



On Robotic Process Automation and its Integration in Higher Education

Cornel Turcu¹, Cristina Turcu²

Stefan cel Mare University of Suceava, Romania^{1,2}

Abstract

Worldwide, the higher education systems are confronted with various issues within a large bureaucratic setting. Time constraints, limited budgets and lack of human resources put strain on managing various tasks. In order to reduce the stress affecting teachers, students, and administrative staff in different departments, viable and easy-to-implement solutions are needed. The relatively young Robotic Process Automation (RPA) technology could allow reducing “the burden of repetitive, simple tasks on employees” [1]. Robotic Process Automation tools could allow the automation of a huge number of redundant manual processes. Recently, it has been noted that RPA starts to play an important role in various industries. The research firm Forrester predicts that the worldwide market for RPA services will reach \$7.7 billion in 2020 and will grow to \$12 billion by 2023 [2]. Although the recent development of this technology allows multiple benefits across various domains, educational institutions are slow to implement solutions based on it. There is limited research to investigate the solutions associated with RPA for various problems encountered in educational institutions. Taking into account the above-mentioned facts, this paper aims to provide some insight into the concept of Robotic Process Automation, as well as a broader perspective upon its successful implementation, in future, in the higher education system.

Keywords: *Robotic Process Automation (RPA), higher education*

1. Introduction

As educational institutions around the world had to adapt to new ways of working as a result of measures to prevent the spread of the novel coronavirus (COVID-19), many are re-examining their operations, with a growing interest in digitalization. With students, employees (teachers, researchers and administrative staff), and partners all working remotely, more and more universities are eager to accelerate their digital transformation. But, we must emphasize that in the last years, there has been a massive increase in the bureaucracy of education [3], as a considerable number of studies reveal. In addition, time constraints, limited budgets and lack of human resources put strain on managing various tasks.

Recently, it has been noted that Robotic Process Automation (RPA), an advanced technology that allows the automation of a huge number of redundant processes, begins to play an important role in various industries. The research firm Forrester predicts that the worldwide market for RPA services will reach \$7.7 billion in 2020 and will grow to \$12 billion by 2023 [2]. Thus, for example, according to [4], RPA accounts for the best return of investments (RoI) for 19% of respondents to this study made up of expert insights from over 400 companies (compared to 12% in 2018). Numerous applications, studies and reports show that RPA can prove incredibly useful to various domains. All these represent a convincing argument for educational institutions (EIs) and their stakeholders to adopt the RPA-based solutions. However, although the recent development of this technology allows multiple benefits across various domains, educational institutions are slow to implement solutions based on it. There is limited research on RPA-based solutions for various problems encountered in higher education institutions around the world. Considering the above, this paper aims to give insight into the RPA application in the field of higher education (HE), for different users, such as: students, teachers, researchers and administrative staff alike.

1.1 Paper Contributions

Considering the above, this paper aims to answer the following research questions:

- What is Robotic Process Automation (RPA)?
- How have publications on RPA developed over time?
- How can higher education stakeholders benefit from RPA?



In order to provide answers to the above questions, the remainder of this paper is structured as follows. In the next section, we explore the concept of Robotic Process Automation by presenting some definitions of RPA, the evolution of scientific papers addressing RPA research, and RPA platforms. Following this, the benefits that RPA-based applications might entail to different categories of higher education stakeholders are described. The final sections present the future work on RPA application in higher education and conclusions of the paper.

2. Background of Robotic Process Automation

In recent years, Robotic Process Automation (RPA) attracts attention for productivity improvement. According to [5], “RPA aims to replace people by automation...”, reducing “the burden of repetitive, simple tasks on employees” [1]. Worldwide there are several definitions, some of which are presented below.

2.1 Defining Robotic Process Automation

The Institute for Robotic Process Automation & Artificial Intelligence defines RPA as “the application of technology that allows employees in a company to configure computer software or a ‘robot’ to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems” [6].

The IEEE (Institute of Electrical and Electronics Engineers) Standards Association defines Robotic Process Automation (RPA): “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” [8].

2.2 RPA Research Trend

In recent years, there has been a growing interest in Robotic Process Automation (RPA), as Google Trend shows (Fig. 1). We can visualize the relative popularity of these keywords between 2015 and 31 March 2020.

