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Harnessing AI for Business Process Automation in Educational Institutions

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ABSTRACT

Business Process Automation (BPA) has been gaining increasing importance in managing companies and organisations, particularly in educational institutions, due to its potential to reduce the time required for routine tasks significantly. This allows employees to focus on more creative and strategic activities. BPA can be applied across various business areas and is suitable for organisations in any sector. The successful transformation of business processes through BPA is highly anticipated. By leveraging Artificial Intelligence (AI), educational institutions can automate administrative and operational tasks, such as admissions, student record management, and communication channels, enhancing efficiency and accuracy. The research explores various AI technologies applicable to BPA, including machine learning algorithms, natural language processing, and robotic process automation, which can automate complex tasks that traditionally require human intervention. The study also identifies key factors influencing the successful implementation of BPA and the ethical considerations of it. This study offers valuable insights for educational institutions aiming to leverage AI for BPA, ultimately improving operational efficiency and overall effectiveness.

Keywords: Business Process Automation (BPA), Artificial Intelligence (AI), Digital Transformation, Administrative Efficiency, Indian Education system

1. Introduction

In today's fast-paced business world, efficiency is key. That's where business process automation (BPA) comes in. When it comes to institutions such as educational institutions, they are under pressure to adapt and innovate in order to meet the evolving technological advancement needs of students, faculty, and staff. Administrative processes, in particular, have a lot of potential to be made more efficient as they often involve repetitive tasks that consume valuable time and resources. Traditionally, educational institutions have utilised various business process automation tools, such as scheduling software for basic data entry of students, faculties and administrative solutions. While these methods have provided some efficiency, they are often limited in scope and

struggle to address modern administrative tasks' growing complexities and scale. These traditional tools can manage simple, repetitive tasks but fall short when dealing with dynamic and multifaceted processes. This is where artificial intelligence (AI) presents a transformative opportunity. By leveraging artificial intelligence (AI) technologies, educational institutions have the opportunity to automate these processes, such as scheduling, grading, and attendance tracking, which not only improves overall efficiency by streamlining workflows and reducing manual effort but also leads to cost reductions through minimised human error and optimised resource allocation. Also, by freeing up educators and staff from these repetitive tasks, these AI empowers them to focus on more strategic initiatives, such as personalised learning experiences, in-depth student support, and curriculum development.

Digital Transformation is an area of interest for organisations of all sizes and sectors, and its growth is largely after the global pandemic context (COVID-19) in the present past. Companies and organisations reinvented their work paradigm to continue providing services and products to markets. Digital transformation can alter the organisation's value-creation process. Paschek et al. mentioned that business processes are combined with IT, which has become an important aspect of this business process automation (Paschek D, et al. 2016).

Administrative business process digitalisation can involve automation or simple, more careful management. Business processes (administrative) can be defined as a collection of related activities (events), resources, and decisions that involve roles (actors) that lead to a valuable output, fulfilling customer needs and implementing the strategic objectives of the organisation. Business processes are the arterial system in organisations, and inter-organizational structures are essential for any competitive advantage. Different performance dimensions characterise each process; for Denner et al., it can be done with costs, flexibility, quality, and time. Business Process Management (BPM) is essential for the constant improvement and study of the effectiveness and efficiency of an organisation. Institutions and large enterprises must use BPM as their use increases and add value to the business process (Denner, M. S. 2018). To a successful BPM project, Gabryelczyk and Roztocki described critical success factors like strategic alignment, project and change management, performance management, governance, methods, people, IT culture, and communication (Gabryelczyk, R., & Roztocki, N. 2018). BPM is crucial for automating business processes involving multiple participants and software systems to maintain competitiveness in the digital business lifecycle.

Robotic Process Automation (RPA), Artificial Intelligence, and Workflow Management/Business Process Management Systems are usually used in BPM and BPA. They complement each other. RPA complements BPM in many areas and vice versa but does not replace it. While BPM provides companies with actual knowledge about their business processes and workflows, RPA involves creating bots that mimic human interactions with information systems. This study explores how AI can be harnessed to streamline administrative processes in educational institutions.

What is Business Process Automation?

Business Process Automation (BPA) involves using technology to perform recurring organisational tasks or processes, replacing manual effort. A business process is a set of functions or activities that you carry out to achieve a specific outcome. It lets you standardise how your team works and ensures more consistent results. BPA aims to streamline business operations, reduce costs, increase efficiency, and improve accuracy and compliance. It encompasses a variety of technologies, such as robotic process automation (RPA), artificial intelligence (AI), and workflow management systems, which can handle a wide range of tasks, including data entry, scheduling, customer service, and document management. By automating the routine processes, BPA enhances productivity and job satisfaction. Also, BPA can improve data consistency and reduce the risk of human error, leading to higher-quality outcomes and better decision-making capabilities.

