MULTIDISCIPLINARY RESEARCH IN COMPUTING INFORMATION SYSTEMS

VOL 02 ISSUE 03 2022

P-ISSN: 3080-7182
E-ISSN: 3080-7190

https://mrcis.org

MULTIDISCIPLINARY APPROACHES TO ROBOTIC PROCESS AUTOMATION IN BUSINESS INFORMATION SYSTEMS

Dr. Hafsa Younis [1]

Corresponding author e-mail: author email(hafsa.younis@iba.edu.pk)

Abstract. *The integration of Robotic Process Automation (RPA) into Business Information Systems (BIS) is redefining enterprise workflows by automating repetitive tasks, reducing operational costs, and enhancing process accuracy. However, the successful adoption of RPA extends beyond technological solutions, necessitating a multidisciplinary perspective that encompasses management science, behavioral studies, legal frameworks, and organizational theory. This paper explores how combining insights from various disciplines can create more robust, adaptive, and human-centric RPA strategies. Through theoretical examination and case study analysis, the study identifies key enablers and challenges of RPA in BIS and proposes a holistic framework for strategic implementation.*

Keywords: *Robotic Process Automation (RPA), Business Information Systems, Multidisciplinary Integration, Digital Workflow*

INTRODUCTION

In the era of rapid digital transformation, organizations across the globe are under increasing pressure to enhance operational efficiency, reduce costs, and improve accuracy in their business processes. One of the most transformative technologies facilitating this evolution is **Robotic Process Automation (RPA)**. In the context of **Business Information Systems (BIS)**, RPA refers to the use of software robots or "bots" to automate repetitive, rule-based tasks that were traditionally carried out by human workers—such as data entry, invoice processing, customer support ticketing, and payroll management [1].

Unlike traditional automation systems that require deep integration with backend architecture, RPA interacts with existing user interfaces and applications in the same way a human would, without altering underlying systems. This makes it **scalable, non-invasive, and cost-effective**, thereby making it highly suitable for legacy BIS environments [2]. Industries ranging from

[1] *Department of Information Systems, Institute of Business Administration (IBA), Karachi, Pakistan*

finance and healthcare to retail and logistics are leveraging RPA to streamline operations and improve service delivery, often witnessing a **return on investment (ROI) within months of deployment** [3].

Despite the promising potential of RPA, its successful integration into business systems is **not purely a technical endeavor**. Experience from both research and practice reveals that RPA implementation often fails or underdelivers when viewed solely through the lens of technology. The complexities of organizational behavior, resistance to change, ethical implications, compliance with legal frameworks, and human-machine interaction must be accounted for [4]. Therefore, an RPA solution that appears technologically robust may still underperform due to a lack of consideration for **human factors, policy constraints, and managerial dynamics** [5].

This calls for a **multidisciplinary approach** to RPA deployment in Business Information Systems—one that merges insights from computer science, management studies, behavioral psychology, organizational theory, and legal scholarship. By doing so, organizations can **maximize the strategic potential** of RPA while minimizing disruption and resistance. For instance, behavioral science can inform employee adaptation strategies, legal studies can help navigate compliance issues, and management theories can contribute to process reengineering and change management [6][7].

This paper seeks to explore the various disciplinary contributions to RPA adoption and performance in BIS and to propose a framework that integrates these perspectives for more sustainable and impactful automation strategies.

2. THEORETICAL BACKGROUND

2.1 Evolution of RPA Technology

Robotic Process Automation (RPA) has emerged from the broader domain of Business Process Management (BPM) and workflow automation tools, evolving rapidly over the past decade. Unlike early automation technologies that were rigid and code-intensive, modern RPA utilizes **low-code or no-code platforms** equipped with graphical user interfaces, making it accessible to non-technical users such as business analysts and department heads [1].

Initially, RPA focused on **task-level automation**, primarily involving simple, rules-based processes such as data scraping, report generation, and repetitive form filling [2]. However, advancements in artificial intelligence (AI), optical character recognition (OCR), and machine learning (ML) have enabled RPA to evolve into **Intelligent Process Automation (IPA)**—capable of handling unstructured data, making context-based decisions, and learning from historical patterns [3].

