To determine the type of sample, three main requirements were taken into account: the school should be located in the city of São Paulo, be private (public schools were excluded from the

study) and have at least 1,000 students. The research strategy allowed focusing on the feeling of quality that the pedagogical coordinators have in relation to the ICT equipment, services and skills of the technology teams present in the institutions participating in the study.

The analyzed variables were proposed according to similarity and seeking greater objectivity as recommended by Hernández, Fernández and Baptista (2013). In the first block of independent variables, presented in the questionnaire for the ICT administrator, the installed technological infrastructure, the services provided and the technical skills of the employees of the ICT department, allow to know the entire ecosystem in which the coordinators are located; pedagogical of educational institutions are inserted. On the contrary, the dependent variables focus on the perception of quality that the pedagogy professional sees in relation to the independent variables, that is, how the infrastructure, services and technical skills of the ICT department influence their opinion on the quality of this ecosystem. In both blocks there are variables that generated data on sex, age, and information relevant to the academic life of the study participants, making it possible to cross-reference the age groups and educational levels of the ICT managers and pedagogical coordinators.

The evaluation instruments were two surveys. The first questionnaire -in which the responses of the institution's ICT manager were compiled- was divided into four pages or sections: on the first page (ICT infrastructure), information was collected on the equipment offered at the school, in the second page (ICT improvements), the questions were directed to the collection of data on the number of professionals and the percentage of calls answered through the institution's ICT department, the third page (ICT maturity level) identified the profile of the ICT professionals of the schools, their professional certifications, as well as the level of technical knowledge in the areas of operation. Finally, the fourth page (adoption of good practices) collected data on agreed service levels, satisfaction surveys and machinery park monitoring. In the second questionnaire, the pedagogical coordinators, or teachers, were able to answer about their satisfaction with the ICT infrastructure, support services and technical skills of care professionals. The data collected through the questionnaires was aimed at preserving the identity of the person who chose to answer the survey, so that no information about the name, document numbers and contact appear in the results. The author's intention in maintaining the degree of confidentiality was to allow the participant to feel completely comfortable answering the questions and in no way could there be any doubt or fear about possible retaliation before the administration of his company in favor of the content of the answers. With this premise, the participants could feel comfortable with the confidentiality initially signed with the author of the research.

Taking into account the results obtained in the application of the instruments, it was possible to detect the relationships between a well-structured school, in terms of ICT equipment, service processes and support, as well as well-prepared technology service teams and satisfaction of the pedagogical career professional. The measurement after data collection was aimed at linking the abstract concepts initially presented as the subject of this study with the empirical factors and indicators that the author of this work intended to clarify.

Results

The results obtained are a consequence of the aforementioned methodology, with the aim of identifying and classifying the provision of services and infrastructure present in private schools in the city of São Paulo, mapping the technical capacity of the ICT teams assigned to the participating institutions in the study and verify the relationship between the management of ICT services and the satisfaction of pedagogical coordination with the services received from the ICT departments of their institutions. The sample was integrated with 69 pedagogical coordinators (and teachers) and 67 ICT managers selected by themselves, and all the participants completed the answers present in their questionnaires.

Reliability Statistics

Reliability calculations were divided according to the profile of the questionnaire. The coefficient used was Cronbach's Alpha. According to Hernández, Fernández and Baptista (2013), the closer the result of the coefficient is to 1, the more reliable is the result of the instrument. Following the parameter defined by the author, in which topics with an Alpha coefficient below 0.6 should be reviewed or eliminated, the decision to exclude 8 topics present in the ICT managers questionnaire was necessary, since the result of the coefficient it was set at 0.244, therefore well below the acceptable standard for review.

The author considered prudent to divide the calculation of the Alpha coefficient according to the segments of each questionnaire, that is, in the instrument dedicated to pedagogical coordinators, there were 3 segments for the qualitative evaluation (satisfaction with the ICT infrastructure, support services and technical skills of service professionals) and in the ICT managers instrument there were 4 segments (ICT infrastructure, ICT improvements, level of ICT maturity and adoption of good practices) and the level of maturity of the ICT segment was excluded due to non-compliance with the minimum coefficient to compose the investigation. Therefore, the result would not be distorted in the main questions to be analyzed. However, for the result the data was recomposed, to complete the final explanation.