Educational institutions often struggle with the complexities of admissions, student record management, scheduling, and communication, where human errors can frequently occur. Introducing Business Process Automation (BPA) in educational institutions offers a solution by using technology to streamline these administrative and operational tasks, significantly boosting efficiency and accuracy. Automating routine processes helps educational institutions

reduce the need for manual effort and drastically cut down on errors. This shift allows administrative staff to devote more time to strategic, student-centred activities, ensuring operations run smoothly and adhere to regulatory standards. Educational institutions can improve their workflows by integrating BPA into their workflows, making them more efficient in addressing the needs of students, faculty, and staff. (SYDLE. n.d.)

Techniques used for Business Process Automation

Business Process Automation (BPA) leverages various technologies to efficiently and enhance the organisational processes. The following sections will explore some of the key techniques used in BPA and their specific applications in educational institutions:

- Natural Language Processing (NLP)
- Machine Learning (ML)
- Robotic Process Automation (RPA)
- Enterprise Resource Planning (ERP)
- Predictive Analytics

Natural Language Processing (NLP): Natural Language Processing (NLP) is an interdisciplinary field of Artificial Intelligence (AI), a form of technology that allows computers to give meaning to user inputs, such as human language and action. NLP can comprehend, interpret, and generate language at human parity. The journey unfolds with syntactic parsing, analysing the grammatical structure of sentences, and semantic analysis, extracting meaning and context. NLP advances its capabilities to comprehend the context of communication, allowing it to decode the finer points embedded in human language (MonkeyLearn. n.d.)

Machine learning (ML): Machine learning (ML) is a subset of artificial intelligence (AI) that involves using data and algorithms to enable systems to learn from experience, recognise patterns, and make decisions with minimal human intervention, continuously enhancing performance over time.

Robotic Process Automation (RPA): Robotic Process Automation (RPA) is a software technology developed with the help of Artificial Intelligence (AI) and machine learning. It designs robots (bots) that independently carry out simple day-to-day tasks without human interference. These tasks include calculations, record-keeping, addressing queries, and executing transactions.

Predictive Analytics: Predictive analytics is an advanced form of data analysis that aims to answer the question, "What might happen next?" It involves using data to anticipate future outcomes. This process uses data analysis, machine learning, artificial intelligence, and statistical models to identify patterns that can predict future behaviours. (Google Cloud. N.d.). By applying historical and current data, organisations can accurately forecast trends and behaviours over various timeframes, ranging from seconds to years.

Enterprise Resource Planning (ERP): Enterprise Resource Planning (ERP) is an integrated software platform that combines various business processes and functions into a single comprehensive system. This technology is designed to streamline and automate core business activities such as finance, human resources, supply chain management, and customer relationship management, ensuring that all departments can share data and collaborate more efficiently.

The implementation of ERP systems involves several critical stages. First, the Planning Phase involves analysing business needs, defining objectives, and selecting the appropriate ERP software. Next, the Design Phase includes customising the system to align with business processes and workflows. The Development Phase follows, where the system is configured

and necessary customisations are made. In the Testing Phase, the ERP system undergoes rigorous testing to identify and fix any issues before going live. Finally, the Deployment Phase sees the system being rolled out across the organisation, with ongoing Maintenance and Support to ensure its continued optimal performance.

Business Process Automation in Education Institutions

In today's rapidly evolving educational landscape, imparting knowledge remains paramount; institutions increasingly recognise the need for streamlined operations and efficient resource allocation (Planergy. N.d.). This is where Business Process Management (BP.M) steps in, offering a powerful framework to optimise administrative tasks and empower educators to focus on what matters most. Business Process Automation (BPA) emerges as a powerful framework to optimise administrative and pedagogical tasks within educational institutions. By integrating structured, well-defined management areas, such as pedagogical, administrative, and human resources management, BPA fosters a holistic, systemic perspective, enabling institutions to focus more effectively on their teaching initiatives. Educational institutions are increasingly adopting AI-driven Business Process Automation (BPA), with some key applications considered important among them.

