Robotics in Shared Service Centers in Emerging Economies

James Pérez-Morón and Lina Marrugo-Salas.
School of Business, Universidad Tecnológica de Bolivar, Campus Tecnológico Km 1. Vía Turbaco, Cartagena de Indias, Colombia. jperse@utb.edu.co y lmarrugo@utb.edu.co

Corresponding author’s email address: jperse@utb.edu.co

Abstract. The purpose of this paper provides a better understanding of Robotic Process Automation- RPA phenomena on the accounting / management activities of Shared Service Centers-SSCs in emerging economies specifically in Latin America - LATAM. Due to the rawness of RPA concept in this attractive region for SSCs, this study aims to explore how automation will affect the future of accounting work in SSCs. This research uses a qualitative approach; it has chosen a single case study method based on purposive sampling as well as semi-structured interviews. A literature review was conducted to analyze the relevant research papers related to RPA within the Scopus Web of Science databases ranging from year 2006 until present. An analysis has been outlined following the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement. This study provides an understanding of organizational changes on accounting /management processes. 33% of all positions from the SSC were eliminated, which its 40% were part of the accounting staff. The existing accounting positions after RPA were associated to decision makings and information analysis. The case demonstrates that RPA generates cost savings, is not perfect and requires initial human interaction and monitoring. To the best of author’s knowledge, there is no article on RPA in SSC’s based in LATAM. The authors help to close this gap, particularly in equipping SCSs in LATAM with knowledge in accounting and management areas that may be automated.

Introduction. Robotic revolution or fourth industrial revolution [1], [2], [3] refers to the progressive automation of repetitive works and processes, mundane tasks [4], [5], even those that require certain cognitive abilities [6] have been replaced by machines, technologies or robots, which has modified the nature of the employment and economies and the nature of the work in the future is expected to change fundamentally as well [7], [8], [9], [10]. Robots and Robotic Process Automation (RPA) are already impacting the work done by qualified humans, and it’s generating structural changes in the labor scene where jobs are created, transformed and destroyed. RPA refers to a computer software configuration [11] that automates manual processes [12] This is due to the scientific and technological advances that have taken place in recent decades, plus the need for companies to generate greater competitiveness in the market, which has been increasing automation of processes at work [13], [14], [3], although this obviously depends on the business sector, the country and the financial capacity of the organizations - it is clear that not all of them are moving at the same pace. Bhatnagar (2019) [1] and Comar et al (2018) [14] show concrete examples of the development of new technologies, such as artificial intelligence, big data, cloud computing, machine learning and robotics, by stating that they “do not exert their influence individually but, combined, generate synergies that multiply their effect and make it, in some way, unpredictable.”. Issa, Sun and Vasarhelyi (2016) [15] also identified further advanced technologies like Scanning and OCR, Electronic records and plentiful computing, Blockchain, Smart contracts and Large data stores. Nowadays there are more complex humans-machine interactions, with a high-paid / low-paid increase in jobs as well as a reduction of medium-paid jobs in secondary sector [15]. Additionally, previous
researches have also demonstrated that technology will replace and complement jobs. Tedious tasks and earnings tend to disappear but upgrading them for analytical more productive jobs [17], [18], [19].

Table 1. Summarizes the WOS review
Source: Author’s own elaboration

| Authors                          | Journal                             | Title                                                                 | H Index | Description                                                                 |
|----------------------------------|-------------------------------------|----------------------------------------------------------------------|---------|-----------------------------------------------------------------------------|
| Balsmeier, B., and Woerter, M. (2019). | Research Policy                     | A thin time different? How digitalization influences job creation and destruction. | 206     | Increased investment in digitalization is associated with increased employment of high-skilled workers and reduced employment of low-skilled workers, with a slightly positive net effect. |
| Nematallah, O., and Verspagen, B. (2019). | Economics of Innovation and Technology | Perpetual growth, the labor share and robots                          | 8       | New technologies may lead to so-called perpetual growth. factor-eliminating technological progress reduces the role of labor in the production process and that this leads to a rising wage rate but ever-declining share of wage income. |
| Piva, M., and Vivarelli, M. (2018).   | Eurasian Business Review             | Technological change and employment: Is Europe ready for the challenge? | 1       | An economy based on R&D, knowledge and innovation—points in the right direction in terms of job creation, specifically in high-tech sectors. |
| Buyst, E., Geoo, M. and Salomons, A. (2018). | Oxford Review of Economic Policy    | Job polarization: an historical perspective                           | 5       | Uses the the hypothesis of Routine-Biased Technological Change (RBTC) to illustrate the employment impacts due to technology. |
| Hershbein and Kahn (2018)          | American Economic Review            | Do Recessions Accelerate Routine-Biased Technological Change? Evidence from Vacancy Postings | 253     | Their results show that recessions accelerate the job routines related to technology, also how skilled workers become key nowadays. |
| Castro Silva and Lima (2017)       | Research Policy                     | Technology, employment and skills: A look into job duration           | 206     | Technological intensity reinforces the positive relationship between skills and job duration. Authors also showed the strong relationship between human capital and technological jobs/firms. |
| Woods (2017)                      | Journal of the Knowledge Economy    | The Effect of Technological Change on the Task Structure of Jobs and the Capital-Labor Trade-Off in US Production | 20      | Authors used the Cobb-Douglas model transformed into the Solow growth model to illustrate the effect of technology on the task structure of jobs, capital/labor ratio, productivity and skills workers. |
| Cirillo (2017)                     | Economics of Innovation and New Technology | Technology, employment and skills:                                    | 8       | This paper investigates the relationships between technological change and structural determinants of employment changes. |
| Martynovich and Landquist (2015).  | Regional Studies                    | Technological Change and Geographical Reallocation of Labour: On the Role of Leading Industries. | 205     | Authors analyzed the effects of technology over regions to attract, relocate and retain workers. |
Graetz and Michaels (2015) demonstrated that the use of industrial robots in a specific business sector increased labor productivity and wages of workers. However, for Bendel (2018) [20], all these changes could also be seen in a negative way; co-robots can support workers but can also displace them which involve both opportunities and risks. This study has the following research question: RQ1: How will automation affect the future of accounting work, specifically, in a Shared Service Centers? SSCs? SSCs refer to an organizational model very popular in LATAM in which a company consolidates routine business functions performed by multiple operational entities into a single one that provides services for the entire company [19], [20]. SSCs are very useful for organizing accounting processes [21], [22], [23], [24], [25] and for companies looking forward cost savings [26], [22]. SSCs combine the best practices of a centralized model and a decentralized model [27], [28], [29]. SSCs have a complex social and organizational arrangement [30] performed in a highly technological environment [31], [23]. And most businesses rather move business support functions to service centers where activities are processed as efficiently as possible [32], [27], [26]. SSCs abound in LATAM due to its geostrategic position and offers a wide variety such as lower costs, high quality service, tighter risk controls and data transparency [33].

