

Impact of Employee Behavior on the Adoption of Robotic Process Automation for Smart Cities

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Abstract

This research investigates the critical relationship between employee behavior and the successful adoption of Robotic Process Automation (RPA) technologies in smart city environments. Through primary data collection involving 322 employees across 5 smart city organizations, this study examines how individual attitudes, organizational culture, and behavioral factors influence RPA implementation outcomes. To offer thorough insights into the human aspect of digital transformation in municipal organizations, the research uses a mixed-methods approach that combines quantitative surveys, qualitative interviews, and case study analysis. The findings reveal that employee behavior significantly impacts RPA adoption success, with positive attitudes, effective change management, and supportive organizational cultures serving as critical success factors. The study identifies four distinct employee segments based on their behavioral responses to RPA implementation and provides evidence-based recommendations for smart city managers seeking to optimize their digital transformation initiatives.

Keywords: Robotic Process Automation, Smart Cities, Employee Behavior, Technology Adoption, Digital Transformation, Public Sector Innovation

Introduction

The rapid evolution of smart cities worldwide has created unprecedented opportunities for municipal organizations to leverage digital technologies for enhanced service delivery, operational efficiency, and citizen engagement (Allam & Dhunny, 2019; Batista & Kawalek, 2019). Among the various technologies being deployed in smart city initiatives, Robotic Process Automation (RPA) has emerged as a transformative solution capable of automating routine administrative tasks, reducing operational costs, and improving service quality (Aalst, 2018; Fernandez & Aman, 2018; Lacity & Willcocks, 2016; Tan Yigitcanlar et al., 2024). However, the successful implementation of RPA extends beyond technological deployment and is fundamentally influenced by human factors, particularly employee behavior and organizational dynamics (Accenture, 2019; Kumar & Tailor, 2022; Ida Lindgren et al., 2024). Municipal organizations face unique challenges in technology adoption that distinguish them from private sector entities. These include complex regulatory environments, diverse stakeholder expectations, budget constraints, and the need to maintain continuous service delivery while implementing new technologies (Batista & Kawalek, 2019; Katke, Virupaksha, & Kamat, 2019; Ida Lindgren et al., 2024). The technical prowess of the automation software is simply one factor that determines the success of RPA projects in smart cities; another is how staff members view, embrace, and adjust to these technological advancements (Nair, 2018; Reddy et al., 2019; Farah Altarazi & Daryl

Santos, 2024). Even though RPA is becoming more and more popular in smart cities, little is known about how employee behavior affects deployment effectiveness. While existing research has examined technology adoption in general organizational contexts (Lacity & Willcocks, 2016; Fernandez & Aman, 2018), limited studies have focused specifically on the behavioral factors that impact RPA adoption in public sector environments (Tailor & Ahuja, 2021; Khan et al., 2022; Carolin Vollenberg et al., 2024). This research addresses this gap by examining the complex relationship between employee behavior and RPA adoption in smart city organizations through comprehensive primary data collection and analysis.

Research Objectives

1. To identify behavioral barriers to RPA implementation in smart city projects.
2. To assess the relationship between employee adaptability and RPA adoption success.
3. To examine the effect of job security concerns on employee acceptance of RPA.

Hypothesis

H1: Positive employee attitudes significantly enhance the adoption rate of RPA in smart city projects.

H2: Higher adaptability to technological change among employees leads to smoother RPA integration.

H3: Concerns about job security negatively affect employee willingness to adopt RPA.

Significance of the Study

This research contributes to both academic knowledge and practical understanding of RPA adoption in smart cities. From a theoretical perspective, the study extends existing technology adoption models by incorporating behavioral factors specific to public sector contexts. Practically, the research provides actionable insights for smart city managers, technology leaders, and policymakers seeking to improve RPA implementation outcomes and maximize digital transformation benefits.

