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Research Article

Digitized and Automated a University Process with Robotic Process Automation

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Abstract
Due to the changing student demographics and technological advances in research and teaching, both public and private higher education institutions offer services in an increasingly competitive environment. At the same time, the service quality expectations of the stakeholders continue to rise. For these reasons, technology solutions are needed for cost savings, efficiency gains, and improved service delivery. Like many other industries, higher education institutions have processes that can benefit from robotic process automation (RPA). RPA can be used to run student/staff jobs that manage back-office functions. It enables to ease the workload of their employees charged with doing these tasks and improve the user experience for students. This study examines an administrative process carried out at İzmir Bakırçay University. At least one administrative personnel assigned for the business process at the beginning of the research. The process consists of repetitive activities defined by specific rules. It was recommended to improve the process, considering the multitude of human errors and the length of the processing time. At the end of the study, the same process was completed within 16 minutes for 240 students without making mistakes, which means 96.97% of the time was saved. Moreover, 75% of personnel needs were reduced, and a 98.51% saving rate.

Keywords: Robotic process automation, Digital transformation, Process analysis and Digital robot

Robotik Süreç Otomasyonu ile Dijitalleştirilmiş ve Otomatikleştirilmiş Üniversite Süreci

Öz
Araştırma ve eğitimdeki teknolojik gelişmeler ve öğrencilerin sürekli değişen demografik özellikleri nedeniyle hem kamu hem de özel yükseköğretim kurumları artan rekabet ortamında hizmet sunmaktadırlar. Aynı zamanda paydaşların hizmet kalitesi beklentileri de yükselmeye devam etmektedir. Bu sebeplerden dolayı, maliyet tasarrufu, verimlilik kazanımları ve iyileştirilmiş hizmet sunumu için teknoloji çözümlerine ihtiyaç vardır. Diğer birçok sektör gibi yükseköğretim kurumlarının da robotik süreç otomasyonundan (RSO) yararlanabilecek süreçleri bulunmaktadır. RSO, yönetsel süreçler olan öğrenci/personel işlerinde kullanılabilir. Bu süreçleri yürütmekle görevli çalışanların iş yükünü hafifletmeyi ve öğrencilerin kullanıcı deneyimini iyileştirmeyi sağlar. Bu çalışma, İzmir Bakırçay Üniversitesi'nde yürütülen bir idari süreci incelemektedir. Bu sürecin başında iş süreci için en az bir idari personel görevlendirilir. Süreç, belirli kurallarla tanımlanan ve tekrarlayan faaliyetlerden oluşur. Bu çalışma ile çok sayıda insan hatası ve işlem süresinin uzunluğu göz önünde bulundurularak sürecin iyileştirilmesi önerilmiştir. Çalışma sonunda 240 öğrenci için aynı işlem 16 dakikada hatasız tamamlanarak %96,97 oranında zaman tasarrufu sağlanmıştır. Ayrıca personel ihtiyacı %75 azaltılmış ve %98,51 tasarruf oranı sağlanmıştır.

Anahtar Kelimeler: Robotik süreç otomasyonu, Dijital dönüşüm, Süreç analizi ve Dijital robot

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1. Introduction

According to the [8], Robotic Process Automation (RPA) is a technology application that enables to execute operations in existing applications, select data, interpret, manipulate, and communicate with other digital systems with computer software or a digital "robot" configuration in the company.

RPA is not only the fastest way to digital transformation but also the most efficient way for organizations to increase their operational efficiency [16]. RPA robots can collect data, run applications, trigger responses, make decisions based on the defined rules, and interact with other systems [9]. It is primarily used to automate highly manual, repetitive, rule-based procedures with low exception rates and standard electronic readable input [2]. Like a human workforce, RPA solutions can be thought of as a virtual robotic workforce whose operational management is handled by the pipeline (supported only by IT). It combines well-understood technical skills with the ability to swiftly understand business processes in terms of inputs, outputs, and decision points while developing a RPA project. RPA provides firms with improved process documentation, lower error rates, and better report quality in addition to cost reductions [10].

