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Relação entre o Uso da Tecnologia da Informação e Comunicação (TIC) e Aspectos Acadêmicos: Percepções de Estudantes Brasileiros de Contabilidade

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Resumo: Este estudo objetivou investigar a relação entre a percepção dos estudantes de contabilidade sobre o uso das TICs (ICT) e seis aspectos acadêmicos: (i) metodologia de ensino (TME), (ii) experiências de aprendizagem inovadoras (EXP), (iii) capacidade de pensar criticamente e refletir sobre soluções de problemas da sociedade (CAP); (iv) desenvolvimento de habilidades comunicacionais (COM); (v) acesso a conhecimentos atualizados/contemporâneos (KNO); e (vi) condições de infraestrutura das instituições de ensino superior (INF). Os dados foram coletados do questionário do estudante do ENADE 2015, obtendo-se a amostra final de 51.269 observações. Em geral, as estatísticas descritivas mostraram que os estudantes estão satisfeitos com os cursos de contabilidade em relação aos seis aspectos acadêmicos analisados e ao uso das TICs. A matriz de correlação de Spearman indicou relações significantes entre as variáveis. A correlação positiva entre o uso das TICs e experiências de aprendizagem inovadoras sugere que as instituições de ensino podem adotar TICs para promover um processo educacional mais atrativo. O uso das TICs e a metodologia de ensino também se mostraram positivamente correlacionadas, sugerindo que as TICs poderiam ser úteis para elaborar ou aperfeiçoar os métodos de ensino. Como implicações, as TICs podem ser adotadas visando vantagem competitiva e motivação discente.

Palavras-chave: TIC, Aspectos acadêmicos, Relação, Percepção, Alunos de ciências contábeis.

Abstract: This study aimed to investigate the relationship between accounting students' perception on the use of ICT as a teaching strategy (ICT) and six academic aspects: (i) teaching methodology (TME), (ii) innovative learning experiences (EXP), (iii) capacity to think critically and reflect about solution to problems of society (CAP), (iv) development of communication skills (COM), (v) access to up-to-date/contemporary knowledge (KNO), and (vi) higher education institutions' infrastructure conditions (INF). I collected data from 2015 ENADE's student survey and obtained a final sample of 51,269 observations. In general, descriptive statistics showed that students are satisfied with the accounting program regarding the six academic aspects analyzed and the use of ICT. Spearman's correlation matrix indicated significant relationships among the variables. Positive correlation between the use of ICT and innovative learning experiences suggests that educational institutions could adopt ICT to promote a more attractive learning process. Use of ICT and teaching methodology were also positively correlated, indicating that ICT could be useful for designing or improving teaching methods. As implications, I support from evidence that ICT could be adopted aiming to obtain competitive advantage and student motivation.

Keywords: ICT, Academic aspects, Relationship, Perception, Accounting students.

Introduction

Use of Information and Communication Technology (ICT) in accounting education has been increasing over the years. It is encouraged to employ ICT in contemporary education as the new generations of students are familiar with technology – particularly the digital ones – and are often characterized as multitasking and fast-paced (Behn et al., 2012; Cheong, Bruno, & Cheong, 2012; Gaviria, Arango, & Valencia, 2015; Lea, 2008; Sprague & Dahl, 2010), which are consistent with what modern technology devices can offer. Also, technology advancements have changed considerably individuals' behavior towards several activities, including study habits. Tablets and cell phones allow students to read texts (e.g., Kindle) and talk (e.g., Whatsapp) to colleagues about their assignments in a more practical and efficient way whenever and wherever they are. Research tools' (e.g., Google Scholar) algorithms have become highly sophisticated, facilitating students' academic lives. Therefore, new learning patterns have emerged (Behn et al., 2012; Pathways Commission, 2012).

Usage of ICT in accounting courses is important from both academic and professional perspectives. From the first one, ICT may help making the learning process more attractive since students expect visual stimulus during the classes (Sprague and Dahl, 2010). Additionally, it may also assist professors to deliver content (Akpotohwo & Ezeani, 2014; Gaviria et al., 2015), optimize pedagogy processes (Akpotohwo & Ezeani, 2014), promote active learning and students' motivation (Akpotohwo & Ezeani, 2014; Carnaghan, Edmonds, Lechner, & Olds, 2011; Gaviria et al., 2015; Lea, 2008), increase student attendance (Caldwell, 2007), and improve academic performance (Caldwell, 2007; Carnaghan et al., 2011; Edmonds & Edmonds, 2008). From the professional perspective, Pincus, Stout, Sorensen, Stocks, and Lawson (2017) highlight that technology changes the accounting profession constantly and automation augments the gap between accountants' academic development and employers' expectations in terms of skills. Similarly, Janvrin and Watson (2017) argue that Big Data is relevant for accounting students to learn, due to the contemporary context of organizations and technology. In reaction to that, Sledgianowski, Gomaa, & Tan (2017) suggest a method to integrate information systems and technological competencies into the accounting curriculum.