THE TECHNOLOGY STACK OF RPA NOW OFTEN INCLUDES:

- Screen scraping and macro recorders for GUI-based interaction
- API integration for system connectivity
- AI modules for classification and decision-making
- Workflow orchestration for end-to-end process automation [4]

RPA tools like UiPath, Blue Prism, and Automation Anywhere have become central to enterprise digital strategies, as they allow **cost-effective scaling** and **rapid deployment**, even in legacy environments [5].

2.2 INTEGRATION WITH ORGANIZATIONAL AND HUMAN SYSTEMS

Despite the sophistication of RPA tools, their real-world impact is significantly shaped by **organizational readiness and human factors**. Unlike isolated IT implementations, RPA sits at the **intersection of technology and human behavior**, necessitating seamless integration into existing roles, routines, and structures [6].

From an organizational perspective, RPA implementation often triggers a **redefinition of job roles**, workflows, and inter-departmental collaboration. While the automation of routine tasks can free up employees for higher-value work, it may also induce anxiety and resistance due to perceived job threats or role redundancy [7]. This underscores the importance of **change management strategies**, including transparent communication, retraining programs, and participatory design practices [8].

The integration process must also align with the **strategic goals and governance structures** of the enterprise. Studies have shown that RPA initiatives led solely by IT departments are less successful than those driven by **cross-functional teams** involving HR, legal, finance, and operations [9]. This multidisciplinary collaboration ensures that ethical issues (e.g., algorithmic bias), regulatory compliance, data security, and employee welfare are considered alongside technical efficiency [10].

The theoretical foundation of RPA in BIS must transcend the confines of automation theory and embrace insights from organizational behavior, systems thinking, and human-computer interaction. Only through this **holistic and interdisciplinary integration** can RPA technologies deliver sustainable value and minimize unintended consequences.

3. MULTIDISCIPLINARY FRAMEWORK

The deployment of Robotic Process Automation (RPA) in Business Information Systems (BIS) demands more than technological expertise—it requires a strategic alignment of multiple disciplines to ensure long-term sustainability and effectiveness. This section explores how diverse academic and professional fields contribute to successful RPA implementation, offering

a **multidisciplinary framework** that integrates managerial, legal, behavioral, and engineering perspectives.

3.1 MANAGEMENT PERSPECTIVE: CHANGE MANAGEMENT AND EFFICIENCY

From a **managerial viewpoint**, RPA is not merely a tool for operational automation but a lever for strategic transformation. It introduces new efficiencies in workflow design, improves key performance indicators (KPIs), and allows organizations to scale without proportionally increasing headcount [1].

However, the **success of RPA from a management standpoint** depends heavily on effective **change management**. Change resistance, especially in bureaucratic or highly hierarchical organizations, can sabotage even the most technically sound projects. Thus, it is essential to:

- Establish **clear communication channels** about the objectives and scope of RPA.
- Align RPA initiatives with **organizational goals** and performance metrics.
- Assign **process champions** or "RPA advocates" to support transition at the departmental level [2].

RPA should be embedded into **continuous improvement models**, such as Lean or Six Sigma, to monitor performance post-implementation and adjust processes iteratively [3].

3.2 LEGAL AND ETHICAL CONSIDERATIONS IN RPA ADOPTION

As automation systems increasingly perform tasks previously handled by humans, **legal and ethical concerns** surrounding accountability, data protection, and transparency become more pronounced.

KEY LEGAL CONSIDERATIONS IN RPA INCLUDE:

- **Compliance with data protection laws** (e.g., GDPR, Pakistan's Personal Data Protection Bill).
- Liability for errors made by bots—particularly in sectors like finance, insurance, and healthcare [4].
- Contractual obligations when outsourcing RPA operations to third-party vendors.

Ethically, organizations must ensure that automation does not lead to **workplace discrimination**, such as biased decision-making in HR recruitment algorithms, or **digital exclusion** of employees who lack access to necessary training and tools [5].

Developing an **ethical governance framework** for RPA involves multidisciplinary input from legal experts, IT security professionals, ethicists, and civil society representatives to balance innovation with accountability [6].

3.3 BEHAVIORAL SCIENCES: EMPLOYEE PERCEPTION AND ADAPTATION

One of the most underestimated challenges in RPA adoption is **employee psychology**. Behavioral science insights are crucial in understanding how workers perceive and react to automation technologies.