- Admission Process Automation
- Financial aid processing
- Course scheduling and optimisation
- Personalized learning
- Administrative tasks
- Grading and assessment

Admissions Process Automation

Admissions teams at universities and higher education institutions face significant workloads due to the high volume of applications. By automating the admissions process, institutions can streamline tasks such as recording, assessing, and processing applications. This reduces the required manual effort, minimises errors, and ensures timely interactions with applicants and faculties. While front-end portals collect application data into a central database, many subsequent processes rely on manual data entry and email communication, which is time-consuming and inefficient. As application numbers rise and competition between institutions increases, automation has significant potential to enhance efficiency and streamline operations. There are some prime applications of automation as being:

· **Chatbots for FAQs:** As most common questions have standard answers, automating query handling can reduce the admissions team's workload and improve the applicant experience. Bot solutions can be integrated with various communication channels (e.g., WeChat, WhatsApp) and operate 24/7, providing instant responses to students. These bots can escalate chats to human operators when necessary. Trend analysis of received queries can help refine the system, reducing the need for human intervention.

· **Scoring of personal statements:** After assessing predicted grades, admissions teams spend significant time reading and scoring applicants' statements. AI-based software could expedite this process by providing an initial assessment and score, giving admissions officers a head start.

· **Automated data entry:** For admissions teams, entering data from one system to another is time-consuming and prone to errors. Automated solutions can transfer data between systems instantly and without errors.

· **De-duplication of applications:** Duplicate applicant identities can cause complications and take up considerable time for admissions teams. If an applicant applies again with a different

email address, most systems won't detect this and will create a new ID, requiring staff to intervene. Intelligent automated software can instantly identify and merge these duplicates, saving time and reducing errors.

Financial Aid Processing

The financial aid process involves evaluating, verifying, and processing thousands of applications annually. This creates a substantial workload for financial aid offices. By automating financial aid processing, educational institutions can enhance efficiency, reduce errors, and provide timely student support. Implementing BPA technologies such as machine learning for predictive analytics and automated communication systems ensures that resources are allocated effectively and processes are streamlined. Some implemented ML-based predictive analytics systems to forecast demand for financial aid and allocate resources accordingly. By accurately predicting student financial needs, the college has been able to optimise its budget for financial assistance and ensure that funds are distributed equitably. So, as the volume of applications and the demand for financial aid grow, automation has considerable potential to increase efficiency and streamline operations. Key applications of automation in financial aid processing include:

• **Customized Communication:** Business Process Automation (BPA) improves the financial aid office's capacity to offer personalised communication and support to students. Automated reminders, personalised financial aid recommendations, and real-time updates on application statuses enhance the overall student experience by ensuring timely and relevant interactions.

• **Renewals:** In financial aid processing, it is essential to notify students and relevant authorities when it is time to reapply for financial aid. Automated reminders can be sent to students via email or text message, informing them of upcoming reapplication deadlines. Financial aid staff are also alerted to ensure timely processing.

Course Scheduling Optimization

Course scheduling optimisation addresses the complex challenge of efficiently arranging courses, instructors, and students within a university setting. As universities expand, the number of courses, students, and faculty members increases, complicating the scheduling process. Effective course scheduling ensures that classes are assigned to suitable time slots and locations while considering constraints such as room capacities, instructor availability, and student course selections. This helps to explore techniques to enhance the genetic algorithm, a powerful optimisation tool, to tackle the course scheduling problem. By improving the genetic algorithm with coevolution, the scheduling process becomes more efficient, accommodating larger academic institutions' growing demands and ensuring optimal resource utilisation.

• **Optimized Time Management:** BPA scheduling assistants in educational institutions optimise time management by analysing patterns and institutional needs. They handle rescheduling conflicts and group tasks to minimise context-switching, enhancing operational efficiency and productivity.

Grading and assessment

The introduction of BPA grading marks a significant change in the grading process. Educators and institutions can revolutionise assessments and support student development by utilising BPA technology. BPA grading solutions offer a comprehensive and efficient method to streamline grading. These solutions automate the assessment of assignments and exams, saving educators valuable time. Furthermore, BPA grading improves accuracy, ensuring consistent and dependable evaluations. Integrating BPA solutions into the grading process transforms teaching practices, enabling educators to provide students with more targeted and meaningful feedback. By utilising BPA solutions, institutions can modernise their grading process and harness the full potential of technology in education.

Challenges and Considerations in Business Process Automation in educational Institutions

While AI-driven business process automation offers significant benefits, it also presents challenges and considerations that institutions must address:

• Data Privacy and Security: In implementing BPA, institutions must ensure that sensitive student and staff data is handled securely and in compliance with relevant regulations such as GDPR (General Data Protection Regulation)

• **Ethical Use of BPA:** Institutions must consider the ethical implications of BPA-driven automation, including issues related to bias, fairness, and transparency.

• **Change Management:** Implementing BPA-driven automation in educational institutions involves altering current processes, systems, and workflows. Stakeholders concerned about job displacement or loss of control may resist this.