Table 1

Reliability statistics of the variables of the pedagogical coordinator questionnaire.

Cronbach's Alpha	Cronbach's alpha based on standardized elements	Number of elements
.772	.670	4
.779	.799	7
.831	.835	3

Note: Created by the author (2019). Relationship between the number of topics and the evaluation segments: Satisfaction in relation to the ICT infrastructure (4 topics), support services (7 topics) and technical skills of service professionals (3 topics).

The three segments that made up the questionnaire for the pedagogical coordinator had an acceptable coefficient, the last of which (technical skills of service professionals) has the highest coefficient (0.831). The difference between the results did not affect the research in a negative way.

Table 2

Reliability statistics for variables of the ICT manager questionnaire

Cronbach's Alpha	Cronbach's alpha based on standardized elements	Number of elements
.771	.741	4
.723	.816	16
.823	.826	5

Note: Created by the author (2019). Relationship between the number of topics and the evaluation segments: ICT infrastructure (4 topics), improvements in ICT (16 items) and adoption of good practices (5 topics).

The coefficients of the questionnaire for ICT administrators in private schools in the city of São Paulo had very similar results to those of the instrument applied to pedagogical coordinators, therefore, they are acceptable and important to validate the instrument, since the questions are very complete and in some cases have no complement to each other.

Factor Analysis

A factor analysis was performed on each research instrument with the intention of identifying complex interrelationships between the variables without any initial assumption between the factors. Hernández, Fernández and Baptista (2013) emphasize the importance of manipulating two or more independent variables and the inclusion of two or more levels or modes of presence in each of the independent variables.

Acceptable values to indicate that factor analysis is appropriate in this investigation are between 0.6 and 1.0. It is true that the interpretation of the results of the Kaiser-Meyer-Olkin (KMO) test varies greatly from one author to another, but the author of this work specified the commonly accepted values.

Then, the Bartlett sphericity calculation was performed so that it was possible to analyze the probability that the correlation matrix has significant results in some of its variables. Bartlett's sphericity test is a test statistic that is applied to examine the hypothesis that variables are uncorrelated in the same population. The test verifies the hypothesis that the correlation matrix is equal to the identity matrix, in short, the linear association between the variables studied is attested.

Calculations performed with the PSPP software, an open source statistical calculation program, showed some variation, so the authors prioritized the battery of calculations at two different points in the research.

Table 3

KMO and Bartlett test in the pedagogical coordinator questionnaire

Kaiser-Meyer-Olkin sample adequacy measure	.735	
Bartlett's sphericity test	Approx. Chi squared	545.883
	gl	120
	Sig.	.000

Note: Created by the author (2019).

Observing the results, we have the KMO of 0.735, as shown in Table 3, thus showing an average relationship between the set of variables present in the research of the pedagogical coordinator. The sphericity test showed a Sig. 0.000, which shows that there is a correlation between some variables.

Although the value is close to the minimum acceptable (KMO of 0.6) for participation in the study, it was important to measure the constitution of all the questions present in both surveys. As the questions were divided into two survey profiles, one for the ICT professional and the other for the pedagogical coordinator, it was necessary to present each research segment individually to the calculations, in order not to distort the result.

The behavior of calculating according to the section of each questionnaire was reproduced at all the necessary times. The result of the work was not affected, since the author maintained the uniqueness of the study according to the initial research design.

Table 4

KMO and Bartlett test in the ICT administrator questionnaire.

Kaiser-Meyer-Olkin sample adequacy measure	.816	
Bartlett's sphericity test	Approx. Chi squared	1525.406
	gl	528
	Sig.	.000

Note: Created by the Author (2019).

The results in the instrument relevant to the ICT administrator were slightly more expressive, with a KMO of 0.816. However, they still show an average relationship between the study variables. Bartlett's sphericity test-maintained Sig. 0.000, which indicates the relationship of the variables.

Assumptions versus survey questions

The specification of the hypotheses was addressed through the initial survey obtained in the literature review and previous research. It is important to reinforce that even taking into account the existing differences and proportions, especially in the case that much research is directed at higher education and with a focus on improving student learning through the use of applied technologies, a large part of studies could be helpful.