1. What is Robotic Process Automation? For Bhatnagar (2019) [1] Robotic process automation (or RPA) is an emerging form of business process automation technology based on the notion of software robots or artificial intelligence (AI) workers. The Institute of Electrical and Electronics Engineers- IEEE Standards Association (2017) [36] defines RPA as: “A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management”. Robotics is a technology to reshap processes and encompasses three different terms: Robotic Process Automation software -RPA-, Cognitive Technology, and Artificial Intelligence. This research only addresses the impact of the first term, in this respect RPA is defined by Deloitte as "fast, non-invasive software with a return on investment of less than a year (...) a great alternative to reduce or eliminate workload of people in bulky back-office processes (repetitive processes of finance, accounting , human resources, supply chain management, customer service, et al) and integrates - in a non-invasive way with the IT environments of companies - with practically any existing application in a process”. The importance of RPA is increasing every day more. Some of the reasons are explained by Moffitt et al., (2018) [4] as follows: “The business process improvement literature and professional auditing literature suggest that RPA can result in improved processes and economies of scale when the steps to perform a rules-based task are repetitive and manual. Conversely, RPA is less appropriate for those tasks that require elements of human judgment, that have uncertain outcomes, or that occur infrequently. When implementing RPA for the first time, organizations should look for easy wins; hence, complex and subjective tasks should be avoided”. Flak (2020) [36] includes the application of the automatic methods and procedures for the substitution of the human person (operator) - to the control of industrial processes. The industries related to automation are mainly manufacturing and processes. According to Bendel (2018) [20] to implement the use of robots, the first thing to consider is the characteristic of the task -which is dirty, boring, dangerous or difficult- in reference to the 4Ds of robotics, since those tasks are more likely to be automated and robotized.

1.1 Impacts of Robotics Process Automation RPA. Walvei (2016) [39] and Flak (2020) [37] warned that "smart" automation can affect highly qualified jobs, including, lawyers, doctors, and accountants. Arntz, Gregory, and Zierahn (2016) [7], showed that people working in the areas of accounting and auditing face a potential for automation of the 98%, which is a first alert about the impact on the accounting profession. Now, some countries are already betting on total automation or automation in manufacturing, in which an industries integrate machinery tangible physical and digital processes, looking for such machines are capable of deciding and cooperating with others as well as with the human population, according to Atzori, Lera and Morabito (2010) [40] this is possible due to the term internet of things " Concept that refers to the digital interconnection of everyday objects and machines with internet"; in the end, it is creating autonomous processes, intelligent factory, and headquarters [34]. It can be said that machines are becoming more intelligent, that is, they are increasingly able to detect their own performance and health, act on this information for themselves and communicate it explicitly to operators and other machines [35] which definitely affects the way as one relationship with people and their traditional use, with negative and positive consequences that these leads-. Although, in order to generate automation process -aimed at organizations that think about incorporating it or have already generated it- certain considerations must be taken into account since it depends on (i) the
organization and characteristics of the workplace; (ii) the previous existence and degree of investments in automation technologies, and (iii) the education of workers (training and assimilation skills). Chui et al., (2017) [6] identified other considerations when determining the implications for companies, namely, what kind of automation is possible with current technology and what is likely as technology evolves; what factors besides technical feasibility should be considered when making decisions about automation, where and how much to automate to better capture the value of long-term automation. In the end, all is part of reinventing and preparing to a new environment that has no return, where the accountants must enhance their creativity, their ability to solve problems and constantly update if they do not want to be replaced. In this regard, Comar et al., (2018) [14] argue that "social renewal, advance, and progress, go through the reinvention of professionals, who come out of their" comfort zone"establish new relationships" with themselves and with their interest groups. In fact, just Osan and Somers (2017) [42] propose how to leverage the fourth revolution since they require new human capacities, the processes necessary to store and manage the data, the professionals with the capacity to generate useful information from these and the functions of continuous improvement that turn knowledge into sustainable yield changes. It is also not a matter of being a victim or extremist, in fact, in the study that was previously cited, Arntz, Gregory, and Zierahn (2016) [7] concluded that it “clearly points to the need to focus more in the possible inequalities and requirements of (re) formation derived from technological change instead of the general threat of unemployment that technological progress could or could not cause.”. That said, robotics, updating new technologies are necessary steps for economic development, but the impacts generated in employment should be guaranteed and carefully studied as a macroeconomic indicator. Accountants, of course, should not be oblivious to these discussions that are generated from different areas.