ICT adoption by educational institutions and faculty is grounded on the assumption that it assists the teaching and learning processes. However, students' point of view may differ from this assumption to the extent to which they do not see value about the use of technology in the educational process. In this regard, this study aims to examine the accounting students' perceptions on the use of ICT as a teaching strategy. More precisely, I utilize a national survey to analyze how accounting students perceive the relationship between the use of ICT and other academic aspects: (i) teaching methodology (TME); (ii) innovative learning experiences (EXP); (iii) capacity of thinking critically

(CAP); (iv) capacity of oral and writing communication (COM); (v) access to updated and/or contemporaneous knowledge (KNO); and (vi) infrastructure conditions (INF). Empirical evidence is necessary to drive decision of education institutions' managers on the technology adoption and use in educational settings.

The contribution of this study to the accounting education literature and practice is two-fold. First, the analysis of how accounting students perceive the usage of ICT as a teaching strategy through a national survey provides a general picture that indicates whether accounting instructors should decrease, maintain, or increase the use of technology. Besides that, the utilization of a national survey allows to capture a greater degree of generalization about the relationship between ICT usage and the aspects investigated within Brazil, since the phenomenon is observed in a national scale. Second, empirical evidence on the abovementioned associations may help education institutions to decide if financial investments in technology resources are necessary to become more competitive. Also, by analyzing the relation between ICT use and the six academic aspects from the students' perspective, this study can support education managers' and politicians' decisions regarding technology use for academic purposes, especially when it comes to teaching methodologies, learning experiences, students' capacity of thinking critically and developing communication skills, access to updated knowledge, and institutions' infrastructure conditions.

The reminiscent of this paper is structured as follows. Section 2 discusses previous literature. Section 3 reports the methodological procedures. Section 4 shows and debates the results. Finally, section 5 provides conclusions and implications from the findings, as well as suggestions for future research.

Literature Review

This section presents the literature review on why ICT is relevant for education. I separate the importance of ICT usage for academic purposes in three main groups: (i) for higher education institutions (HEIs); (ii) for the learning process; and (iii) for the students.

ICT and higher education institutions

Technology advancements are changing progressively the context of organizations (Akpotohwo & Ezeani, 2014; Janvrin & Watson, 2017; Pathways Commission, 2012; Pincus et al. 2017; Sledgianowski et al., 2017). Technology creates a skill gap that accounting education must address (Pincus et al., 2017). Then, higher education institutions (HEIs) should pay more attention to this movement and adopt the newest technologies to keep up with modifications in the practice field of accounting. As new competencies are demanded by the job market, adjustments in accounting programs are necessary. For example, Big

Data is a relatively recent topic that present and future accountants will have to deal with, as pointed out by Janvrin and Watson (2017) and Sledgianowski et al. (2017). However, at least in the Brazilian accounting education (and it may be the case of accounting education in other countries as well), it is plausible to say that students get graduated without a solid basis for analyzing great amounts of data. Investments in quantitative methods and data collection courses, as well as statistics software, represent a need that could not be ignored by today's accounting programs and education policymakers.

Despite the changes in accounting practice and the skill gap occasioned by technology, researchers and educators have been dedicating efforts to offer alternatives to integrate technology into accounting curriculum. For instance, Janvrin and Watson (2017) provide sources of publicly available data and free software to be used in the accounting classes. Additionally, the authors also emphasize four cases from Big 4 audit firms (PwC, Deloitte, EY, and KPMG) related to Big Data that could be useful to teach accounting. Similarly, Sledgianowski et al. (2017) provide a summary of relevant articles that discuss instructional cases and other materials by competency area (Accounting, Foundational, and Broad Management). The authors also reported vendor academic alliances that HEIs could negotiate to acquire software, database, and other materials. Watty, McKay, & Ngo (2016) show general educational software (e.g., Collaborative technology) and accounting-specific technologies software (e.g., Pearson MyAccountingLab Online Homework systems) as well. Finally, Lawson et al. (2014) and Lawson et al. (2015) describe a more broadly framework for competency integration in accounting education, which includes technology competency. Lawson et al. (2015) still provide the levels of competency integration that may help HEIs to design their accounting curriculum and to incorporate ICT into accounting programs.