RPA, which allows for the easy completion of repetitive and complicated processes, can also be used in university processes. Performing repetitive work by the personnel in the units causes time and cost losses. Furthermore, human-caused mistakes might obstruct effective process management. Including RPA in university processes and executing relevant tasks by robots can reduce human-induced errors while also saving time and cost [13]. This study focuses on the use of RPA in university processes. The study aims to digitize and automate a process at İzmir Bakırçay University. Students require the internship obligation document prepared by the departments. The problem is that the preparation process of the internship obligation document is regularly done for around 240 students in the Faculty of Engineering in each semester, and it wastes time and resources. As part of the process, the internship obligation document, which is a work that is regularly repeated and demands labor, was digitalized and automatically completed, signed, and delivered to the relevant student. Thus, it will be possible to save time and cost, especially in the repetitive operations at the operational level. The motivation of this study is to use the limited human resources of the university more efficiently and to ensure that repeated tasks may be completed more quickly and autonomously. This study achieved 75% of labour force, 96.67% of time savings and 98.51% of saving rate.

The rest of the article begins by explaining the studies in Section 2 and revealing the connections between them. The flow chart of the study is presented in Section 3, and all steps are explained in detail. Section 4 gives the results of the RPA implementation and discusses them. Finally, Section 5 concludes the study.

RPA tools are designed to relieve employees of the burden of repetitive and/or uncomplicated activities in a wide range of areas [1]. Each sector has its own set of processes. The automation of internal administrative procedures related to the delivery of public services is highlighted as part of the progression toward a more digitized, efficient, and thriving local government. However, this progress is frequently founded on unrealistic expectations about digital technology' revolutionary ability [11]. RPA seems to have the potential to benefit municipalities by performing organized activities and decreasing the need for workers to undertake repetitive and monotonous work, hence reducing cost and reducing lead times [12,14]. A study of federal and state agencies found [6]:

- RPA has already been embraced by 65% of federal agencies and 41% of state agencies to facilitate work.
- RPA is viewed as a building block for exploiting AI and ML capabilities by 61% of federal agencies and 49% of state agencies.
- 26% of agencies have 51-100 robots deployed, while 15% have 101-200 robots deployed.
- RPA success is measured by government agencies by:
- Increased speed of service delivery (46%)
- Cost avoidance/savings (41%)
- Reduction in data processing errors (37%)
- RPA was expected to save 5,000 to 50,000 hours of annual work time by 34% of respondents.

According to the 2021 Gartner Digital Transformation Divergence Across Government Sectors Survey [7], 19% of government respondents had already used RPA, with another 33% planning to do so in the next two years. The popularity of RPA stems mainly from the operational efficiency it provides and its ability to bring benefits fast and its application in automating old system activities.

There are various examples of the applications of RPA in public institutions. In their study, [18] focused on the methodology of RPA in administrative business processes. The usage of RPA in public administration administrative processes is investigated using the example of subject accreditation for scientific and technical activities. Through the introduction of elements of robotization business processes, the proposed methodology takes into account the unique characteristics of government processes, meets the needs of government agencies, and will significantly improve government agency performance and citizen satisfaction, as well as reduce costs in automating the functions and processes of government agencies. In another study, [3] conducted an in-depth case study at the Finnish government shared services center during their implementation of an Artificial Intelligence (AI) centric RPA technology. They used a theory of knowledge embodiment to explain how people and machines interact. They wanted to add to the theory by conceptualizing the knowledge embodying process in the future of work while expanding the knowledge embodiment theory. They contribute to practice by elucidating the consequences of how people and computers collaborate on knowledge work in organizations that have adopted AI technology.