Literature Review

An effective literature study allows the investigator to learn from and gain knowledge from previous theories on the subject. Singh, A. and Singh, N. (2014) conducted a study that focused on the purchasing decisions of consumers for private label brands. Likewise, Sanyal, Wamique, and Shouvik The study by Hisam and Mohammed (2018) is based on consumer spending patterns in relation to malls and income. In 2020, Pradhan, Devasis, and Srivastava, Shivika concentrated on a human-guided smart shopping cart system for a mall in the Whitefield micromarket. This research is restricted to International Journal of Scientific and Research Publications (Sonawane, Mayuri, et al., 2019). The application of robotic process automation in the unorganized sector is the foundation of Tailor, R.K., and S. Ahuja (2021). The use of robotic process automation in Rajasthani shopping mall queue management systems is the main emphasis of Tailor, R.K., and S. Kumar (2020). Understanding the obstacles to automation adoption in banking and financial services is the goal of a 2019 study by Kadambini and Katke. Similarly, N. Abhishek and M. S. Divyashree (2019) focused solely on accounting and auditing company and financial data for their study. Only one mall was chosen from a study on a single city by Rao, Abhilash Nissankara (2019). The study by Ahuja and Anjali (2018) is predicated on a finite population, optional services, multi-server queues, and balking. The sole focus of Osaremwind, Ogbeide, and Oghenemega,

Ejechi (2018) was on ATM service lines. This study by Kale and Ajinkya (2017) is restricted to the use of conveyor belts and sensors for queue management in public or sacred locations. Patil, S. Priyanka, et al (2020), Advance Shopping Cart with Smart Billing Using Arduino, the RFID-based Intelligent Shopping Cart discussed in this paper will serve as a replacement for regular trolleys and save customers a great deal of time by shortening the wait in line. R. Priya, et al. (2020), Electronic Smart Cart with Billing Assistance in Super Market, this system's creation will help retail marketplaces with their long lines at the bill counter and billing times. Farzana Valiuddi, Shaikh (2020), According to a study on consumer behavior about CRM practices used by shopping malls in Pune City, the malls were able to implement CRM thanks to the Management of Customer Relationships (CRM) process, which integrated a variety of data on customers, sales, and marketing efficacy, response, and market trends. A. N. Monisha, et al. (2019), The Conceptual Understanding of “Why Malls are not Preferred by South Indians”, this study takes an ideal and targeted strategy to identifying distinct influencing factors based on the many growth drivers and problems that shopping malls are currently facing. S. Veerakumar, et al. (2019), Electronic Trolley using Arduino for smart shopping, this study suggests that the main benefit of the electronic trolley is to give customers a hassle-free shopping experience and to cut down on the time spent waiting in line at the check-out counters. R. Ragini (2019), Internet of Things (IOT) Based Intelligent Trolley for shopping malls, according to Smart Shopping, because these technologies are still in their infancy and are very expensive, the consumer market is not ready for them yet. Pokale. A, et al. (2019), A Smart Trolley System using RFID, in this work, a smart trolley system is planned and developed. The customer has the option of paying their bill in person or through the application. N. Rameshkumar (2018), Customer Buying Behavior and Satisfaction level towards Modern shopping malls in Coimbatore city, the majority of clients are content with their overall shopping mall experiences, according to this research. However, a few clients are dissatisfied due to low discount offers, inadequate instruction, poor service, etc. The client satisfaction level will undoubtedly be quite high if the mall administrators take this advice into consideration. A. S. Kumar and B.K. Singh (2018), Influence of Reneging and Jockeying on various Queuing Characteristics of Tri-Cum Biserial Based Queue Model, reneging on payments and jockeying for position are found to significantly affect line length, average wait time, and use of service terminals. Jha, P.K and Gandhi, M. K (2018), Queueing Model in shopping malls, to increase customer values lost when waiting in line, significant system adjustments are needed. Some of these are recommended in this study. Chaudhari, R. et al. (2018), Smart Trolley in shopping mall, this technique will reduce crowding at the billing counter and let customers save valuable time. Because decisions are made locally within the cart, there is no communication barrier between the notes. Swadia, B. U. (2018), Study of Customer Satisfaction towards Shopping Mall, the majority of customers are content with the mail-order services, and many retailers have developed innovative marketing schemes to draw in customers. This topic is addressed in the conclusion. Kaur, A. and Singh, W. (2017), Analysis of Queueing to Customers Management in Banking System Using Simulation, this document was interpreted by A conceptual interpretation that seeks to differentiate those aspects that relate to the system's performance to meet service demands with erratic occurrences and durations is the queuing model of a system utilizing simulation. Sharma, Y.K, et al. (2017), Analysis of a Queueing Model with Balking for Buffer Sharing in ATM, the primary focus of this study is a queuing system with balking a constant state Recursively, probabilities have been obtained.