ICT usage is even more relevant to HEIs when it comes to distance education (DE) or hybrid education (HE). HEIs cannot offer DE or HE without adopting some reasonable level of ICT and investing in compatible infrastructure to support these technologies. According to Bryant, Schafer, and Kahle (2005) and Akpotohwo and Ezeani (2014), distance courses are expensive to be developed and faculty training is equally a cost for HEIs. However, DE and HE may bring competitive advantage to HEIs, then their managers should reflect upon marketing and financial issues before discarding these modes of education. HEIs that offer distance courses are more competitive because it allows them to be "present" at many regions at the same time others HEIs are and represent an alternative to face-to-face education to obtain more revenue. Also, it is needless to say that technology will shape how individuals learn and study. Recent and informal modalities of education arouse from the use of ICT in education. For example, important international HEIs (e.g., Harvard University) offer massive open online courses (MOOCs). Modern infrastructure may attract students and improve HEIs' reputation while preparing education institutions for the future.

Finally, as technology gets sophisticated and DE reaches students who would not otherwise study due to distant locations, education managers should also consider the social issues involved in offering DE. Taking these considerations, ICT is essential from a HEIs' perspective because it has potential to positively impact their social, financial, and infrastructure spheres.

ICT and the educational process

Literature suggests that technology could help improving the accounting education process (Apostolou, Dorminey, Hassell, & Rebele, 2016, 2017; Behn et al., 2012;

Literature suggests that technology could help improving the accounting education process (Apostolou, Dorminey, Hassell, & Rebele, 2016, 2017; Behn et al., 2012; Gaviria et al., 2015; Watty et al., 2016). Gaviria et al. (2015) provide a model for using virtual learning objects (VLO) in accounting education. Professors can include learning activities, content, and other materials in VLO in which students get engaged and work to accomplish the educational goals. Edmonds and Edmonds (2008), in turn, conducted a quasi-experiment study to verify the effects of student response system (SRS), also referred to as "clickers," on introductory managerial accounting students. They provide evidence that SRS improves academic performance, especially for low-GPA students. Findings regarding SRS technology also supports that it promotes active learning environment and enhances student attendance, preparation for class, and feedback (Caldwell, 2007; Carnaghan et al., 2011; Edmonds & Edmonds, 2008).

"Digital technologies provide the opportunity to both prepare students for the 21st century careers and to create new financial models for higher education, but progress to date in using technology in new ways for teaching and learning has been slow" (Pincus et al., 2017, p. 7). Innovative ways of using technology can be associated with a number of reasons. However, the first and most important step is to adopt it. ICT adoption in accounting education settings still represents an issue today. For example, Watty et al. (2016) interviewed 13 accounting academics and found five main obstacles to embrace technology: (i) faculty resistance; (ii) individual champions pushing uphill; (iii) comfortability and generational attitudes; (iv) Faculty capacity and support; and (v) time/workload. Qualitative evidence on faculty resistance indicates that professors do not have the knowledge to manage technology or they prefer older teaching methods. On the other hand, individual champions are those who embrace and encourage the usage of technology, but according to their own statements they get demotivated by their colleagues who disagree with this perspective. One of the interviewees said that "I got crucified...for what I was doing [...]" (Watty et al., 2016, p. 7). Comfortability, faculty capacity, and time/workload are aligned with the two prior mentioned obstacles. Instructors simply do not feel comfortable using ICT because they are scare of it. Additionally, faculty

are not willing to spend time learning how to use technology due to the workload they already have. Akpotohwo and Ezeani (2014) and Senik and Broad (2011) obtained similar results about barriers to integrate ICT in accounting education. Technology is changing the way we learn though and adjustments in teaching methods' design should be made. Maybe, new generations of accounting educators will be more concerned with utilizing ICT effectively in the education process.

Use of ICT is particularly fundamental to accounting education because, as Behn et al. (2012) note, accounting courses remained constant while technology has evolved significantly. Ignore the usage of technology when teaching accounting may be a mistake if it can contribute to enhance student learning and satisfaction. Technologies permit to reimagine accounting courses and traditional models of learning (Watty et al., 2016). Thus, "research is needed to construct models of education that rely on updated modes of delivery, especially in the context of curricular innovation." (Apostolou et al., 2016, p. 46). Finding ways to employ ICT effectively in the educational process is a key point of the discussion and should be in the research agenda of accounting educators.