2. Methodology. This research reviews the literature using papers published between 2006 and 2020. The literature search was done independently by two researchers who searched for papers in various databases (Scopus and Web of Science) using the following keywords “robotic process automation, automation, shared service center, back office, accounting, technology, labor changes”. These search terms were initially broad in scope with the intention to cover a wide breadth of knowledge in answering the research question. Then, key word synonyms were identified and combined with key words to allow a more comprehensive search. The search used both ‘free terms’ and ‘index terms’ funneled using the Boolean operators (OR, AND) and truncations. This review was conducted by following the reporting checklist of the Preferred Reporting Items for Systematic Reviews and Meta- Analyses [36]. Figure 1 presents the results of PRISMA analysis:
Figure 1. Results of PRISMA analysis.
Source: Author’s own elaboration

(a) Records identified through Web of Science/Scopus searching
(n = 3,378)

(b) Records after duplicates removed (n = 2,425)

(c) Records screened (n = 2,425)
(d) Records excluded (n = 1,605)

(e) Full-text articles assessed for eligibility (n = 1,605)
(f) Full-text articles excluded, with reasons (n = 1,552)

(g) Studies included in quantitative synthesis (meta-analysis) (n = 53)
The review conducted in this study is guided by the main question: How will automation affect the future of accounting work in Shared Service Centers SSCs? More specifically, other guiding sub-questions are listed as follows:

I. Q1: What is the current state of RPA from the accounting perspective?
II. Q2: How has RPA been implemented in the field of SSCs?

This research excludes the following papers indexed in WOS and Scopus: papers published in letters, congresses, editorials, note, incorrect affiliations, inaccessible abstracts, short surveys, and wrong titles. Finally, only 53 relevant papers closely or partially related were found within the five keywords selected. This paper follows the qualitative research methodology in response to calls for investigations, such as in the case of Herbert (2014) [44] and Kreiner (2006) [45], and the experiences of accountants in the context of shared service work described in Lepisto et al., (2018) [32]. This study subscribes to exploratory and descriptive case-based research, selected based on purposive sampling [37]. It is a single case with the holistic design of the instrumental type to be developed on a single unit of analysis given its revealing and character [38].

3. The Shared Service Center “GLEco”. The study was conducted in LATAM. The organization being studied, referred to as “GLEco” is a company created in 2001 in North America by a group of investors who established as its goal to design innovative products of high-tech water sports. Its corporate headquarters are in the United States, it has distribution centers in Asia and the Shared Services Center of the Caribbean and Latin America in Colombia, South America was founded in 2001. The company has won numerous worldwide awards and recognitions. This paper aims to observe the implementation and impacts of RPA in some accounting processes and in the organizational structure of the company. The situation experienced by the company is shown chronologically, from the moment in which it is decided to implement RPA and the evaluation after the decision. Initially, permission is requested from the main headquarters in the USA to start collecting data on randomly selected managers and employees. A few weeks later and after several sessions where consensus was not reached, finally approval is received from senior management to start documenting the case, but not before signing a new NDA (Non-Disclosure Agreement) or Confidentiality Agreement where the first numeral states that the generic information could be shared and the company's patented information should be kept in absolute confidentiality such as: "idea, discovery, research, data, formulations, specification, process, technique, algorithm, architecture, know-how, invention, plan, drawing, outline, outline of products, document, manual, report, market studies, photography, sample, prototype, customer lists, price list, detailed product description, business plan, marketing plan, financial information or work in progress " as well as the identity of the officials who are part of the study. Subsequently, the interviews to the accounting, computer experts, clients and logistics staff of the office in Colombia began via telephone and email. The company went through a series of events which have put to the test the management capacity of its directives and which led to the search for initiatives to reduce costs and seek greater efficiency in the processes, which led to the emergence of RPA as a response to such concerns.

3.1 Seasonal Products. The main market was the North American one and during the winter season (December to March approximately) the sales of nautical products fell drastically what showed that the items were put under a strong seasonality that the sales underwent strong oscillations depending on the time of the year. The sustained fall in revenues led to the search for initiatives to reduce costs. In this regard, Ma et al., (2018) [48] point out those seasonal products give rise to a new media scenario and pose both challenges and opportunities for companies. However, and as established by Lobos Andrade and Muñoz Ibáñez (2005) [49], seasonality is an external factor that cannot be controlled by producers, which impacts not only production processes; it also establishes the seasonal component as the most relevant of the time series data used to analyse price stability and marketing margins.