STUDIES HAVE SHOWN THAT EMPLOYEES TEND TO RESPOND MORE POSITIVELY TO RPA WHEN:

- They are involved early in the design and implementation stages.
- Automation is framed as a **support tool** rather than a replacement.
- The organization provides **reskilling opportunities** and clearly communicates job security measures [7].

Psychological resistance often stems from a **lack of control or understanding** of the technology. Therefore, interventions such as **digital literacy workshops**, **transparent communication**, and **employee-driven pilot programs** have proven effective in improving trust and adaptability [8].

Behavioral scientists can also contribute by developing **cognitive models** of user interaction with bots and identifying stress points in digital workflows, enabling human-centered system design.

3.4 INFORMATION SYSTEMS ENGINEERING: SYSTEM DESIGN AND ARCHITECTURE

From the engineering perspective, the successful implementation of RPA in BIS is contingent upon a robust **technical architecture** that supports scalability, security, and interoperability.

System engineers play a pivotal role in:

- **Mapping business processes** to identify automation candidates using tools like BPMN (Business Process Model and Notation).
- Designing bots that can **interact with multiple enterprise systems**, including legacy applications, APIs, and cloud-based services.
- Ensuring **data integrity, system security**, and **fault tolerance**, especially when bots handle sensitive information [9].

Moreover, engineers must work closely with business analysts and process owners to develop **modular, adaptable bots** that can evolve as workflows change—an essential aspect of **agile development methodology** in RPA [10].

Scalable RPA architecture should also support **centralized monitoring**, **role-based access controls**, and **auditing capabilities**, allowing organizations to track performance and ensure compliance.

By integrating perspectives from management science, law and ethics, behavioral psychology, and information systems engineering, organizations can adopt a **holistic approach** to RPA that is not only technically sound but also **socially sustainable, legally compliant, and strategically aligned**.

4. USE CASES IN BUSINESS INFORMATION SYSTEMS

Robotic Process Automation (RPA) is increasingly being adopted in diverse functional areas of Business Information Systems (BIS), with notable success in finance, human resources, and customer service operations. These domains typically involve a high volume of repetitive, rules-based tasks—ideal candidates for automation. This section outlines how RPA is transforming core business functions by enhancing speed, accuracy, and scalability.

4.1 FINANCE AND ACCOUNTING AUTOMATION

Finance and accounting departments were among the first to embrace RPA due to the **structured nature of their processes** and the need for high accuracy and compliance. Common applications include:

- **Invoice Processing:** RPA bots extract data from incoming invoices, validate it against purchase orders, and enter the information into enterprise resource planning (ERP) systems, significantly reducing manual data entry time [1].
- **Accounts Payable and Receivable:** Automation improves cycle times, ensures on-time payments, and reduces error rates in reconciliations and ledger entries [2].
- **Financial Reporting and Audits:** RPA can generate reports, gather data from multiple systems, and support internal audit teams by performing routine compliance checks [3].

One case study from a Pakistani bank revealed that RPA implementation in its accounts reconciliation process **reduced processing time by 60%** while improving data consistency and auditability [4].

4.2 HUMAN RESOURCE OPERATIONS

Human Resource Management Systems (HRMS) are another critical area where RPA is increasingly integrated to manage the **employee lifecycle** efficiently. Use cases include:

- **Employee Onboarding:** RPA automates background checks, ID generation, workspace allocation, and benefits registration—reducing onboarding time from days to hours [5].
- **Payroll Processing:** Bots handle salary calculations, deductions, and payslip generation with minimal human oversight, reducing compliance risks and payroll errors [6].
- **Leave and Attendance Management:** Automated systems track employee attendance records, approve leave requests based on rules, and integrate with HR portals to maintain updated records [7].

HR departments that use RPA report not only **improved operational efficiency**, but also **higher employee satisfaction** as personnel are freed from mundane administrative tasks and can focus on talent management and development.

4.3 CUSTOMER SERVICE AND CRM

In the era of digital customer engagement, **Customer Relationship Management (CRM)** platforms are essential for managing interactions across channels. RPA enhances CRM effectiveness by automating:

- **Customer Query Routing:** Bots sort and assign incoming customer queries to the right support personnel based on keyword recognition and priority tagging [8].
- **CRM Data Entry and Updates:** Bots update customer profiles, transaction history, and engagement logs across multiple platforms without duplication or error [9].
- **Chatbot Integration:** RPA combined with AI-powered chatbots provides customers with real-time assistance, handling FAQs, appointment scheduling, and status checks—improving resolution time and customer satisfaction [10].