ICT and students

Despite the recent changes in students' study habits occasioned by ICT, accounting programs still fail to keep up with technology advancements that could assist both faculty and students to have a more fluent educational process. Therefore, students sometimes think that accounting education is boring and demotivating (Gaviria et al., 2015). Also, Lea (2008) observes that new generations of students seek immediate gratification and are often characterized as fast-paced multitasking. Traditional education methods (e.g., lecture and reading in the classroom) are passive and lack the enthusiasm students search for in a learning process. Sprague and Dahl (2010) put that students expect more visual stimulus and incorporation of technology into classes. Thus, different teaching approaches, especially those focused on the students, should be utilized (e.g., active learning).

ICT provokes new learning patterns (Pathways Commission, 2012), and accounting educators should be aware of this and use teaching strategies to capture student attention. In this sense, Cheong et al. (2012) defend that in order to get students engaged in the classes, educators must utilize the same smart devices that students already use in their daily lives (e.g., mobile phone). Instructors can take advantage from technological skills of the new generations of students and use ICT in favor of education. Instead of being distracted by social media websites (e.g., Facebook) during the class, educators can use students' own mobile phones to develop an academic activity. As described by Carnaghan et al. (2011), telephony-based SRS is used to transmit answers to questions. Mobile devices usage in the classes should not be a relevant problem since they are ubiquitous among students.

More alternatives of ICT usage can be found in literature. Cheong et al. (2012) report a mobile-app-based collaborative system to promote higher-order thinking skills. Likewise, Seow and Wong (2016) designed the first mobile gaming app for learning accounting, called Accounting Challenge (ACE). According to the authors, ACE can be played outside the classroom and it allows students to learn with fun. This mobile characteristic is fundamental because contemporary students tend to be more at home with technology (Behn et al., 2012). ACE represents an extension of formal education and an example of how learning is becoming mobile as smart devices become ubiquitous. This is consistent with Watty et al.'s (2016) perspective, who articulate that "we need to consider a model that reflects a vision that is firmly planted in innovative use of technology to provide anywhere, anytime, for anybody, education." (p. 12).

Methodology

This section describes the methodological operation adopted by this study. More precisely, data collection and sample procedures are explained, as well as the variables of the study utilized in the analysis.

Data

This study utilized publicly available data from 2015 National Exam of Student Performance (ENADE) that is administered periodically by National Institute for Educational Studies and Research Anísio Teixeira (INEP). ENADE aims to evaluate the quality of higher education in Brazil through the analysis of undergraduate students' performances. Students take an exam including general formation (GF) and specific component (SC) questions. GF questions are related to broader contents, such as social responsibility, environment, and technology advancement. On the other hand, SC questions comprehend the specific contents learnt over the undergraduate programs (e.g., Psychology, Biology, Accounting etc.). Student performance on GF and SC questions forms his/her final performance. Additionally, students who took 2015 ENADE answered a mandatory electronic survey, which contained a total of 68 questions about sociodemographic information (e.g., gender, marital status, age etc.) and other aspects related to faculty, academic experiences, education institutions' characteristics, and culture. The focus of this study is on the electronic survey. More precisely, on the questions 29, 30, 34, 35, 49, 58, and 61. Table 1 provides details about the questions.

Table 1.
Questions of interest from the 2015 ENADE's electronic survey

Question	Variable	Description
Q29	TME	The teaching methodologies used in the undergraduate program have challenged you to deepen knowledge and develop reflective and critical skills
Q30	EXP	The undergraduate program provided innovative learning experiences.
Q34	CAP	The undergraduate program promoted the development of your capacity to think critically, analyze and reflect on solutions to problems of society.
Q35	COM	The undergraduate program has helped you to increase your ability to communicate in oral and written forms.
Q49	KNO	The undergraduate program provided access to up-to-date and/or contemporary knowledge in your area of formation.
Q58	ICT	Faculty have employed information and communication technologies (ICT) as a teaching strategy (multimedia projector, computer lab, virtual learning environment).
Q61	INF	The infrastructure conditions of the classrooms were adequate.

Column "Question" identifies the order that questions appeared in the 2015 ENADE's electronic survey. For instance, Q29 was the 29th question of the electronic survey. Column "Variable" represents the names of variables used in this study. Column "Description" describes the questions. Students responded these questions considering a 6-point scale, ranging from 1 (totally disagree) to 6 (totally agree). Intermediate levels of the scale were not labeled. Also, students could answer "I do not know" or "It does not apply" to the questions. Due to the strict objective of this study, not all data from the 2015 ENADE's electronic survey were kept in the dataset, only the relevant ones (students' sociodemographic information and questions referred in Table 1).