According to the common understanding regarding the hypotheses, the author of this work has delved into the research topic and developed the statement of the hypotheses that were discussed: the installed technological infrastructure and the ICT services provided by the technology departments of the schools are positively related to the level of satisfaction of the pedagogical coordinators.

According to Hernández, Fernández and Baptista (2013), the characteristics of the hypotheses followed the pattern of quantitative research, referring to a real situation, they must be understandable, the relationships with the variables must be clear and credible and the most important fact for him. The construction of the final object must be observable and measurable. With these parameters as reference points, the author focused on eliminating the hypotheses and, consequently, their model variables or concepts that could restrict the clear and precise understanding of the expected result.

The author of this work understood his hypotheses as multivariate causal relationships, since there are several possible relationships between the cause (infrastructure, services and skills) and the effect (quality perception of the pedagogical coordinator) of the ICT ecosystem. As for the research design, according to the characteristics, it is a quantitative, cross-sectional and descriptive non-experimental research.

Table 5

Research questions and their hypotheses.

Research question	Hypothesis
In the opinion of the coordinators of the pedagogical department, the support services (help desk and infrastructure), the networks and the maintenance of the information management systems provided by the department of information and communication technology (ICT) Does the school meet expectations?	<ul style="list-style-type: none"> • In the opinion of the pedagogical coordinator, the ICT infrastructure meets expectations (H1: % ≥ 80) • In the opinion of the pedagogical coordinator, the ICT services meet expectations (H2: % ≥ 80)
What are the opportunities for improvement in the services offered by the ICT department of the schools?	<ul style="list-style-type: none"> • For greater opportunities, more improvements (H3: OPORT1 $\neq 0$ and H4: OPORT2 $\neq 0$)
How can the adoption of the best practices present in the service management and corporate governance models contribute to increasing the level of maturity in the management of the services offered by the school's ICT department?	<ul style="list-style-type: none"> • For greater maturity, greater adoption of good practices (H5: MATUR $\neq 0$ and H6: BOAPR ≥ 5)

Note: Creation by the author (2019). Variables naming convention: OPORT1 (opportunity for improvements in ICT products in the opinion of the pedagogical coordinator), OPORT2 (opportunity for improvements in ICT products and services in the opinion of the ICT administrator), MATUR (maturity of ICT) and BOAPR (models of good ICT practices).

Results of variables versus hypotheses

The calculation of the basic results of the variables was carried out through a frequency analysis resulting from the responses to the questionnaires applied to each profile of the participating professional.

The main questions were grouped together to raise and measure the perception of quality of the pedagogical coordinator in relation to the equipment, data networks (wireless or not), educational systems and support services maintained by the technology department of the information from the institution where you are employed. To guarantee the confidentiality of the information obtained, no data was compromised that would compromise the identity of the respondent.

Table 6

Measurement results of the expectations variables of the pedagogical coordinator and their hypotheses

Hypothesis	Variable measure	Percent
In the opinion of the pedagogical coordinator, the ICT infrastructure meets expectations (H1:% ≥ 80)	Overall, how satisfied or dissatisfied are you with the equipment provided by your institution's information and communication technology (ICT) department (pedagogical coordinator questionnaire)?	<ul style="list-style-type: none"> • Extremely satisfied = 40.58% • Moderately satisfied = 55.07% • Not very satisfied = 2.90% • Neither satisfied nor dissatisfied = 1.45%
In the opinion of the pedagogical coordinator, the ICT services meet expectations (H2:% ≥ 80)	In general, how satisfied or dissatisfied are you with the helpdesk provided by the ICT department of your institution (pedagogical coordinator questionnaire)?	<ul style="list-style-type: none"> • Extremely satisfied = 36.23% • Moderately satisfied = 44.93% • Not very satisfied = 13.04% • Neither satisfied nor dissatisfied = 1.45%

Note: Created by the author (2019).