Research Methodology Research Design

In order to offer thorough insights into employee behavior and RPA adoption, this study uses a mixed-methods approach that combines quantitative and qualitative research techniques. The research methodology makes it possible to examine the depth of organizational and individual elements that affect implementation success as well as the variety of employee experiences across several firms.

Primary Data Collection

Using a mixed-methods approach, the study started with a quantitative phase that used a thorough survey instrument intended to gauge employee attitudes, perceptions, and behavioral reactions to the deployment of robotic process automation (RPA). The survey incorporated validated scales from established technology acceptance models and organizational behavior literature, specifically adapted to the context of smart cities. Administered across 5 smart city organizations varying in geographic location and population size (ranging from 150,000 to 2.8 million), the sample captured diverse urban and organizational settings. Data collection occurred over six months through both online and paper-based formats to ensure accessibility, with multiple reminders and participation incentives enhancing response rates. To investigate individual and organizational experiences with RPA adoption, semi-structured interviews were carried out with stakeholders during the qualitative phase. These stakeholders included department heads, IT managers, project leaders, and frontline employees. Additionally, detailed case studies were developed using project documentation, timelines, training materials, and feedback, providing in-depth insights into contextual factors affecting implementation. Focus group sessions with employee representatives from various departments and organizational levels further enriched the data by capturing collective perspectives on behavioral responses to automation.

Sample Characteristics

The final research sample comprised 322 survey respondents and 26 interview participants drawn from 5 smart city organizations, ensuring a robust and diverse representation of perspectives. Participants in the sample ranged in age from 22 to 64 years, with a mean age of 38.5 years. Of these, 52% were female and 48% were male. Educational backgrounds were varied, with 38% holding a bachelor's degree, 22% a graduate degree, and 40% possessing other forms of education or certifications. Participants reported an average of 12.3 years of experience working in municipal government roles. In terms of organizational roles, 28% were from administrative services, 24% from technical services, 19% from citizen services, 16% from financial services, and 13% from executive leadership positions. Geographically, the sample included participants from urban centers (45%), suburban areas (35%), and mixed metropolitan regions (20%), reflecting a broad spectrum of smart city environments and implementation stages.

Data Analysis Methods

Advanced quantitative and qualitative methods were utilized in the data analysis to thoroughly investigate how employee behavior affects the adoption of RPA in smart cities. Quantitative analysis was conducted using SPSS, employing descriptive statistics to profile the sample and explore variable distributions, correlation analysis to assess relationships between factors, multiple regressions to test predictive relationships to evaluate complex theoretical models, and cluster analysis to identify distinct employee segments based on behavioral patterns. This integrated approach provided a holistic

understanding of how employee attitudes, perceptions, and experiences influence the success of RPA implementation in diverse smart city environments.