For better clarification, figure 1 shows how the ICT and the academic variables will be tested. The focus is to establish how ICT connects with TME, EXP, CAP, COM, KNO, and INF, even though correlations among the six academic aspects will also be reported. I must highlight that the two-sided blue arrows represent correlations, not the impact of an independent variable on a dependent variable.

Based on the literature utilized in this study, I expect to find positive correlations between the ICT and the academic aspects. A positive relationship would indicate that ICT can help to increase the educational aspects under examination and, in turn, to support that ICT delivers better learning processes.

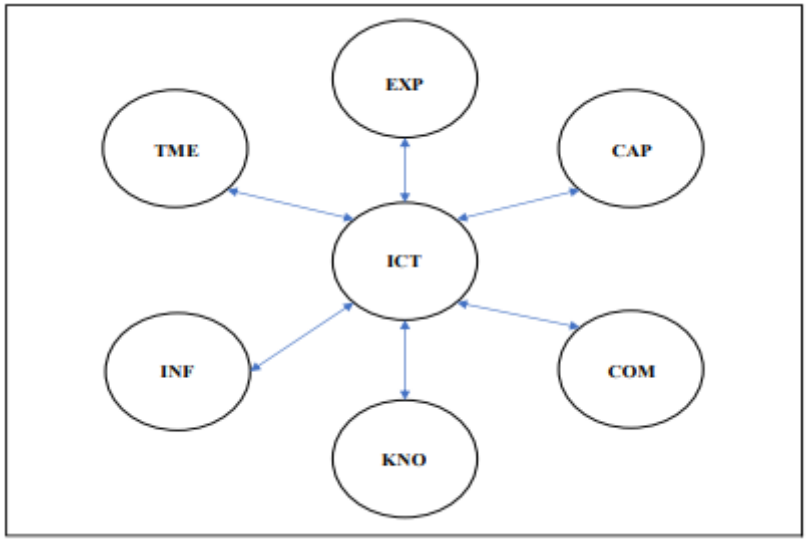

Figure 1.
Relationship between ICT and academic aspects
Source: Prepared by the author.

Sample

Table 2 shows sample procedures. 2015 ENADE was taken by a total of 65,483 accounting students, which represents the population of the study. Question 58 of the electronic survey is the focus of this study since it asks students whether instructors are employing ICT as a teaching strategy during the accounting program. Missing values for question 58 were eliminated. I also chose to exclude "I do not know" or "It does not apply" answers for question 58 in order to avoid interpretation problems when analyzing the results. I then obtained an intermediate sample of 53,739 observations. Likewise, I dropped those observations that had "I do not know" and "It does not apply" answers for questions 29, 30, 34, 35, 49, and 61, which constitute other variables of interest. Ultimately, I excluded a student who had an error measurement in his/her gender information. Final sample consists of 51,269 students (78.3% of population).

Table 2.
Sample procedures

Sample procedures	Freq.	%
Population	65,483	100.0
(-) Missings values for question 58	(10,597)	(16.2)
(-) "I do not know" or "It does not apply" answers for question 58	(1,147)	(1.8)
(=) Subtotal	53,739	82.1
(-) "I do not know" or "It does not apply" answers for questions 29, 30, 34, 35, 49, and 61	(2,469)	(3.8)
(-) Error measurement	(1)	(0.0)
(=) Final sample	51,269	78.3

To treat outliers, I used blocked adaptive computationally efficient outlier nominators (bacon) command on final sample to detect multivariate outliers (Billor, Hadi, & Velleman, 2000; Weber, 2010). According to the test, no outliers were identified. Thus, all the 51,269 observations were utilized in the analysis.

Results

This section brings the students' information, descriptive statistics, and correlations among the variables of the study. It also discusses potential explanations for the results and brings a brief indication whether the results are aligned or not with previous studies.

Student information, descriptive statistics, and correlations

Table 3 describes students' information. Majority of students are female (60.6%), not married (71.3%), white (55.3%), with a family income per month between 4 and 6 Brazilian minimum wages, with a job (85.7%), and taking a face-to-face undergraduate accounting program (80.2%).