3.2 Asia and Intellectual Property. The new future products began to be manufactured in a non-owned factory in Asia in 2014, with industrial designs, prototypes, and patents. The new product line was a success in the first months. However, during the same period, the decrease in the frequency of purchases by some distributors and representatives was identified and when inquiring about the reasons, it was detected that the Asian company had taken intellectual property, modified designs, and prototypes and was directly marketing the "new" products at a lower price, even with regular
customers. The violation of intellectual property rights in country X has always been considered a major concern for foreign companies. Since 2001 country X has made great strides in protecting the intellectual property. However, country X still requires special attention to international standards regarding intellectual property, cooperation with foreign peers and recognition of the need for new forms of public-private partnerships [39]. Although they have several international patent applications that surpassseventeen countries like Germany and South Korea and like Japan and the USA, their innovations do not demonstrate dominant influence in the rest of the world, they have a very low commercial value, additionally China is in the first position in the list of countries with "priority surveillance" for not providing adequate and effective protection of intellectual property according to the United States. Pending orders had to be produced in alternate factories, at less competitive prices. The transition took a while, several customers decided to wait for their orders, if they receive a compensation(additional accessories, credits for future orders or international freight payment), while others decided to cancel their orders and requested the return of the deposits paid. All of this hit even more intensely the company’s finance and it became even more important for top management to reduce costs. The legal process against those who stole the intellectual property began and is still ongoing, pending the decision of the Court.

3.3 Main Strategic Decisions. To counteract the seasonality of the products, a marketing and penetration strategy was initiated towards new markets such as the European, Australian and Asian Pacific Islands. The research and development department began to work on expanding the portfolio of products that met the brand's own innovative character, which could be sold in a sustained manner independent of the season and complement the existing line. Creation of a manufacturing and distribution center in the USA. Bank loans are acquired to materialize this project since with the background of intellectual property it was difficult to return sensitive information to any other factory. This decision was jointly supported by offering the possibility of being able to regain available inventory in the main market. The opening of the Shared Services Center (SCS) in Colombia, South America for the Caribbean and Latin America aimed to improve service levels, continue to reduce qualitative and quantitative cost in personnel, processes, technology, and property and consolidate administrative functions such as Logistics and International Transportation, Human Resources, Finance, Purchasing, and Accounting.

3.4 Implementation of RPA in SCS in LATAM. The SCS employs 15 people detailed as follows: 1 General Manager, 1 Human Resources Manager, 1 Accountant, 2 Accounting Assistants, 2 Logistics and Transportation Assistants, 1 Production Coordinator, 2 System Engineers, and 5 Salesmen. When senior management began to consider the RPA, it began by reviewing all process maps in conjunction with all the administrative staff to determine which were the most manual and repetitive tasks that were likely to be automated, without sharing any activity with the company’s IT staff. The selected RPA Tool was BdPath (name changed), and the accounting software was QuickBooks Online Plus (QBO), independently of the volume of transactions, which focuses on organization, productivity and insights, key characteristics for this SSC. QBO can sync with hundreds of different apps which automate multiple tasks to, below it is QBO’s apps used and their main features in the SSC:

3.4.A Payroll Automation (this feature takes care of global employee’s net payment, employment taxes, reports, worked hours, among others), which uses the app “QuickBooks Online Payroll” powered by KeyPay

3.4.B Invoice/Inventory Automation (Invoicing and Inventory have been streamlined with “Shopify for QuickBooks Online” app, create templates, shipping orders, invoices automatically and export all sales to QBO, using any gadget)

3.4.C Inventories, sales through multiple distribution channels (in physical, social networks), handling of transport documents and production orders are handled in a single site (“Shopify for QuickBooks Online” app dropships from a third-party warehouse)

3.4.D Payment Automation (with "Shopify for Quickbooks Online” app the company can accept online payments from different currencies via credit card or bank transfer. This app is integrated with around 100 worldwide gateways and offers a merchant account).

The main types of automation processes identified were:

1. Specific Processes: Transactional processes that are part of a larger function within the company, are simple and repetitive. Eg: Inventory management, Receipt, and processing of invoices within
accounts payable, accounts receivable, reports, marketing campaigns

2. Multifunctional Processes: Processes that are executed through multiple functions in an organization. Eg: Bank reconciliations, Payroll

3. End-to-end processes: These are complete processes carried out through multiple tasks. They usually involve several officials generating reprocesses and possible bottlenecks. Eg: Payment to suppliers, purchase orders, import and export and international cargo transportation

By automating the above processes, the main results were the following:
- Cost reduction: 60-70%
- Accuracy: 100%
- Employees in the new processes: 1
- Saving time: 2800 hours

3.5 Example of an accounts receivable process, end-to-end (before and after). To highlight the benefits of RPA this paper will show some data regarding the application of RPA for the process of accounts receivable in the company. Under standard conditions, the duration times of the processes and people involved in the process do not vary, also considering that there are no errors that delay the process. See Figure 2:

**Figure 2. Accounts Receivable Workflow. After**
Source: Author’s own elaboration
3.6 Process of Accounts Receivable of Invoice not paid without Automating (See Table 2).
Estimated time of completion: 20 minutes People involved in the process: 3 Accuracy: 80%

Table 2. Wage level in US Dollars.
Source: Author’s own elaboration

| Position                        | Before RPA | After RPA | Reduction | %   |
|--------------------------------|------------|-----------|-----------|-----|
| General Manager                | $2,500     | $2,500    | 0         | 0   |
| H.R. Manager                   | $2,000     | $2,000    | 0         | 0   |
| Accountant                     | $1,500     | $1,500    | 0         | 0   |
| Accounting Assistant (2)*$480 each | $960     | 0         | $960      | 100%|
| Logistics and Transport Assistants (2) *$480 each | $960 | 0 | $960 | 100% |
| Production Manager             | $1,000     | 0         | $1,000    | 100%|
| Systems Engineer (2)           | $960       | $960      | 0         | 0   |
| TOTAL                          | $9,880     | $6,960    | $2,920    | 29% |