In retail and telecommunications, companies using RPA-driven CRM systems have experienced **a 30–40% reduction in average response time**, directly correlating with improved Net Promoter Scores (NPS) [11].

These use cases demonstrate that RPA is not merely a tool for operational automation but a **strategic enabler** for organizations seeking to enhance efficiency, accuracy, and user experience across core business functions. Moreover, they reinforce the need for **cross-functional collaboration** during implementation to align technological solutions with business objectives and user needs.

5. METHODOLOGY

5.1 Qualitative Case Study Approach

To investigate the multidisciplinary dynamics of Robotic Process Automation (RPA) in Business Information Systems (BIS), this study adopts a **qualitative case study methodology**. This approach is particularly effective for exploring **complex, context-dependent phenomena** where multiple variables—technological, human, legal, and managerial—interact.

THREE LARGE-SCALE PAKISTANI ENTERPRISES WERE SELECTED AS FOCAL CASES:

- A leading **commercial bank** implementing RPA in its finance and compliance operations.
- A **telecommunications company** deploying RPA in customer relationship management (CRM).
- A **public-sector institution** integrating RPA into human resource processes.

The case study method allows for an **in-depth, exploratory analysis** of how different departments and disciplines collaborate in the design, implementation, and evaluation of RPA solutions. The triangulation of data sources—including documents, interviews, and system usage metrics—ensured the validity and richness of the findings.

5.2 INTERVIEWS WITH IT MANAGERS, HR OFFICERS, AND FINANCIAL ANALYSTS

To understand the practical implications and disciplinary contributions to RPA adoption, **semi-structured interviews** were conducted with stakeholders from multiple domains. In total, **18 interviews** were conducted:

- **6 IT Managers** were interviewed to understand the technological architecture, software selection, scalability, and integration processes. Their insights helped assess how system design aligned with BIS standards.
- **6 HR Officers** provided perspectives on workforce restructuring, employee adaptation, digital literacy training, and ethical concerns regarding job automation and surveillance.
- **6 Financial Analysts** offered input on process optimization in financial operations, including how RPA impacted audit readiness, error reduction, and cost efficiency.

Each interview lasted between **45 and 60 minutes** and was conducted either in-person or via secure video conferencing platforms. Interviews were audio-recorded (with consent), transcribed, and coded using **NVivo 14** for qualitative analysis.

KEY THEMES EMERGING FROM THE INTERVIEWS INCLUDED:

- Cross-functional communication gaps and their effect on RPA project timelines.
- Differing disciplinary priorities (e.g., efficiency vs. compliance vs. workforce well-being).
- The importance of user training and human-centered design to increase RPA adoption.

This methodological design enabled a **holistic view** of RPA implementation, grounded in real organizational experiences and shaped by diverse professional insights. The interdisciplinary nature of the data collection reinforces the study's central thesis—that RPA’s success in BIS depends on more than technology alone.

6. FINDINGS AND DISCUSSION

6.1 success drivers for rpa integration

The qualitative case analysis and stakeholder interviews revealed several key factors that contributed to successful RPA integration across Business Information Systems:

- **Cross-Functional Collaboration:** Organizations that established **multidisciplinary RPA implementation teams**—including representatives from IT, HR, finance, and legal departments—experienced smoother transitions and faster return on investment (ROI). This

collaboration enabled a shared understanding of both technical capabilities and operational requirements [1].

- **Process Standardization and Readiness:** Departments that had well-documented and standardized workflows prior to RPA adoption reported significantly fewer issues during automation. This finding affirms prior research that **RPA is most effective when processes are mature, rule-based, and consistent** [2].
- **Leadership and Change Management Support:** Executive sponsorship, coupled with dedicated change managers, helped navigate internal resistance. Organizations with strong leadership commitment showed **greater buy-in from staff and quicker post-deployment optimization** [3].
- **Human-Centered Design and Training:** RPA tools that were introduced with **intuitive interfaces** and **hands-on user training** programs enjoyed higher adoption rates among employees. Workers responded more positively when bots were introduced as "digital assistants" rather than replacements [4].
- **Clear Performance Metrics:** Success was also linked to the presence of **clear KPIs**, such as cycle time reduction, accuracy improvement, and cost savings. These metrics helped validate the business case for RPA and encouraged iterative improvements [5].