Table 3.
Students' information

Student Information	Frequency	%
Age (Mean and Standard Deviation)	28.66	7.09
Gender	51,269	100.0
Female	31,079	60.6
Male	20,190	39.4
Marital Status	51,269	100.0
Married	14,690	28.7
Not married	36,579	71.3
Ethnicity	51,269	100.0
White	28,329	55.3
No white	22,940	44.7
Family income, per month	51,269	100.0
0-3 Brazilian minimum wages1	19,691	38.4
4-6 Brazilian minimum wages1	20,892	40.7
7+ Brazilian minimum wages1	10,686	20.8
Job	51,269	100.0
Job	43,923	85.7
No job	7,346	14.3
Modality of education	51,269	100.0
Face-to-face education	41,114	80.2
Distance education	10,155	19.8

1 Brazilian minimum wage at the moment of data collection was 724 BRL (approximately 143 USD).

1 Brazilian minimum wage at the moment of data collection was 724 BRL (approximately 143 USD).

Subsequently, Table 4 provides descriptive statistics for 2015 ENADE's electronic survey questions. I observe through minimum and maximum values that students' perception about all variables are conflicting. However, when analyzing the median and mean values it is possible to verify that students tend to strongly agree with questions.

In other words, students felt challenged by the teaching methods used by educators (mean = 5.04; SD = 1.18), the undergraduate program provided innovative learning experiences (mean = 5; SD = 1.25), promoted the development of thinking critically (mean = 5.19; SD = 1.09), increased the ability to communicate in oral and writing ways (mean = 5.19; SD = 1.09), as well as provided access to up-to-date knowledge (mean = 5.09; SD = 1.15). Besides that, accounting students' perception on the use of ICT as a teaching strategy indicate a high level of agreement (mean = 5.19; SD = 1.19). It suggests that use of ICT is strongly present in the accounting learning processes. Finally, infrastructure conditions are adequate according to the students' standpoint (mean = 4.91; SD = 1.38).

Focusing on ICT variable, descriptive statistics provide initial evidence that technology has been employed intensively as a teaching strategy, although no data are available on the quality of the usage of ICT. However, this initial finding is congruent with prior literature (Akpotohwo & Ezeani, 2014; Gaviria et al., 2015; Janvrin & Watson, 2017; Lawson et al., 2014; Lawson et al., 2015; Pathways Commission, 2012; Watty et al., 2016), which consider ICT useful for the accounting learning process.

Table 4

Descriptive statistics of variables of the study

Variable	Obs1	Mean	SD2	Minimum	Median	Maximum
TME	51,269	5.04	1.18	1	5	6
EXP	51,269	5.00	1.25	1	5	6
CAP	51,269	5.19	1.09	1	6	6
COM	51,269	5.19	1.10	1	6	6
KNO	51,269	5.09	1.15	1	5	6
ICT	51,269	5.19	1.19	1	6	6
INF	51,269	4.91	1.38	1	5	6

1 Observations. 2 Standard deviation. Table 4. Descriptive statistics of variables of the study

1 Observations. 2 Standard deviation.

Since Shapiro-Wilk's and Shapiro-Francia's tests indicated that data did not follow normal distribution ($p < .05$), I utilized Spearman's correlation matrix to test the relationships. Table 5 shows the results. Due to the results showed in Table 4, I could expect significant correlations among the variables of the study. All relationships are significant at .01 level. However, I emphasize the ICT column.

Table 5.
Spearman's correlation matrix: 2015 ENADE's electronic survey questions

Variable	ICT	TME	EXP	CAP	COM	KNO	INF
ICT	1.00						
TME	0.54 **	1.00					
EXP	0.53 **	0.75 **	1.00				
CAP	0.53 **	0.68 **	0.68 **	1.00			
COM	0.53 **	0.66 **	0.66 **	0.76 **	1.00		

** p < .01; * p < .05.

ICT and TME have a correlation coefficient of .54 (p < .01), which can be considered a strong relationship. It suggests that students' perception on the use of ICT is related to the teaching methodologies that challenge students to deepen their knowledge. Although not all accounting educators use ICT to teach, this is an evidence that supports a positive relationship between use of ICT and teaching methods. For this reason, I also encourage faculty who still resist to technology adoption to reconsider their decision. Based on the positive correlation found here, ICT has potential to positively impact student learning, constituting a robust argument to use ICT in educational settings.

ICT and EXP have also a positive and significant correlation coefficient (coeff. = .53; p < .01). It denotes that use of ICT in the accounting learning processes are related to innovative academic experiences students have during the undergraduate program. This finding has important implications for HEIs and faculty. Use of ICT can provide innovative learning experiences, which in turn may reduce the drop out rate. HEIs may then require from instructors to employ ICT to attract and retain students, improving drop out rates and the allocation of fixed costs.