The first hypothesis (H1) raised (in the opinion of the pedagogical coordinator, does the ICT infrastructure meet expectations?) Refers to the entire technological ecosystem offered by the educational institution. The quality perception of the pedagogical professional takes into account the equipment and the broadband offer (tablets, computers, laptops, projectors, Internet and wireless network). The minimum acceptance percentage defined by the authors was 80%. After adding the two percentages at the top of the evaluation, with the concepts extremely satisfied and moderately satisfied, the total value is 95.65%, a result much higher than the expected final value. This accumulated result reinforces the initial concept that private primary schools in the city of São Paulo invest heavily in technological infrastructure, which becomes a competitive differential in the market. For the newly graduated pedagogical professional, it is a great start to his career working in schools well equipped with modern classroom support systems.

The second hypothesis (H2) has mainly questions that raise the relationship between the support services offered by the information technology teams in schools and the quality perception of the pedagogical coordinator. In addition to the perceived quality in the use of equipment and connectivity networks by the pedagogical professional, the feeling of a good support service received complements the study. The expected percentage of the result of the variables that make up hypothesis H2 (in general, how satisfied or dissatisfied are you with the support service (assistance service) provided by the ICT department of your institution?) It was 80%. As in the result of the team quality hypothesis, the two main themes (extremely satisfied and moderately satisfied) were added to integrate the result. The percentage reached was 81.16%, which shows that in the private schools of basic education in the city of São Paulo, the support services of the ICT teams are within the expectations of the pedagogical coordinators.

Table 7

Results of the measurement of the variables of opportunity for improvement and their hypotheses for pedagogical coordinator and ICT manager

Hypothesis	Variable measure	Percent
For more opportunities, more improvements (H3: OPORT1 ≠ 0)	In your opinion, is there an opportunity to improve the products and services offered by the ICT department of your institution (questionnaire of the pedagogical coordinator)?	<ul style="list-style-type: none"> • Yes = 89.86% • No = 10.14%
For greater opportunities, more improvements (H4: OPORT2 ≠ 0)	What is the average monthly percentage of calls made at your institution? Consider all calls, such as infrastructure, systems, and network infrastructure (ICT administrator questionnaire).	<ul style="list-style-type: none"> • More than 81% = 44.8% • 71 to 80% = 35.8%

Note: Creation by the author (2019). Variable naming convention: OPORT1 (opportunity to improve ICT products from the point of view of the pedagogical coordinator), OPORT2 (opportunity to improve ICT products and services from the point of view of the ICT administrator).

The two hypotheses about opportunities in the technological environment each have the opposite opinion. In H3, the pedagogical coordinator understands the central question (in your opinion, is there an opportunity to improve the products and services provided by the ICT department of your institution?) It is measured through a closed answer (Yes or No). The authors' expectation when measuring this variable leads to the creation of an opportunity index with the two points of view (pedagogical coordinator and ICT manager) separate, but complementary to each other. The measured value of the

variable that constitutes H3 was 89.86%, that is, only 10.14% of the pedagogical coordinators cannot see any opportunity for improvement.

In the opinion of the ICT manager, the variables that make up hypothesis H4 (what is the average monthly percentage of calls made in your institution? Note that all calls, such as: infrastructure, systems and network infrastructure) have answers percentage measures, in which the manager had to choose the average number of successfully completed support calls in his department. Adding the two positive percentage values, the authors obtained a result of 80.6%, a result that means that there are still 19.4% opportunities for improvement in this regard.

Table 8

Results of the measurement of maturity variables and their hypotheses for ICT managers

Hypothesis	Variable me	Por ciento
For greater maturity, greater adoption of good practices (H5: MATUR ≠ 0)	In your opinion on a scale of 0 to 5 (5 is the highest and 0 the lowest), what is the level of control you have over your infrastructure?	<ul style="list-style-type: none"> • 4 = 47.8% • 5 = 22.4%

Note: Creation by the author (2019). Variable naming convention: MATUR (ICT maturity).

The maturity hypothesis (H5) met the most basic problems of the ICT administrator of the institutions. The main question was about the level of control that the manager has over his fleet of machines, people and services. A table of 5 points was presented (5 being the highest value and 0 the lowest value) and the result of the measured variable was added to the two points considered high to integrate the study. The sum was 70.2%, that is, 29.8% of the questioned ICT managers do not have an acceptable level of control over their ecosystem of technology and services.