Automated Accounts Receivable Process of Invoice not paid (eliminated processes have been crossed out). Estimated time of completion: 3 minutes People involved in the process: 1 Accuracy: 100%

4. Discussion - The organizational structure changed after RPA. The implementation of RPA not only affected the accounting part but also had an impact in logistics and transport and production. At first the intention of the company was to retain human talent; however, it was impossible because as they have conceived the charges most of the activities, they performed were routines that had been automated or were in the process of being. It is concluded that the impacts were from the labor point of view, with a reduction in the jobs. Bendel(2018) [20] stated that one of the concerns that comes with automation process is "the impact on a weakened labor markets marked by job insecurity and high unemployment"; for this case, although there was no significant impact because it was a small office, attention should be paid to the multiplier effect, since if these practices are extended, the impacts can be much greater. At the same time, greater process efficiency was achieved by reducing waiting time by customers; this no longer must wait days for their documentation (commercial invoice, packing list and certificate of origin as well as other trade documents) to proceed with the importation or logistics processes.
Figure 3. Organizational pyramid before and after RPA

Source: Author’s own elaboration
The implementation of RPA accomplished the original goal of cost reduction, a total of $2,920 USD per month in reduction equivalent to a 29% reduction of the payroll. Five of fifteen positions of the SSC in LATAM (33%) were eliminated, two of five positions (40%) were part of the accounting staff (one of the positions was the AR Specialist and the other one was the Inventory Analyst, see their functions in figure 3). Essentially, the tedious / routinized jobs disappeared meanwhile the others still exist due to the skills their jobs require and that cannot be automated (at least yet), like creativity, critical thinking, emotional intelligence and ability to “read” people. This last finding is in aligned with Cortes, Jaimovich and Siu (2017) [51] and the World Economic Forum (2016) when stated that the changing nature of work, and skills instability—the rapid change in the skills requirements of all existing jobs—are nowadays among the most important drivers of change. It is also aligned with the European Commission (2016) when confirmed that the impact of concurrent disruptions in technological, demographic and socioeconomic level will transform the employment landscape and skills requirements. The existing accounting positions after RPA were associated to decision makings and information analysis. The case demonstrates that RPA generates cost savings, is not perfect and requires initial human interaction and monitoring.

Figure 4. Accounting positions removed and their functions

Source: Author’s own elaboration
The key person contacted in the SSC was the controller. After several attempts to set an appointment emails and calls, the controller finally agreed to meet the interviewers to know further the purpose of this research. The meetings were in the SSC’s office and it was necessary to meet several times to clarify the intentions of the researchers and the potential benefits for the SSC. The controller helped to contact upper management in corporate headquarter until final approval to share the information was provided. The first round of semi-structured interviews started with two guide questions:

Q1: What is RPA?
Q2: What is your experience with an RPA Tool called BdPath (robot software)?

During the interviews, the respondents provided in-depth details of the functioning of their areas and the main bottlenecks identified, which explained why upper management considered RPA as a solution to overcome their difficulties. The cost of implementation an RPA Tool was a big concern (the respondents thought the cost was high). All the information gathered served as the primary guide for this research’s writing. This study collected data through semi-structured interviews (lasted from one up to two hours). In total, 37 hours of interviews were undertaken from October to December 2018 with nine respondents including the chief executive officer, chief information officer, chief technical officer (in USA), the operational manager, the controller, the logistics manager, the production manager, the human resource manager, accountants (in SSC in Latin America). All interviews have been recorded and then the transcription process completed accordingly. These results are in Table 3.

### Table 3. Details of Interviews.
Source: Author’s own elaboration

| Item | Name and Position                  | Interview Session |     |
|------|-----------------------------------|-------------------|-----|
|      |                                    | Frequency | Duration (hours) |     |
| 1    | Chief Executive Officer           | 1         | 3               |     |
| 2    | Chief Information Officer         | 2         | 6               |     |
| 3    | Chief Technical Officer           | 2         | 6,5             |     |
| 4    | Operational Manager               | 2         | 5               |     |
| 5    | Controller                        | 2         | 4               |     |
| 6    | Logistics and Transport Manager   | 1         | 2               |     |
| 7    | Human Resource Manager            | 1         | 3               |     |
| 8    | Accountants                       | 2         | 5,5             |     |
| 9    | Production Manager                | 1         | 2               |     |
|      | **TOTAL**                         |           | **37**          |     |
Surprisingly, some collaborators had already heard and read about it, which was not something imposed: “When I first heard about RPA was a few years ago during college, I’m really glad we’re considering RPA for our company……. Actually, I think it’ll improve the company performance across the board. It will be a bit awkward to have a robot as a new co-worker [laugh]” (Richard, Accountant, 38 years old). Others felt skeptical when heard about RPA: “A robot may do a great job but I’m not quite sure how well it can do when it comes to numbers or figures…Upper management will always want a human being to be responsible for counting the beans of the company. These tasks are still too sensitive to handle for a machine, I guess”. (Marcus, Financial Analyst, 55 years old).