ICT and CAP have a coefficient of .53 (p < .01), suggesting that the more students perceive the presence of ICT in the education process, the higher is the development of the capacity of thinking critically and reflecting about solutions to problems of society. ICT may help students in the sense of searching for information and optimizing academic activities, especially in computer lab settings, that would otherwise take more time for them to be achieved. Real-time access to information in today's world is essential to trigger students' critical thinking and should be allowed during the classes to enhance student learning.

ICT and COM have a significant relationship (coeff. = .53; p < .01). Therefore, it suggests that the use of ICT may impact the development of oral and writing skills. Multimedia projector facilitates work presentations because students do not have to memorize all the content and it may be related to the oral performance as they present academic work in front of a class. Writing communication, in turn, is developed while students need to write articles for homework or summarize reading texts. Writing editing software (e.g., Microsoft Word) may optimize this process by suggesting a more precise and

correct language with less effort to write. As Grace and Gilsdorf (2004) note, accounting students may lack communication skills. The positive correlation between ICT and COM found in this study supports that ICT can help students to acquire communication competency, which has been perceived as an important aspect for accountants (Siriwardane and Durden, 2014). Therefore, faculty should test distinct ways of employing ICT to develop students' communication competency.

ICT and KNO have a positive coefficient of .63 ($p < .01$). This strong relationship shows that the usage of ICT by accounting educators promotes acquisition of up-to-date and/or contemporaneous knowledge. As research tools (e.g., Google) become smarter and more user-friendly, students can use it to instantly access information and learn from it, including both distance and face-to-face classes. This is also a positive factor in favor of using ICT in the teaching and learning processes.

ICT and INF obtained a coefficient of .60 ($p < .01$), indicating that use of ICT may enhance students' perception about educational institutions' infrastructure. This was expected because education institutions that invest in technology resources improve their support for learning. Therefore, modern infrastructure tends to be seen by students as a positive aspect of an educational institution. I highlight two practical implications for HEIs. First, modern technologies may attract more students, educators, and researchers who are searching for a high-quality support for their education and research projects. And second, the way HEIs are seen in terms of infrastructure conditions may impact their reputation. HEIs that provide technology resources for their students, faculty and researchers tend to have good reputation. Also, infrastructure conditions may influence employers' mood as the resources work adequately, making the teaching and administrative processes more efficient. Specifically, this study found a positive correlation between ICT and INF, suggesting that students' perception on classrooms' infrastructure is related to the use of ICT by faculty.

Regarding other relationships, I emphasize that the highest correlation is between TME and EXP (coeff. = .75; $p < .01$). It suggests that teaching methods have influence on students' innovative academic experiences. This finding is also expected as students spend most of the time inside classrooms or paying attention to the instructor. Given that, teaching methods can be both positive and negative experiences for students, depending on how instructors design and execute them. The lowest correlation, albeit significant, is between COM and INF (coeff. = .50; $p < .01$). This moderate positive correlation denotes that infrastructure impacts on the development of students' communication skills. This empirical evidence supports the general idea that educational institutions must offer adequate infrastructure for students to obtain the skills demanded by the job market.

Findings obtained through Spearman's correlation matrix are consistent with prior literature in the sense of technology is relevant for HEIs and accounting education process (Akpotohwo & Ezeani, 2014; Gaviria et al., 2015; Janvrin & Watson, 2017; Lawson et al., 2014; Lawson

et al., 2015; Pathways Commission, 2012; Watty et al., 2016). HEIs and educators should keep employing ICT effectively to improve student learning.

Supplementary analysis

Finally, I conducted a supplementary analysis. Specifically, I sought for differences between accounting students' perceptions from face-to-face education (FFE) and distance education (DE). Students who study via DE naturally require the use of technology. Then, their vision may be overestimated when answering the 58th question of the 2015 ENADE's electronic survey. Table 6 demonstrates the results. Because Shapiro-Wilk's and Shapiro-Francia's tests pointed out that data did not follow normal distribution ($p < .05$) and Levene's test suggested that data did not have homogeneity of variances ($p < .05$), I employed Welch's t test (two-tailed). I observe that there is a significant difference between DE and FFE students. However, FFE students had a higher mean than DE students for question 58 ($p < .01$). It may be due to the form of how question 58 was asked. Actually, question 58 asks ICT in general, but specifies three technologies: multimedia projector, computer lab, and virtual learning environment. From these ICT resources, DE students could use only virtual learning environment. Thus, it may have reduced DE students' perception on the use of ICT as a teaching strategy in relation to FFE students' perception.