RPA is increasingly being used to develop more modern, complex administrative operations in universities. [4] mentioned the use of RPA by an Australian university. According to the study, the institution reaped significant benefits from its RPA adoption. By automating student document uploads, the university was able to cut processing time in half, eliminate manual procedures, and reduce process touch points from 40 to one, saving the institution 1,330 hours of manual labor per year while also enhancing service time and eliminating mistakes. [17] explored the adoption of RPA technology within higher education. This article provided an overview of the possibilities for RPA technology to improve the functionality and efficiency of higher education institutions. They studied numerous prospective beneficiaries of this technology to address RPA in the context of higher education. They offered just a few use cases, but some with tremendous value and specific benefits. [15] focused on automating the entry of student information into the University portal. They claim that this robotization will help the organization use fewer human resources for such automated measures, resulting in successful, efficient, and error-free investigations.

Although the benefits of using RPA technology in public institutions have been clearly demonstrated in the literature, there are relatively few studies on the issue. This study aims to contribute to the literature by creating and discussing the benefits of an example digital robot at the university.

2. Material and Methods

RPA consists of software of robots that work instead of humans, without human involvement. From the development of robots to their implementation, the robot must pass through several stages in the automation process. Figure 1 shows the flowchart representation of the methodology used in this study. RPA studies are generally carried out using the methodology described below, consisting of six steps [5].

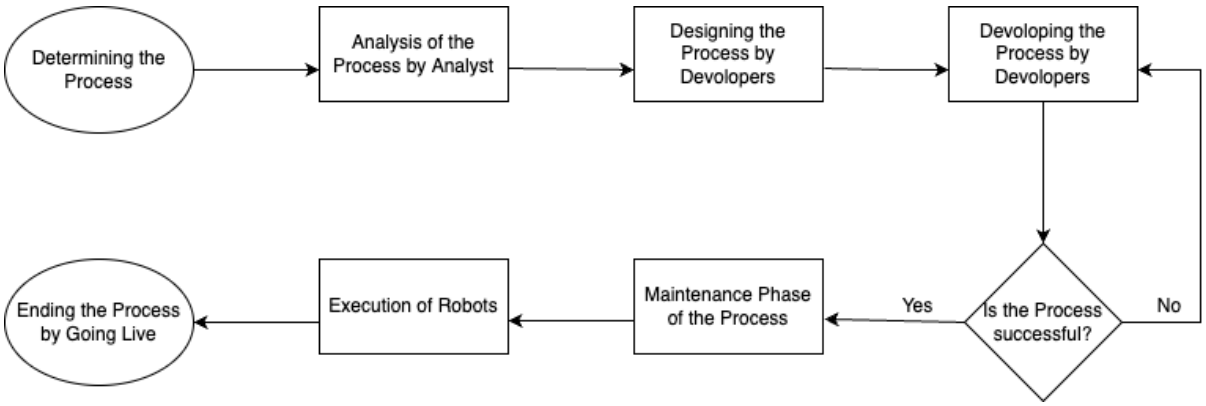

Figure 1. Flowchart of RPA methodology

2.1 Analysis Phase:

The RPA life cycle begins with the analysis phase. The customer's requirements are examined at this point. The next step is to determine whether or not the process can be automated. If the process can be automated, the RPA analyst team and the developer team collaborate to examine the process.

2.2 Design Phase:

Automation of tasks occurs during the design phase. The RPA development team collaborates with the analyst team to prepare a "Process Description Document" (PDD) that contains details about the entire process. The analyst team then creates a flowchart to visualize the process flow. After the design is complete, the RPA tool is used to initiate the development of the RPA software and automate the tasks. RPA employs both human path and robot path ideas. The human path is the step-by-step processing of all procedures using just human power and no robots. The user completes all the job's steps without any assistance. Robot path is the automatic execution of steps defined by a user.

2.3 Development Phase:

With the help of the PDD tool, the developer constructs bots-commands to automate processes. The created robots can run on the entire operating system without any restrictions.