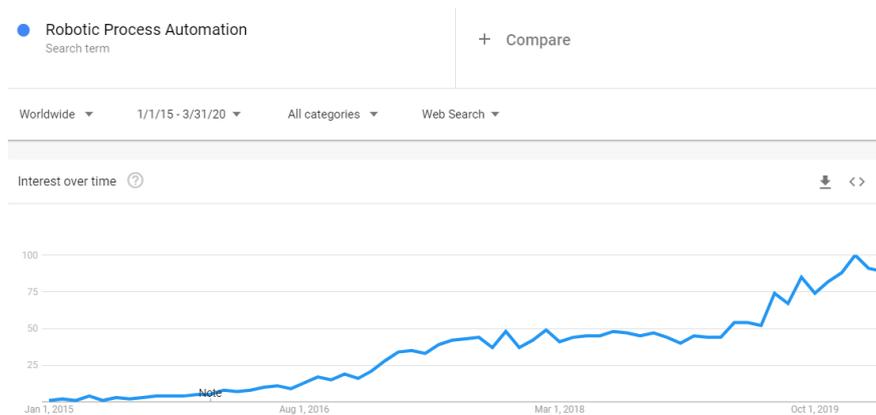


Fig. 1. Search volume index for the data provided by Google Trends corresponding to the Robotic Process Automation search terms

Moreover, the number of scientific publications that addressed Robotic Process Automation is quickly growing. In order to identify the current trend of scientific publications on the RPA, the authors of this paper conducted an extensive literature review, using available data from a number of five relevant scientific databases, including Web of Science, IEEE Xplore, Science Direct, Springer Link, ACM digital library. Fig. 2 shows the results regarding the annual number of RPA-related scientific papers, published between 2015 and 2019, as recorded in the considered databases. These results highlight the substantial increase in scientific publication of robotic process automation research over the study period.

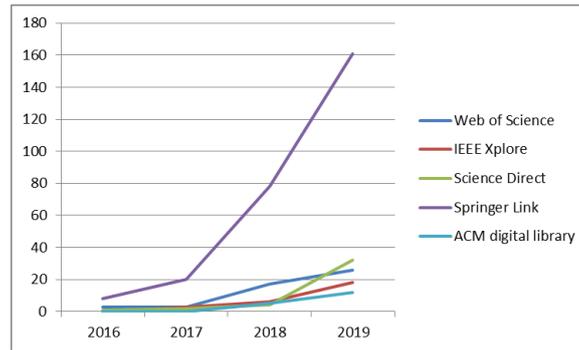


Fig. 2. The evolution of annual numbers of scientific articles related to the RPA

The limited scientific literature related to RPA offers widespread opportunities for future research and development.

2.3 RPA Platforms

Robotic process automation can offer multiple benefits to different fields, including higher education. Nevertheless, for a quick and easy development of RPA solutions, some could benefit from support of RPA platforms.

Currently, there are already numerous vendors on the market offering RPA software tools, including: Another Monday, Automai, Automation Anywhere, Blue Prism, Cognizant, Conduent, Contextor, Foxtrot, G1ANT, HelpSystems, Jacada, Kofax, Kryon, NICE Systems, OnviSource, OpenConnect, Pega, Redwood, Softomotive, UiPath, Verint, Visual Cron, WinAutomation, WorkFusion, etc. Furthermore, every year an increasing number of new tools enter the market, each of them having different characteristics and benefits. At this time, RPA platforms are still in the early stages of maturity. Thus, according to [5], "to achieve more widespread adoption, RPA needs to become 'smarter'".

Experts estimate that as RPA platforms continue to grow and develop, more impactful and powerful RPA-based applications can and will be created and deployed in order to help a variety of workers from different domains, including higher education.

3. Applications of RPA in higher education context

Given this understanding of robotic process automation, what are potential areas of RPA applications in higher education? To date, numerous applications, studies and reports show that RPA could prove incredibly useful across various domains. But, despite the evidence of multiple benefits of RPA, the impact that RPA has on the education sector is hardly considered.

When time, funds and resources are insufficient in educational institutions, RPA can facilitate the efficient use of all three. Thus, RPA applications in higher education can offer a wealth of potential opportunities to multiple stakeholders, such as students, teachers, researchers, admins, etc.

3.1 Use cases

We propose to address educational RPA solutions from the following different perspectives: a) student-oriented, b) teacher-oriented, and c) admin-oriented.

Fig. 3 presents some examples of how RPA can be used in higher education by students, teachers and administrative staffs alike. Regarding RPA applications in administrative support services, RPA could be used across almost all administrative departments of a university, including secretary, finance, human resources, etc.

3.1 Benefits of RPA applications in higher education

RPA application in higher education could bring multiple benefits to all stakeholders, such as:

- Drive down costs. RPA not only allows the cost reducing, but it also improves efficiency.
- Time saving. RPA solutions allow saving time for teachers and administrative staff, by leaving the most repetitive tasks to RPA-based applications. Thus, it will allow them to spend more time in interactions with students.



- Place focus on more valuable tasks. Saved time that would otherwise be squandered in performing various repetitive manual tasks, could be used by teachers and administrative staff that teachers to focus more on creative work.
- Increased management capabilities. RPA allows higher education institutions to better manage operations and processes. It also allows the generation of critical reports for analysis and audit purpose.
- Improved student and staff experience. Reducing repetitive paper-based activities will allow academic staff to be able to focus on creative activities, etc.