Finally, the initial motivation to reduce costs was always clear, however, there are also other benefits that derive from the use of RPA. Two employees spoke about their experience after implementation: “As one of the architects behind the implementation of RPA, to “see people go” was not easy. High-talented, smart and committed employees, and more important, personal friends in some cases, lost their jobs. Having a robot as a co-worker was something that all employees/professionals aren’t ready for. On the other hand, the productivity and accuracy increased dramatically, key processes in several areas were streamlined and senior management considered that RPA was worth it. From a personal perspective, my role as a controller changed positively, I had to develop new powerful skills and improve another set of abilities. Now, I was more analytical oriented, and began to spend more time making strategic/educated decisions and with higher quality information.” (Joseph, Controller, 38 years old). “Information is way more reliable now and is handy 24/7. The person in charge of that task prior RPA was good, however cannot beat the current software in terms of efficiency and accuracy.” (Richard, Accountant, 41 years old). One of the exclusive distributors reflected on the experience: “Multiple times in the past I was given the shipping documents and accounting/financial information a bit late. That caused me some fees with customs. Now, that bottleneck is gone. Once I place an order, triggers are pulled immediately into the new tool you guys implemented and I get all the documents I require right away, no waiting time”… So I appreciate these types of improvement and now we can focus on closing more sales and expand”. (Mary, Distributor, 60 years old).

5. Directions for future research. This study introduces the concept of RPA in SSCs in Latin America. The findings will help other SSCs to incorporate RPA in their operations. Future research is required in how to use other new technologies (Cognitive Technology, Blockchain, Big Data, Machine Learning, Internet of Things and Artificial Intelligence) in SSCs in Latin America as well as other areas that can be automated (logistics, legal, compliance, HR, purchasing, finance, payroll) following prior research studies’ methods [52]. Specifically, future research could focus on the following questions:

1. How will these new technologies create and help managing jobs, organizational problems and business relations in LATAM?
2. How do the business environments in the SSC host country influence the success or failure of RPA implementation in LATAM?
3. What are the cost impacts on SSCs from different organizational contexts? Will those results vary/how much once multiple in-depth case studies and cross-country data be used?
4. What are the opportunities and challenges faced by SSCs in emerging countries while implementing RPA?
5. What new technologies will SSCs implement in each country of LATAM? In what areas of the SSC? Can the same technology be applied in all SSCs with presence in countries of LATAM across the board?
6. How will accountants and all workers in general be motivated in the machine economy?
7. What will be the consequences and how will we address the income inequality?
8. What is the bias in new technologies? What are their sources and main impacts?

6. Conclusions. It is a fact that the incorporation of new technologies and the fourth industrial revolution in the business sector is here to stay and is constantly evolving. Neither accounting nor SSC’s should be left out of global trends. It is an excellent opportunity for the empowerment of the profession and defense for a more analytical and less technical role. The accounting information system (AIS) course require updates. Accountants of 21st century with IT and data analytics knowledge make a perfect combination and gather the new skills an accountant should have information creation and maintenance, data analysis, and IT infrastructure [53], [15].

LATAM is a valley for SSCs who need to remain competitive by adapting these new technologies in addition to other factors that the region offers (labor arbitrage, LATAM environment, geographic proximity to North America, et al). Part of the new SSCS approach is to become strategic decision centers and to be attractive for different company’s sizes. Competitiveness that will allow SSCs to enhance their operations, control and transparency [35].

It is clear that jobs will be lost, tasks and positions in administrative management will be created, modified and disappeared, however, one aspect that must be considered is a strong social preference for the provision of certain tasks and services by humans as opposed to machines, there is a social value associated with humans who perform certain tasks that tend to preserve their comparative advantage. [7], social, interpersonal and analytical skills are still important, despite the specialization of work, as accountants constantly negotiate with clients, analyses their processes and respond to open-ended queries [27].

Companies should anticipate this reality and should carry out an exhaustive inventory of the activities of the organization and create a heat map where the automation potential is high, in this way, all the associated risks will be reduced and planned in advance. This requires universities to update themselves in these trends, interdisciplinary work groups are created, and company-academy partnerships are established to strengthen these labor competencies [54].

RPA can improve productivity, accuracy, and compliance, and allows professionals to focus on more creative and more valuable work. It is a mistake to believe that it takes a lot of money and investments in RPA to see big changes in operational efficiency. The implementation of these systems reduces costs, improves the accuracy and speed of a work process, reducing human negligence, but can also affect psychosocial aspects such as motivation and commitment of employees, due to staff reductions. These technologies speed up the collection and processing of data; although it can also generate the rejection of technology because of the concern to lose their jobs [55]. The current supply of vendors capable of automating processes in the company is very varied and offers competitive market prices, research estimates that it will be further reduced with the passage of time and increases their degree of reliability.

The results show that due to its low cost, development and efficiency increase, it is expected that the use of the RPA gradually grows in specific processes (accounts payable, inventories), multifunctional (reconciliations of invoices and banking) and cutting-edge processes (payroll and purchases). Other accounting processes that will benefit from RPA are billing, payroll, preparation of financial reports and other financial activities of the company, such as cash flow, investment, debt, financial planning and decision making [55].

The Accounting Big Four are also part of this wave, implementing and patenting key tools in their daily operations: document review platforms, asset inspection, automate auditing processes, drones to monitor inventory, Natural Language Processing, among other. They have
also partnered with high-tech players: IBM Watson, Ayasdi, Narrative Science, Kira, H2O.ai. [56].

Finally, it should be noted that the accountants will not disappear; they should simply adjust their role pointing to consulting, analysis and value-added services. Here the strengthening of soft skills and greater knowledge about RPA and ICTs becomes vital for universities, which should incorporate the RPA approach in updating the accounting curricula to foster new skills in IT audit, systems design, and analytics to accountants [53] so they can respond to nowadays challenges and requirements from employers [57], [58], [59].