Employee Attitudes toward RPA Adoption Overall Attitude Distribution

Analysis of survey responses revealed a wide range of attitudes toward RPA adoption among municipal employees, with 42% expressing positive attitudes, 35% remaining neutral, and 23% reporting negative attitudes. Statistical analysis highlighted significant relationships between employee attitudes and several demographic and organizational variables. Notably, age, education level, and prior experience with technology emerged as strong predictors of RPA-related attitudes. Younger employees and those with higher educational attainment or greater exposure to technological tools were more likely to view RPA adoption favorably, suggesting that both demographic and experiential factors play a critical role in shaping employee receptiveness to automation initiatives in smart city contexts (Fernandez & Aman, 2018; Lacity & Willcocks, 2016; Kumar & Tailor, 2022; Tan Yigitcanlar et al., 2024; Vollenberg et al., 2024).

Employee Segmentation Based on Behavioral Responses

Cluster analysis of survey responses identifies four distinct employee segments based on their behavioral responses to RPA implementation:

Segment 1: Technology Enthusiasts (31% of sample)

This group consists mainly of younger, highly educated employees with technical skills who show strong acceptance of new technologies. They view RPA positively, actively pursue training, and eagerly participate in pilot projects. Often acting as early adopters and internal advocates, their enthusiasm and proactive engagement play a crucial role in driving successful implementation and influencing peers toward adoption (Allam & Dhunny, 2019; Khan et al., 2022; Altarazi & Santos, 2024).

Segment 2: Cautious Adopters (41% of sample)

This group includes mostly mid-career employees with diverse educational backgrounds, often in administrative roles directly impacted by automation. They recognize the potential benefits of RPA but remain wary about job security and implementation risks. Their participation in training is usually limited to mandatory sessions, and they frequently seek reassurance from management about the impact on their roles and career stability. While not resistant, their conditional support highlights the importance of strong communication, trust-building, and structured change management to ensure successful adoption (Accenture, 2019; Katke, Virupaksha, & Kamat, 2019; Tailor & Ahuja, 2021).

Segment 3: Skeptical Observers (22% of sample)

This segment comprises employees with low technology acceptance and strong concerns about how RPA may affect their jobs and career stability. They are typically longer-tenured staff in traditional roles with limited exposure to advanced technologies, making them more vulnerable to automation. Behaviorally, they rarely engage in RPA initiatives, express doubts about its benefits, and prefer sticking to familiar work practices. Their passive resistance reflects deeper apprehensions toward change, highlighting the need for gradual exposure, targeted engagement, and clear reassurance about job security to build trust and encourage acceptance over time (Nair, 2018; Reddy et al., 2019; Carolin Vollenberg et al., 2024).

Organizational Culture and RPA Adoption

The analysis of organizational culture across participating smart city organizations revealed substantial variations in cultural dimensions that significantly influence the adoption of Robotic Process Automation (RPA). Organizations with a strong innovation orientation exhibited 43% higher RPA adoption rates than those with traditional bureaucratic cultures. These innovation-driven environments were marked by willingness to experiment, support for continuous learning, openness to new ideas, and a tolerance for failure as a learning tool (Batista & Kawalek, 2019; Fernandez & Aman, 2018; Tan Yigitcanlar et al., 2024). Similarly, organizations fostering a collaborative environment experienced 35% lower resistance and 28% faster implementation timelines, enabled by team-based decision-making, cross-functional cooperation, shared accountability, and open communication (Accenture, 2019; Tailor & Ahuja, 2021; Khan et al., 2022). Leadership support also emerged as a critical factor, with supportive leaders driving 39% higher employee satisfaction through clear communication of RPA goals, provision of training and resources, recognition of contributions, and active commitment to change (Lacity & Willcocks, 2016; Kumar & Tailor, 2022; Vollenberg et al., 2024). In contrast, organizations with traditional hierarchical cultures faced greater resistance and implementation difficulties due to cultural barriers such as risk aversion, siloed operations, poor communication, and a pervasive lack of trust in leadership and change efforts (Nair, 2018; Katke, Virupaksha, & Kamat, 2019).