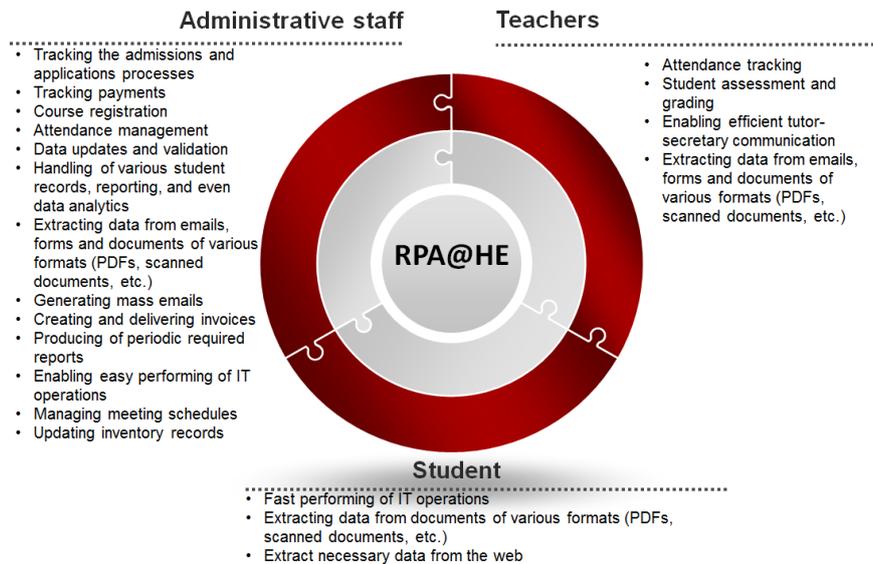


Fig. 3. Use cases of RPA in higher education

4. Future Work

Although RPA is currently used in various domains, implementation to its full potential is a real challenge. Worldwide, the potential of RPA in educational institutions is still being explored.

According to various scientific papers and international studies, “artificial intelligence (AI) applications in education are on the rise and have received a lot of attention in the last couple of years” [7].

In order to provide better products for complex processes, a solution aims to empower robotic process automation with Artificial Intelligence (AI), the next stage within the development of process automation being viewed as Intelligent Process Automation (IPA).

According to [8], intelligent process automation represents “a preconfigured software instance that combines business rules, experience-based context determination logic, and decision criteria to initiate and execute multiple interrelated human and automated processes in a dynamic context. The goal is to complete the execution of a combination of processes, activities, and tasks in one or more unrelated software systems that deliver a result or service with minimal or no human intervention”. Thus, adding machine learning capabilities could enable intelligence-requiring tasks such as adaptation, self-learning, self-correction, etc. to be performed.

5. Conclusion

This paper explores the adoption of RPA technology within higher education. Although by implementing RPA applications, educational institutions can see very quickly the benefits that they bring to teachers, students, researchers, and admins, however, many educational institutions are slow in implementing solutions based on this technology. This paper offers a perspective of the potential scale of RPA technology within higher education institutions in order to make them more functional and efficient. RPA platforms had and will have an important role in the development of RPA-based applications. Currently, there are many RPA platforms available, some of them being presented in this paper. Anyway, choosing the most appropriate platform to use could be a real challenge and a comparative study based on relevant factors is needed. In order to address RPA in the context of higher education, we considered different possible beneficiaries of this technology and we presented only several use cases, but some with great value and certain benefits. Notwithstanding, further



potential RPA applications are vast. In order to take advantage of the opportunities that RPA can bring in higher education, several obstacles should be overcome.

References

- [1] Aguirre, S. & Rodriguez, A. Automation of a business process using robotic process automation (RPA): A case study. in Workshop on Engineering Applications 65–71. (2017).
- [2] Joseph, L., Le Clair, C., O'Donnell, G., Sharma, A., Dangi, S., Nagel, B., The RPA Services Market Will Grow To Reach \$12 Billion By 2023. Despite Growth, Scale Remains Elusive For Enterprises, Forrester (2019).
- [3] Spector, Hannah. "Bureaucratization, education and the meanings of responsibility." Curriculum Inquiry 48, no. 5 (2018): 503-520.
- [4] The State of Logistics Technology Report, EFT Supply Chain & Logistics Business Intelligence, Eyefortransport Ltd, UK (2020).
- [5] van der Aalst, W. M., Bichler, M. & Heinzl, A. Robotic process automation. Springer. Business & Information Systems Engineering, 60(4), 269–272. <https://doi.org/10.1007/s12599-018-0542-4>. (2018).
- [6] What is Robotic Process Automation?, Available at: <https://irpaai.com/what-is-robotic-process-automation/>, Accessed February 4, 2020.
- [7] Zawacki-Richter, Olaf, Victoria I. Marín, Melissa Bond, and Franziska Gouverneur. "Systematic review of research on artificial intelligence applications in higher education—where are the educators?." International Journal of Educational Technology in Higher Education 16, no. 1 (2019): 39.
- [8] IEEE Guide for Terms and Concepts in Intelligent Process Automation, IEEE Corporate Advisory Group, in IEEE Std 2755-2017, vol., no., pp.1-16, 28 Sept. 2017, doi: 10.1109/IEEESTD.2017.8070671. (2017)