7. References

[1] N. Bhatnagar, Handbook of Experimental Pharmacology, 2019.
[2] A. Hirschi, The fourth industrial revolution: issues and implications for career research and practice, 2018, pp. 192-204.
[3] T. Nam, Citizen attitudes about job replacement by robotic automation, vol. 109, 2019, pp. 39-49.
[4] K. Moffit, A. Rozario y M. Vasarhelyi, Robotic process automation for auditing, 2018.
[5] K. Schawb, The fourth industrial revolution. New York: Crown Business, 2016.
[6] M. Chui, J. Manyika, K. George y M. Miremadi, «McKinsey & Company,» 2017. [En línea]. Available: https://www.mckinsey.com/business-functions/operations/our-insights/human-plus-machine-a-new-era-of-automation-in-manufacturing.
[7] M. Arntz, T. Gregory y U. Zierahn, The risk of automation for jobs in OECD countries: a comparative analysis, 2016, pp. 1-34.
[8] E. Brynjolfsson y A. McAfee, The second machine age: work progress and prosperity in a time of brilliant technologies, 2014.
[9] E. Ford, Rise of the robots technology and the threat of a jobless future, 2015.
[10] C. Frey y M. Osborne, the future of employment: how susceptible are jobs to computerisation? 2017, pp. 254-280.
[11] L. Willcocks, M. Lacity y A. Craig, «The IT Function and Robotic Process Automation,» The Outsourcing Unit Working Research Paper Series, 2015.
[12] C. Bataller, A. Jacquot y T. S.R, Robotic Process Automation, 2017.
[13] A. S, M. P, C. B y N. D, A novel automated Financial Transaction System Using Natural Language Processing, 2020.
[14] C. Comar, G. Duncan y K. Miller, FlipTube technology promotes clean manipulation of forensic samples on automated robotic workstations, 2017.
[15] H. Issa, T. Sun y M. Vasarhelyi, «Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation,» Journal of Emerging Technologies in Accounting, vol. 13, 2016.
[16] E. Buyst, M. Goos y A. Salomons, «Job Polarization: An Historical Perspective».
[17] D. Acemoglu y H. Autor D, «Skills, Tasks and Technologies: Implications for employment and earnings,» de Handbook of Labor Economics .
[18] D. H, «The Task Approach to Labour Markets: An Overview».
[19] H. Autor D y M. J. Handel, «Putting Tasks to the Test: Human Capital, Job Tasks, and Wages,» Journal of Labor Economics , 2013.
[20] O. Bendel, Co-robots from an ethical perspective, vol. 141, 2018, pp. 275 - 288.
[21] N. Su, R. Akkiraju, N. Nayak y R. Goodwin, Shared Services Transformation: Conceptualization and Valuation from the Perspective of Real Options, 2009.
[22] F. Sum, I. Paula, G. Tortorella, A. Pontes y F. R.T, «Analysis of the Implementation of a Lean Service in a Shared Service Center: A Study of Stability and Capacity,» IEEE
Transactions on Engineering Management, pp. 1-13, 2019.
[23] A. Bhimani y L. Willcocks, Digitization ‘Big Data’ and the transformation of accounting information, vol. 44.
[24] D. Harritz, «Role of Management Devices in Enacting Strategy - Case study of shared service centre,» Journal of Accounting and Organizational Change, vol. 12, pp. 504-521, 2016.
[25] J. Lindvall y E. Iveroth, «Creating a Global Network of Shared Service Centres for Accounting,» Journal of Accounting and Organizational Change, vol. 7, nº 3, pp. 278-305, 2011.
[26] J. Oliveira y S. Clegg, «Paradoxical Puzzles of Control and Circuits of Power,» de Qualitative Research in Accounting and Management, vol. 12, 2015, pp. 425-451.
[27] W. Seal y I. Herbert, «Shared Service Centers and The Role of the Finance Function: Advancing the Iron Cage?» Journal of Accounting and Organizational Change, vol. 9, nº 2, pp. 188-205, 2013.
[28] R. Raudla y K. Tammel, «Creating Shared Service Centers for Public Sector Accounting,» Accounting, Auditing and Accountability Journal, vol. 28, pp. 158-179, 2015.
[29] D. Howcroft y H. Richardson, «The Back Office Goal: Exploring connections and contradictions in shared service centres,» Work, Employment and Society, vol. 26, pp. 111-127, 2012.
[30] B. Quinn, R. Cooke y A. Kris, Shared Services: Mining for Corporate Gold, Englewood Cliffs, NJ , 2000.
[31] D. Schulman, M. Harmer y J. Dunleavy, Shared Services - Adding Value to the Business Units, Hoboken, NJ, 1999.
[32] L. Lepisto, J. Dobroszek, S. Moilanen y E. Zarzycka, «Being a Management Accountant in a Shared Service Centre,» Journal of Accounting and Organizational Change, 2018.
[33] I. Herbert y W. Seal, «Shared Services as a new organisational form: some implications for management accounting,» The British Accounting Review, vol. 44, nº 2, pp. 83-97, 2012.
[34] S. Bridelli, S. Wesneck y F. Martins, Shared Services Center: A Definitive Solution for The Administrative Processes? vol. 1, 2005, pp. 1-8.
[35] Deloitte, Shared Services Centers in Latin America, 2015.