• **Skills and Training:** Educational institutions must invest in training staff to effectively utilise BPA technologies and ensure they have the necessary skills and knowledge.

• **Dependence on Technology:** Relying too much on automated BPA systems in educational institutions can pose risks if the technology fails or experiences downtime.

Business Process Automation in Indian Education Institutions

Business Process Automation (BPA) is revolutionising the way educational institutions in India operate by streamlining administrative and academic processes, reducing manual workload, and enhancing overall efficiency. This transformation is pivotal for institutions aiming to stay competitive and deliver quality education.

• **System for Assessment, Accreditation, and Rating of Transparency and Holistic Education (SAMARTH)**

Samarth is a notable BPA initiative in Indian educational institutions. It is an ERP solution tailored specifically for higher education institutions in India, designed to automate various administrative and academic functions. In 2019, the Ministry of Education developed Samarth to enhance institutional efficiency through digital process integration. Samarth includes automated admissions, which streamline the application process from submission to final admission, reducing processing time and minimising errors. The Student Information System manages student data, including enrolment, academic records, and personal information, ensuring data accuracy and accessibility. Examination management is also automated, covering examinations' scheduling, conduct, and result processing, thereby improving accuracy and efficiency. Also, Samarth handles HR and payroll functions by managing employee records, payroll, leave, and other HR tasks, enhancing administrative efficiency. Financial management is another critical feature, as it streamlines accounting processes, including budgeting, expense tracking, and financial reporting.

• **National Academic Depository (NAD)**

The NAD is an initiative by the Government of India to facilitate the digital issuance, storage, access, and verification of academic awards issued by educational institutions. This platform automates academic records management, reducing administrative workload and enhancing the efficiency and reliability of document handling.

• **SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)**

SWAYAM is an online platform developed by the Ministry of Education, Government of India. It is designed to achieve the three main principles of education policy: access, equity, and quality. While its main function is to deliver educational content, it also involves significant process automation for course management, enrollment, and certification.

• **AISHE (All India Survey on Higher Education)**

AISHE conducts an annual web-based survey that collects data on various parameters such as teachers, student enrollment, programs, examination results, education finance, and infrastructure. Automating this data collection process helps in efficient data management and analysis, aiding policy-making and institutional planning.

• **ERP Solutions by Private Vendors**

Several educational institutions in India also use ERP solutions from private vendors such as TCS iON, Oracle PeopleSoft, and SAP ERP. These solutions automate various administrative

processes like admissions, fee management, timetable scheduling, attendance tracking, and examination management, thus enhancing operational efficiency.

Globally, many educational institutions are adopting AI and Business Process Automation (BPA) to streamline administrative and operational workflows. Though specifics are often confidential for security reasons, some universities disclose their use of technologies like chatbots for student services and personalised learning tools. Notable institutions include:

• **Staffordshire University**: Staffordshire University uses a chatbot named **Beacon**, which provides a digital assistant for students and offers personalized and responsive information.

• **Georgia State University (GSU)**: Georgia State University uses a chatbot named **Pounce** to assist with admissions, financial aid, class registration, campus resources and more.

• **University of California**: The University of California uses an AI-powered chatbot named Berkeley, which is available to help with inquiries from both students and prospective students.

• **Deakin University**: Deakin University uses a chatbot named **Genie**, which is available to help prospective students with any information they need

• **National Cheng Kung University**: NCKU is the first university to establish a **smart Campus Security Center** incorporating AI among universities in Taiwan.

• **Virginia Commonwealth University**: VCU uses an automated grading tool called **Gradescope** to save time and automate parts of the review and feedback process.

• **Carnegie Mellon University**: CMU has a personalised learning tool (ITS) named Skillometer, a visual graph of the learner's success in each of the monitored skills related to solving algebra problems.

Conclusion

Business Process Automation (BPA) is a critical enabler for educational institutions aiming to enhance operational efficiency and accuracy. By automating routine tasks such as admissions, student record management, scheduling, and communication, BPA significantly reduces manual effort and human error. This allows administrative staff to focus on strategic, student-centred activities, thereby improving the overall quality of education and service delivery. By leveraging AI technologies, including machine learning, natural language processing, and robotic process automation, EPR and BPA can handle complex tasks traditionally requiring human intervention. This integration streamlines operations, provides substantial cost savings, and ensures compliance with regulatory standards. Adopting BPA and effective BPM practices gives educational institutions a powerful framework to improve operational efficiency, reduce costs, and enhance overall effectiveness. Embracing these technologies and methodologies is crucial for institutions aiming to stay competitive and provide high-quality education in a rapidly evolving landscape.

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