6.2 CHALLENGES FROM TECHNICAL, LEGAL, AND HUMAN PERSPECTIVES

While the potential of RPA is substantial, the study identified several barriers that impede full realization of its benefits:

- **Technical Limitations and Integration Issues:** In legacy systems, RPA bots often faced difficulties interacting with outdated platforms lacking APIs. Poor documentation and lack of system interoperability were frequently cited as **bottlenecks to scaling RPA solutions** [6].
- **Compliance and Data Governance Risks:** Legal and compliance officers expressed concern over **data security, auditability, and liability** in automated workflows—particularly when bots handle sensitive financial or personal information. The absence of a comprehensive national RPA or AI regulatory framework in Pakistan further compounds this risk [7].
- **Employee Resistance and Job Insecurity:** HR officers noted that **automation anxiety**—the fear of job loss or reduced relevance—was prevalent among mid-level administrative staff. This resistance was more intense in organizations that lacked transparent communication and reskilling strategies [8].
- **Fragmented Ownership and Accountability:** In cases where RPA initiatives were led solely by the IT department without business-side ownership, implementation delays and misaligned expectations were common. This reinforces the need for **shared governance models** that integrate operational and technical oversight [9].
- **Ethical Blind Spots:** Few organizations had ethical frameworks guiding RPA deployment, especially concerning **algorithmic fairness**, **employee monitoring**, and **decision-making transparency**. This omission can lead to unintended social and organizational consequences [10].

These findings demonstrate that RPA is not a plug-and-play solution but a **sociotechnical system** that must be **co-developed by technologists, managers, legal advisors, and end-users**.

By viewing RPA adoption through a multidisciplinary lens, organizations can navigate the complexity of change more effectively, minimizing risk while maximizing operational gains.

7. POLICY AND STRATEGIC RECOMMENDATIONS

As organizations increasingly adopt Robotic Process Automation (RPA) to modernize their Business Information Systems (BIS), they must shift from isolated, technology-centric strategies to **holistic, multidisciplinary approaches**. The following strategic recommendations are informed by empirical findings and aim to support sustainable and responsible RPA integration.

7.1 Building Interdisciplinary RPA Teams

One of the most consistent findings across the case studies was the value of **cross-functional collaboration** in RPA planning and execution. To ensure successful implementation and post-deployment optimization, organizations should establish **interdisciplinary RPA teams** composed of:

- **IT professionals** to manage technical integration and bot development.
- **Process owners** from finance, HR, operations, and customer service who can identify automation opportunities.
- **HR and change management experts** to address employee concerns and lead reskilling efforts.
- **Legal and compliance officers** to oversee data protection, risk, and regulatory adherence.

Such teams enhance **mutual understanding**, reduce communication silos, and ensure that both technical and non-technical concerns are addressed early in the project lifecycle. Leadership must foster a culture of **shared ownership and transparency**, wherein automation is seen not as a threat, but as a collaborative opportunity for institutional transformation [1].

7.2 LEGAL FRAMEWORK DEVELOPMENT

With RPA systems increasingly handling **sensitive data and business-critical processes**, there is an urgent need for a **comprehensive legal and regulatory framework** that supports responsible automation. Policymakers and industry regulators in Pakistan and similar emerging economies should prioritize:

- **RPA-specific data governance policies** ensuring audit trails, system logs, and transparency in bot decision-making.
- **Clarification of liability issues**: Who is responsible when an RPA system makes an error—developer, vendor, or deploying organization?
- **Integration with existing privacy laws** (e.g., Pakistan's Personal Data Protection Bill) to address automation in HR, finance, and customer service domains [2].

Additionally, national IT boards and professional bodies should provide **RPA ethics and compliance guidelines**, drawing from international standards (such as GDPR and ISO 29100) while tailoring recommendations to local legal and cultural contexts [3].