2.4 Control and Monitoring Phase:

The RPA development team tests the robots developed at this step. If the tests fail, the robots are sent to development to fix bugs found during testing. The next phase begins after the test phase has been completed.

2.5 Support and Maintenance Phase:

If software errors are discovered after the control and monitoring phase, the process is sent back to the RPA development and testing team. The development team reanalyzes the robots and works to fix the issues.

2.6 Execution of Robots:

Robots are examined to ensure that the implementation fits the requirements. At this stage, the software is sent back to the testing and development team to correct any errors—the robots whose fixed errors are finally run in the production system.

3. Results and Discussion

RPA applications can be applied in various areas within universities, particularly in operational procedures. It is feasible to reduce the requirement for personnel and use it more efficiently in repetitive routine applications thanks to RPA applications. In this study, as an example case, a robot was developed that automatically generates the internship obligation document required

by the students studying at İzmir Bakırçay University who must complete an internship to graduate. This job is regularly done for around 240 students in four departments in each semester, and it wastes time and resources. Figure 2 presents the human path of the process. If this task is to be completed utilizing just human resources and no robots, the steps in Figure 2 must be followed step by step. First, an excel file should be opened. Then, the word document should be opened and filled in all necessary places on the document until all students' documents are completed. Then, the documents should be sent to the students one by one by e-mail.

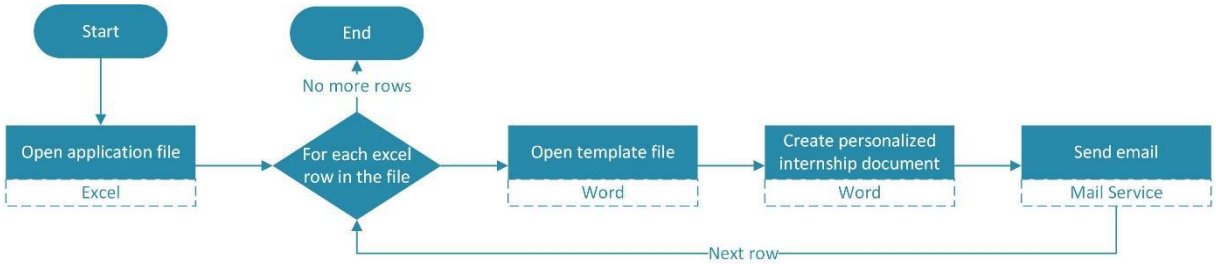

Figure 2. Human path of the selected process

The study aims to use RPA to avoid wasting time and resources. Figure 3 shows the robot path that summarizes the followed flow.