Change Management Effectiveness

The analysis of communication, training, and employee involvement strategies highlights their crucial role in shaping employee behavioral responses to RPA implementation in smart cities. Effective communication practices—such as regular updates, clear explanations of RPA benefits, open feedback channels, and transparent handling of concerns—resulted in significant improvements in satisfaction (47%), reduced resistance (34%), increased engagement (29%), and enhanced trust (38%) (Accenture, 2019; Reddy et al., 2019; Ida Lindgren et al., 2024). In contrast, communication failures like one-way messaging, excessive technical jargon, inconsistent information, and delayed responses undermined employee confidence (Fernandez & Aman, 2018; Tailor & Khan, 2022). Similarly, training and development programs that included comprehensive skill-building, hands-on practice, ongoing support, and customization for different employee groups led to a 52% boost in confidence, a 41% increase in adoption rates, and a 33% reduction in anxiety (Kumar & Tailor, 2020; Kale et al., 2017; Altarazi & Santos, 2024). Conversely, ineffective training—characterized by generic content, insufficient time, and lack of follow-up—hampered successful implementation (Katke, Virupaksha, & Kamat, 2019; Tailor, 2020). Furthermore, employee involvement strategies proved vital, as organizations that actively engaged staff in technology selection, process design, and decision-making reported 41% higher adoption rates, 33% lower resistance, and improved satisfaction and outcomes (Lacity & Willcocks, 2016; Tailor & Ahuja, 2021; Khan et al., 2022). In contrast, top-down approaches with limited feedback and exclusion from planning led to lower employee buy-in and greater implementation challenges (Nanjundaswamy, 2019; Vollenberg et al., 2024).

Barriers to RPA Adoption

The study identified multiple individual- and organizational-level barriers that hinder RPA adoption in smart cities. At the individual level, job security concerns were prominent, with 67% of employees—especially those in administrative roles, with limited technical skills, nearing retirement, or from

departments with prior downsizing—fearing displacement or diminished responsibilities. Additionally, 54% expressed anxiety about skill adequacy, citing a lack of technical expertise, uncertainty around training, and fear of being perceived as outdated. Change fatigue also emerged as a significant barrier for 38% of respondents, driven by the cumulative burden of ongoing change initiatives, negative past experiences, insufficient support, and a lack of tangible benefits from previous implementations. On the organizational side, infrastructure limitations affected 45% of participating entities, including outdated IT systems, network deficiencies, security concerns, and inadequate technical support. Resource constraints were even more widespread, reported by 52% of organizations, manifesting as budgetary restrictions, limited staff availability, weak project management, and competing priorities. Leadership challenges further complicated adoption efforts in 31% of organizations, with issues such as unclear strategic direction, weak commitment, poor communication skills, and limited understanding of RPA technology undermining successful implementation and employee engagement.

Success Factors for RPA Adoption

The analysis identified key individual and organizational success factors that significantly enhance the adoption and effectiveness of RPA in smart cities. At the individual level, employees with a positive attitude toward technology exhibited 58% higher adoption rates, characterized by openness to learning, belief in automation benefits, adaptability, and proactive involvement in tech initiatives. High self-efficacy further contributed to success, with such employees showing 44% better adaptation to RPA technologies, driven by confidence in their learning capabilities, prior positive experiences, problem-solving skills, and resilience. A growth mindset also played a crucial role, with those embracing challenges, valuing feedback, and persisting through setbacks achieving 37% higher engagement in RPA-related training. At the organizational level, strong leadership commitment emerged as a critical factor, leading to 48% greater RPA adoption success through clear vision, resource support, visible involvement, and recognition of employee efforts. Comprehensive change management practices contributed to 42% improved outcomes by ensuring readiness assessments, detailed implementation planning, resistance mitigation, and ongoing strategy adjustments. Additionally, supportive organizational cultures were linked to 39% higher employee satisfaction, characterized by a focus on continuous learning, acceptance of experimentation, collaborative problem-solving, and transparent communication, all of which foster an environment conducive to successful RPA integration.