Table 6.
Differences in FFE and DE accounting students' perception

Group	Obs1	Mean	SE2	SD3	p (two-tailed)
Distance education students	10,155	4.94	0.013	1.34	0,000
Face-to-face education students	41,114	5.25	0.006	1.14	

1 Observations. 2 Standard error. 3 Standard deviation. Table 6. Differences in FFE and DE accounting students' perception

1 Observations. 2 Standard error. 3 Standard deviation.

Concluding remarks

This study investigated the perception of accounting students on the use of ICT as a teaching strategy and its associations with other academic variables. For this end, I collected data from 2015 ENADE's electronic survey, resulting in a sample of 51,269 observations. I sought to contribute to accounting education literature by providing empirical evidence about how the use of ICT is related to other academic aspects and by discussing some potential explanations for the results.

Descriptive statistics (Table 4) showed that students strongly agree with the questions. It suggests that students are satisfied with the teaching methods, learning experiences, the use of ICT as a teaching strategy, education institutions' infrastructure, and the accounting program in general. Spearman's correlation matrix (Table 5) demonstrated that all

variables were significant associated. I highlight the correlation between ICT and EXP because its practical implications. It seems that use of ICT as a teaching strategy can offer a more attractive educational process, promoting innovative learning experiences. Thus, education institutions may benefit from this evidence by adopting the newest and useful ICT. Another important positive correlation is between ICT and KNO. By utilizing ICT in the learning process, students are able to search for information in real time. It means that up-to-date knowledge can be learnt. If ICT is not available during the education process, knowledge acquisition would be limited to the content of text-book and the instructor, which may not be updated or instantly accessed. Ultimately, I sought for differences between perceptions of accounting students who were taking FFE or DE (Table 6). Evidence supported that the use of ICT as a teaching strategy was perceived in a more intense way by FFE students than DE students. It may be related to the form in which question 58 was asked, as discussed in section 4.

This study has important implications for accounting education practice and literature. First, evidence supports that the ICT usage is positively correlated with students' capacity of thinking critically, communication skills, and access to up-to-date knowledge. Thus, I recommend that instructors who still resist adopting technology should give the ICT a chance because students tend to perceive that it can be useful as a teaching strategy. Second, ICT use is positively correlated with infrastructure conditions, suggesting that instructors who use technology for teaching purposes increase students' perceptions on the quality of classrooms' infrastructure. This is particularly relevant for private HEIs because this aspect may be a competitive advantage over their market competitors. Third, ICT and innovative learning experiences are also positively correlated. This is an indication that ICT can improve student motivation, which in turn may enhance student satisfaction and performance. If ICT has the power to motivate students by providing different learning experiences, it can reduce drop out rates indirectly, as well as improve multiple student variables related to motivation.

Regarding the limitations of the study, I must emphasize two points: (i) results should be observed cautiously, since data were gathered from students' standpoint. Hence, there might have some bias in student perception; and (ii) question 58 asks if faculty are using ICT as a teaching strategy, but no indication about the quality of ICT usage was rated. Thus, students' answers for question 58 could be based on the frequency and/or on the quality of the use of ICT. Data availability then represented a limitation to extent to which it impaired my ability to obtain more specific evidence on the use of ICT as a pedagogy strategy.

Future studies could investigate the relationship between students' perception on the use of ICT in the learning process and academic performance. This would be helpful to know if students' perception about the impact of ICT usage on their performance matches the actual impact of ICT on performance measured objectively. In other words, a more robust evidence could be obtained by analyzing if students who think

ICT help them learning actually improves their performance. Also, it could be opportune to examine, in terms of differences and similarities, both faculty's and students' perceptions about the use of ICT as a teaching strategy. Data from these two sources are important to understand how ICT is being employed in the learning processes of accounting education. Lastly, Pincus et al. (2017) put that "information technology has been adapted to familiar ways of teaching, but has not yet made a significant difference in what is being taught (curriculum) or how material is being taught (pedagogy)" (p. 7). In this respect, research on innovative ways of using ICT in accounting education is demanded.

Finally, I emphasize that ICT is not the solution for all education issues. Similarly, the findings of this study are merely an indication of how ICT relates to academic aspects and need to be interpreted cautiously. However, based on the present and prior literature, ICT use for education purposes has been found helpful and the main idea this paper found and wants to defend is its potential to collaborate positively with accounting education.

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