The author tried to understand the main reasons why almost 30% of ICT administrators in private schools in the city of São Paulo do not achieve a minimally acceptable level of control, and in most of the responses the factor is mentioned economic (little money available). Another aspect of the responses was the lack of trained professionals, even in the case of managers, where low academic training and recent professional experience influenced the responses. Most managers interviewed also mentioned the fact that there is no standard in creating technology environments for schools, although there are good practice frameworks in the market, in none of the schools visited was there a clear and explicit statement of use of good practice standards.

Table 9

Results of the measurement of good practice variables and their hypotheses for ICT managers

Hypothesis	Variable measure	Percent
For greater maturity, greater adoption of good practices (H6: BOAPR \geq 5)	At the end of each call, is there a specific satisfaction survey for that service?	<ul style="list-style-type: none"> • Yes = 32.8% • No = 62.7% • Not applicable = 3.0%

Note: Creation by the author (2019). Variable naming convention: BOAPR (use of ICT best practice models).

For the hypothesis about good practices, the correlated variables raised questions related to the measurement of the satisfaction of the calls answered through small opinion polls, generally embedded at the end of each event attended, the need to inform the management of the company about the performance of the IT department and employees and the existence or not of a specific and confidential communication channel for complaints related to the assistance provided by the IT teams of the schools participating in the study. The most important index was measured through the variable: at the end of each call, is there a specific satisfaction survey for that service performed? The result of the measurement brought to light a fact that is very illuminating about the main difficulties that ICT managers in private primary schools in the city of São Paulo, according to the result of the measurement, only 32.8% of managers ICT have a satisfaction survey on their closed support calls. A number considered high, 62.7% of managers have no idea of the result of the service provided by their support teams.

Discussions and conclusions

The study was carried out with the intention of verifying what equipment, systems, data networks (wireless or not) and support services exist in private primary schools in the city of São Paulo. The author was aware of the great difference between the research participants and, in part of the cases, an on-site visit was necessary to correctly orient the responses of the ICT administrators who agreed to answer the questions. Many of them expressed concern by exposing their companies to compromise their image in the educational market in which they operate. To minimize this discomfort, it was necessary to develop a confidentiality term that the author gave to each participant. Another solution found to not compromise the employees who chose to answer the questions was not to mention any name, document number, company marks or any other data that could put the company or the participating employee at risk.

The basic education segment is highly reactive and cautious about sharing information. However, the author realized that there are professionals who are determined to change this behavior, be it by creating meetings in a round table format or even informal associations with the purpose of exchanging experiences and good market practices. From these initiatives, it was possible to accelerate research and data collection for the composition of this work.

The author verified through data collection and verification of results that there is a large gap in companies in the private education segment in the sample of the population in which the study was conducted. Part of this difference lies in the lack of preparation of the institution's technology executive, because according to the data collected, part of the professionals who occupy the position of ICT manager in schools do not have formal training in technological governance, nor in financial administration and people management. On the other hand, the pedagogical coordinators, mainly the elderly, over 45 years of age, are concerned about the quality of the services received from the ICT departments of their institutions. Younger coordinators demonstrate a technology-focused approach such as: offering wireless networks, broadband quality, new computers and tablets, and modern educational systems. Certainly, for the technology professional inserted in this context, there is an enormous difficulty to adapt due to the context presented.

Another case that caught the attention was the fact that there was a lot of financial investment without prior planning, since most of the companies that participate in the study still have in their presidencies or directorates members belonging to the family of the founders, when not the founder is the principal director. There were few schools where senior management and finance professionals were identified. This characteristic certainly limits the strategic planning that the technology sector needs to gradually insert itself into the educational context.

The author understood that this study could be used as a reference for future works with the intention of mapping and monitoring the evolution of the private education market for basic education in the city of São Paulo. Due to the importance of these companies in the Brazilian context, since the capital of São Paulo (São Paulo) is a center that generates financial and educational opportunities. The best schools, colleges and courses are located in the city and this panorama has a tendency to improve the level of excellence that few Brazilian cities have.

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Date received: 27/10/2019
Date reviewed: 28/11/2019
Date accepted: 10/06/2020