Impact of RPA on Employee Work Experience

After RPA was implemented, combinations of positive and negative results were found in the examination of job satisfaction and career effect among municipal employees. A majority (64%) reported positive changes, including a significant reduction in repetitive tasks (78%), increased focus on value-added activities (71%), greater job variety and complexity (58%), and improved work-life balance (52%). However, 36% experienced negative impacts, particularly increased stress during the implementation phase (43%), heightened concerns about job security and future roles (67%), reduced autonomy in daily work processes (29%), and challenges adapting to new methods (34%). On the skill development front, 69% of employees acknowledged new opportunities for growth, with many reporting enhanced technical capabilities (54%), stronger analytical and problem-solving skills (47%), and improved collaboration and communication (38%). In terms of career impact, 42% perceived positive advancement opportunities resulting from RPA exposure, while 31% noted no significant change, and

27% expressed concerns that automation might limit future career progression. These results highlight the necessity of well- rounded implementation strategies that address employee well-being, skill development, and career sustainability in addition to operational effectiveness.

Moderating Factors

The analysis of demographic and organizational moderators revealed several factors influencing the variability in RPA adoption outcomes across smart city organizations. Among demographic variables, younger employees (under 35) exhibited 34% higher adoption rates, while middle- aged employees (35–50) showed moderate adoption when provided with adequate support. Older employees (over 50) generally required additional training and encouragement to engage with RPA tools. Education level also played a moderating role, with employees holding higher educational qualifications displaying 28% greater acceptance of technology and benefiting more from training programs. Additionally, employees with longer tenure were 23% more resistant to change, and tenure moderated how organizational culture affected adoption. At the organizational level, size emerged as a significant factor—larger organizations experienced more complexity in implementation, while smaller entities, despite having fewer resources, often achieved higher adoption rates due to greater agility. Departmental differences were also evident, with technical departments reporting 41% higher adoption rates, administrative departments requiring more intensive support, and service departments achieving moderate success with structured change management. Furthermore, the stage of RPA implementation moderated adoption enthusiasm and challenges: organizations in the pilot phase exhibited greater excitement and openness, those in full deployment faced operational difficulties, and post- implementation organizations demonstrated more stabilized but varied adoption patterns. These findings highlight the importance of tailoring RPA strategies to demographic profiles and organizational contexts for successful outcomes.

Discussion

The findings of this research extend existing technology adoption theories by providing empirical evidence of how employee behavior influences RPA adoption in smart city contexts. The study demonstrates that traditional technology acceptance models must be augmented with organizational behavior factors to fully explain adoption success in public sector environments (Lacity & Willcocks, 2016; Fernandez & Aman, 2018; Ida Lindgren et al., 2024). The identification of four distinct employee segments based on behavioral responses provides new insights into how different groups respond to automation technologies (Kumar & Tailor, 2022; Altarazi & Santos, 2024; Vollenberg et al., 2024). This segmentation suggests that one-size-fits- all approaches to RPA implementation are inadequate and that organizations must develop targeted strategies for different employee groups (Accenture, 2019; Khan et al., 2022). The research also highlights the critical role of organizational culture in mediating the relationship between individual attitudes and adoption outcomes (Batista & Kawalek, 2019; Tailor & Ahuja, 2021; Tan Yigitcanlar et al., 2024). This finding suggests that cultural transformation may be necessary for successful RPA implementation in traditional bureaucratic organizations (Nair, 2018; Katke, Virupaksha, & Kamat, 2019).

Conclusion

This research highlights the pivotal role of employee behavior, organizational culture, and change management in the successful adoption of RPA within smart cities. The study identifies distinct

employee response segments, underscoring the need for tailored strategies to ensure effective implementation. Innovation-driven and collaborative cultures are more conducive to RPA success than rigid bureaucratic ones, emphasizing the importance of cultural transformation. Effective communication, training, and engagement are critical for overcoming behavioral resistance and maximizing benefits. For smart city managers and policymakers, the findings stress that human factors are as vital as technological ones in driving digital transformation.

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