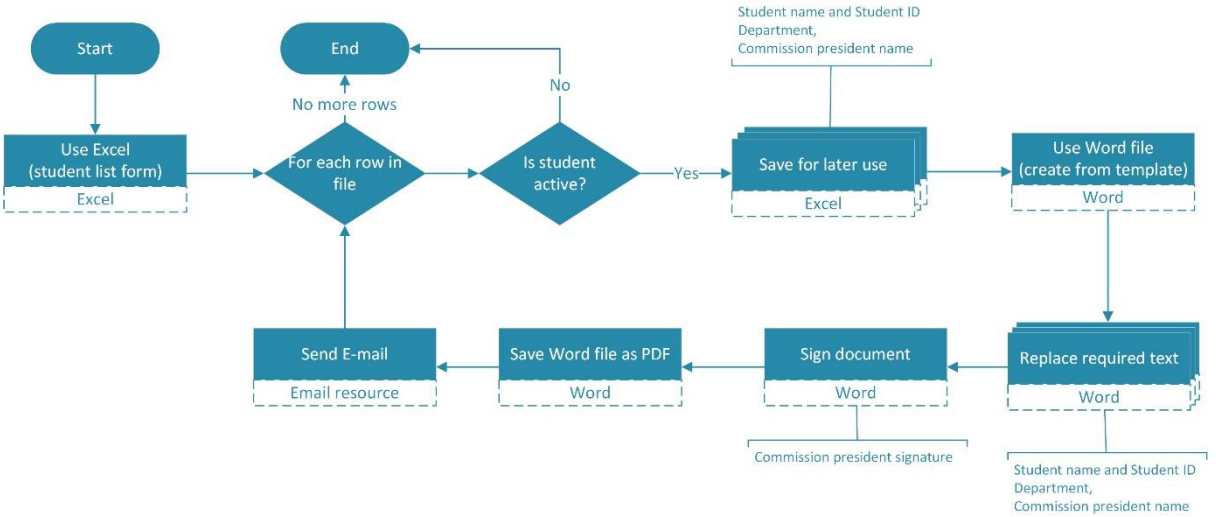

Figure 3. Robot path of the selected process

During the development of the robot, the UiPath StudioX application was used. Currently, there is an excel file containing the details of the students (Student Number, Department, Name and Surname, Student Status, Internship Commission President) and a draft of the internship obligation document. The study's goal is to automatically transfer each student's details from excel to the internship obligation document one by one. Once the robot is designed, the excel file containing the student's information is automatically opened, and the student's status is checked. If the student status is active, the robot transfers the Student Number, Department, Name, Surname, and Internship Commission President sections of the excel sheet to each student's internship obligation document. The chairman of the commission's signature, which

is saved as a picture file, is also added as a picture to the relevant field, and each student's signed documents are saved as PDF. The process is completed by sending the documents saved as PDFs to the students' email address. Since the automated process is rule-based, consists of digital and structured data, and is a static process that will not change much, it was deemed appropriate to be done by the robot. The robot can quickly complete a process that requires a person to spend 2 minutes for each student (totally 2*240=480 minutes), especially given the university's high student density, in minutes and without human assistance. With RPA, the work of four people (one from each of the four departments) who had been working for more than a day was finished in 16 minutes with only one person. 75% of personnel and 96.67% of the time were saved in total.

4. Conclusion

RPA is a type of automation that may be repeated continuously, is prone to human error, and is employed in tasks that could result in avoidable labor loss. It provides secure and fast transactions in data cleaning, data extraction, and data transfer procedures. In addition to all of this, RPA technology allows employees' performance and productivity to improve and cost savings. Although RPA is used in various areas, the automatic internship obligation document is created with an example study, which focuses on its usage in universities. It is usually an iterative and static procedure that involves a considerable number of people and requires the production of hundreds of documents at once. Considering these process features, it is very suitable for RPA technology, as it provides savings in terms of both labor, cost, and time.

The automatic creation of the internship obligation document, a routine job that must be completed every semester for about one thousand students, was completed and made available at İzmir Bakırçay University. In this approach, a process involving many people, including students, civil servants, and the heads of the internship commission, that would generally take four and a half days to complete can be finished in 16 minutes. The entire process takes place in a digital environment, and once done, the required document is produced and sent to the students’ email addresses. The workforce loss of all people involved in the process is reduced by 97%, and the risk of human error is eliminated. Table 1 summarizes the values in the current situation where the works are conducted without the use of a robot, and Table 2 summarizes the improved values seen with the developed robot.

Table 1. Current situation analysis

Metrics	**Values**
Frequency	Once per semester
Repetition	240
Cycle time (min)	2
Duration (min)	480
Number of employees	4
Cost (TL)	80600

Table 2. Improved situation analysis

Metrics	Values	Improvement
Frequency	Once per semester	
Repetition	240	
Cycle time (min)	0.06	96.67%
Duration (min)	16	
Number of employees	1	75%
Cost (TL)	1200	98.51%

In terms of universities, there are numerous RPA-related works available. In future studies, the development of robots related to other jobs can be allowed the university to save money on labor and other expenses. Considering RPA's contribution to digitalization universities are expected to benefit significantly from a valuable automation system.

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Ethics in Publishing

There are no ethical issues regarding the publication of this study.

Author Contributions

All authors contributed equally.

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