[36] I. C. A. Group, IEEE Guide for Terms and Concepts in Intelligent Process Automation, New York, NY, 2017.
[37] O. Flak, System of organizational terms as methodological concept in replacing human managers with robots, vol. 70, 2020, pp. 479-500.
[38] Deloitte, ¿Qué es Robotics Process Automation? 2018.
[39] U. Walvei, «Digitalization and Structural Labour Market Problems: The Case of Germany,» ILO Research Paper , 2016.
[40] L. Atzori, A. Lera y G. Morabito, The Internet of Things: A Survey, 2010, pp. 2787 - 2805.
[41] A. Frank, L. Dalenogare y N. Ayala, «Industry 4.0 technologies: implementation patterns in manufacturing companies,» International Journal of Production Economics, 2019.
[42] A. Osan y K. Somers, Optimizing production in the age of the machine, 2017.
[43] A. Liberati, D. Altman, J. Tetzlaff, C. Mulrow, P. Gotzsche, J. Loannidis y D. Moher, The PRISMA Statement for Reporting Systematic Reviews and Meta-analyses of Studies that Evaluate Healthcare Interventions: Explanation and Elaboration.
[44] I. Herbert y W. Seal, «A Knowledge Management Perspective to Shared Service Centers: A Case Study of a Finance SSC,» Shared Service as a New Organizational Form, pp. 133-151, 2014.
[45]  G. Kreiner, B. Ashforth y S. D.M, «Identity Dynamics in Occupational Dirty Work: Integrating Social Identity and System Justification Perspective,» Organization Science, vol. 17, nº 5, pp. 619-636, 2006.
[46]  M. Patton, Qualitative Research and Evaluation Methods, 3 ed., 2002.
[47]  R. Yin, Case Study Research and Methods, Thousand Oaks, 1994.
[48]  J. Ma, D. Huang, D. Markovitch y B. Ratchford, «High or Low Season,» European Journal of Marketing, vol. 52, pp. 1956-1980, 2018.
[49]  G. Lobos y T. Muñoz, «Índices de estacionalidad de los precios recibidos por los productores de manzanas chilenas,» Pesquisa Agropecuaria Brasileira, vol. 40, nº 11, pp. 1051-1057, 2005.
[50]  X. Y y R. Suttmeier, «China’s Post-WTO Technology Policy: Standards, Software and The Changing Nature of Techno-Nationalism,» The National Bureau of Asian Research, 2004.
[51]  G. Cortes, N. Jaimovich y H. Siu, «Disappearing routine jobs: who, how and why,» Journal of Monetary Economics, vol. 91.
[52]  J. Paul y A. Rosado-Serrano, «Gradual Internationalization vs Born-Global/International New Venture Models,» International Marketing Review, 2019.
[53]  J. Coyne, E. Coyne y K. Walker, «A Model to Update Accounting Curricula for Emerging Technologies,» Journal of Emerging Technologies in Accounting, vol. 13, pp. 161-169, 2016.
[54]  D. Drum y A. Pflvermacher, «Accounting Automation and Insight at the Speed of Thought,» Journal of Emerging in Accounting, vol. 13, 2016.
[55]  D. Fernandez y A. Aman, «Impacts of Robotic Process Automation on Global Accounting Services,» Asian Journal of Accounting and Governance, vol. 9, 2018.
[56]  D. Faggella, «AI in the Accounting Big Four - Comparing Deloitte, PwC, KPMG, and EY,» 2019.
[57]  Association to Advance Collegiate Schools of Business AACSB, 2014.
[58]  Deloitte, Tech Trends 2013: Elements of Postdigital, 2013.
[59]  PricewaterhouseCoopers, «Data Driven: What Students Need to Succeed in a Rapidly Changing Business World?» 2015.
[60]  H. Castro Silva y F. Lima, Technology Employment and Skills: A look into job duration, 2017.
[61]  V. Cirillo, Technology, Employment and Skills.
[62]  Deloitte, The Robots are ready, are you? 2018.
[63]  B. Hershbein y L. Kahn, «Do Recessions Accelerate Routine-Biased Technological Change?» American Economic Review, pp. 1737-1772, 2018.
[64]  M. Lacity y J. Willcocks, «A New Approach to Automating Services,» Massachusetts Institute of Technology Sloan Management Review, 2016.
[65]  Lighthizer, «Office of The United States Trade Representative,» 2018.
[66]  M. Martynovich, Lundquist y J. M, «Technological Change and Geographical Reallocation of Labour: On the Role of Leading Industries,» de Regional Studies, 2015, pp. 1633-1647.
[67]  O. Nomaler y B. Verspagen, «Perpetual Growth, The Labor Share and Robots,» de Economics of Innovation and New Technology, 2019, pp. 1-19.
[68]  M. Piva y M. Vivarelli, «Technological change and employment: is Europe ready for the challenge?» Eurasian Business Review, 2018.
[69]  F. Silva, M. Ostos y O. Gonzalez, Automatización Robótica de Procesos (RPA), 2017.
[70]  K. Tammel, «Shared Services and Cost Reduction Motive in The Public Sector,» International Journal of Public Administration, vol. 40, nº 9, pp. 792-804, 2017.
[71]  M. Williams, «An Old Model of Social Class? Job Characteristics and the NS-SEC
Schema,» de Work, Employment and Society, 2016, pp. 153-165.
[72] J. Woods, «The Effect of Technological Change on the Task Structure of Jobs and the Capital- Labor Trade-Off in US Production.» Journal of the Knowledge Economy, pp. 739-757, 2015.