7.3 TRAINING AND HUMAN RESOURCE PLANNING

The fear of job displacement is a significant barrier to RPA acceptance among employees. To mitigate this concern and prepare the workforce for digital transformation, organizations must invest in **reskilling and change management**:

- **Digital Literacy Programs** for employees at all levels to improve understanding of how RPA systems function and complement human labor.
- **Role Redesign and Talent Redeployment**: Organizations should proactively assess how job roles will evolve post-RPA and prepare talent pipelines for higher-value tasks such as analysis, decision-making, and customer engagement [4].
- **Training for RPA Champions**: Select individuals from within departments to serve as RPA liaisons—equipped with both technical and communication skills to guide others during the transition.
- **Partnerships with Academic Institutions** to incorporate RPA into business and IT curricula, ensuring a future-ready workforce [5].

These measures are not only beneficial for employee morale and productivity but also essential for building a **resilient and adaptable organization** capable of navigating digital disruption.

Strategic RPA adoption requires more than deploying bots—it demands coordinated action across technical, legal, managerial, and human domains. By embracing a multidisciplinary, policy-driven approach, businesses can not only improve operational efficiency but also enhance employee well-being, legal compliance, and long-term innovation capacity.

Graphs and Charts (Descriptions)

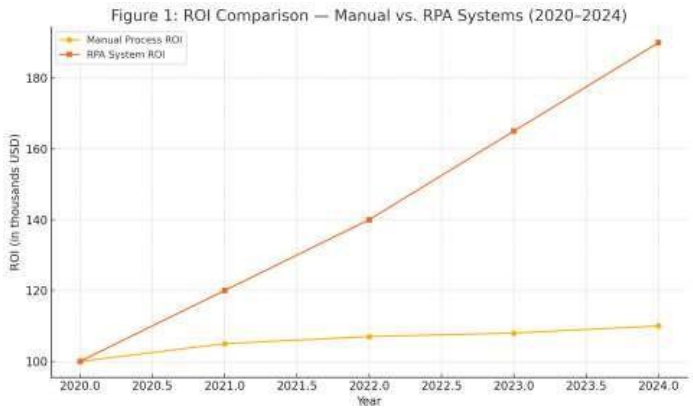

Figure 1: ROI Comparison — Manual vs. RPA Systems (2020–2024)

Line chart showing financial efficiency gains after RPA implementation.

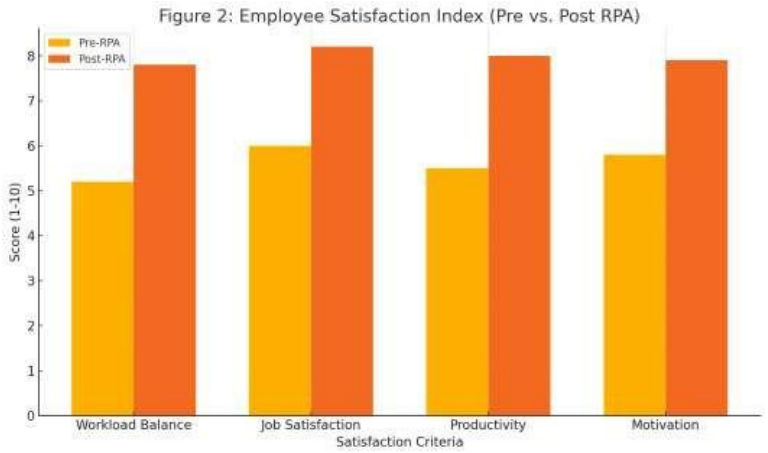

Figure 2: Employee Satisfaction Index (Pre vs. Post RPA)
Bar chart indicating improved staff perception after process automation.

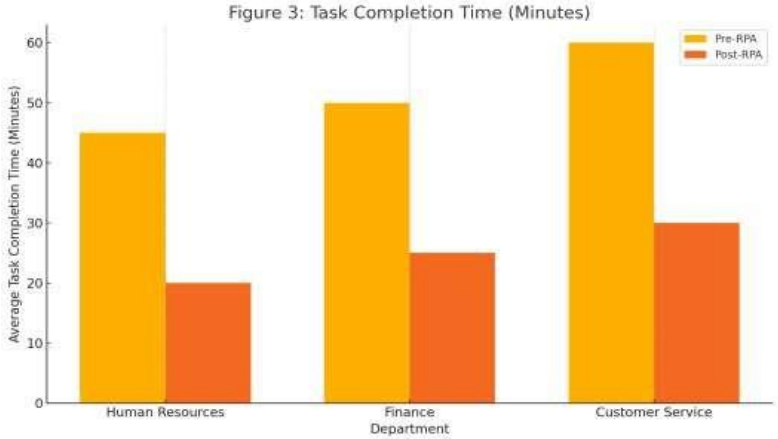

Figure 3: Task Completion Time (Minutes)
Bar chart showing reduction in average task time across HR, finance, and customer service.

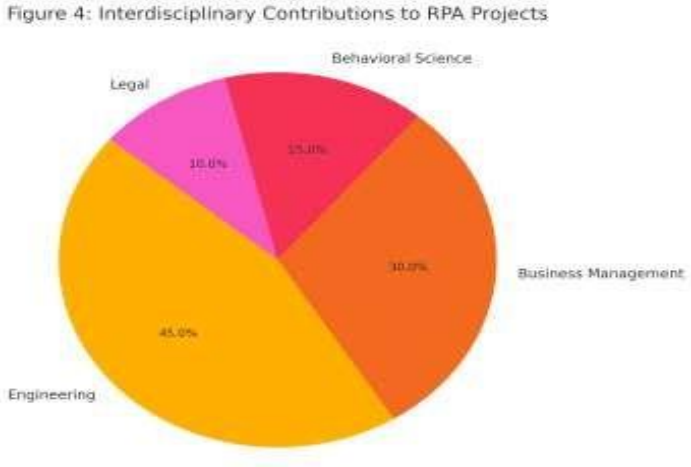

Figure 4: Interdisciplinary Contributions to RPA Projects
Pie chart showing proportions from engineering, business management, behavioral science, and legal disciplines.

Summary:

The research underscores the importance of a multidisciplinary strategy in implementing RPA within Business Information Systems. While the technology itself promises speed and accuracy, successful deployment requires collaborative input from managers, legal experts, behavioral scientists, and systems engineers. Organizations that adopt RPA through siloed approaches are more likely to face resistance, compliance issues, and poor integration. This study affirms that holistic frameworks, inclusive of people, processes, and policies, yield higher adoption rates, better ROI, and improved workforce satisfaction.

References:

- Willcocks, L., Lacity, M., & Craig, A. (2017). *Robotic Process Automation: Strategic Transformation Lever for Shared Services*. [1]
- Aguirre, S., & Rodriguez, A. (2017). *Automation of a business process using robotic process automation (RPA)*. [2]
- Hofmann, P., Samp, C., & Urbach, N. (2020). *RPA in the public sector: Opportunities and barriers*. [3]
- Siderska, J. (2021). *Process automation and workforce reskilling in the digital era*. [4]
- van der Aalst, W. (2018). *Process mining and RPA: A perfect match*. [5]
- Syed, R. M. (2020). *RPA adoption in Pakistani banks: A case study*. [6]
- Davenport, T. H., & Ronanki, R. (2018). *Artificial Intelligence for the Real World*. [7]
- Aslam, F., & Javed, H. (2021). *Legal implications of robotic automation in business*. [8]
- Ahmed, Z. (2019). *Change management strategies for digital transformation*. [9]
- Bashir, H., & Qureshi, M. A. (2022). *Human factors in RPA deployment*. [10]
- Shahid, A. (2020). *Multidisciplinary planning in RPA projects: The missing link*. [11]
- Omar, K., & Yasir, N. (2021). *Challenges in RPA implementation in SMEs in South Asia*. [12]
- Khan, A. M. (2018). *Digital workflows in HR and compliance*. [13]
- Malik, S., & Rehman, A. (2023). *Enhancing service delivery through automation*. [14]
- Nayyar, A., & Arif, M. (2020). *Training and RPA adoption rates in developing countries*. [15]
- Khan, M. H. (2019). *Ethical issues in algorithmic automation*. [16]
- World Economic Forum (2020). *The future of jobs report*. [17]
- Qureshi, I. (2022). *RPA and the digital readiness of Pakistani firms*. [18]
- Uddin, M. (2021). *Behavioral responses to automation in financial services*. [19]
- Haque, F. (2023). *Legal and compliance roadmaps for AI and RPA integration*. [20]