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Revealing Contrasting Perceptions of RFID Adoption: A Multi-Group Investigation of Organizational Determinants

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Abstract

Purpose: RFID (Radio Frequency Identification) technology is a value chain innovation tool that enables B2B (business-to-business) and B2C (business-to-customer) innovation in business supply chain. With the recent development of information technology, various RFID solutions have been developed. In addition, the cost of building RFID systems is decreasing due to the development of RFID technology. The purpose of this study is to analyze the factors affecting the successful implementation of RFID from a positive, neutral, and negative perspective. **Research design, data and methodology:** To this end, this study develops a conceptual theoretical research model using cognitive behavioral theory. For validating research model, in this study, data were collected from people working at companies, and empirical analysis was conducted using the PLS-SEM (partial least squares structural equation model) approach. **Results:** This study analyzes factors that affect willingness to adoption of RFID. As a result of the empirical analysis, there are differences in perceptions between RFID capability, information system assurance capability, collaboration, trust, expectation for performance, and willingness to adoption of RFID depending on positive, neutral, and negative perspective. **Conclusions:** The empirical results of this study will provide useful insights and information for companies' successful adoption of RFID.

Keywords: RFID Capability, Assurance Capability, Collaboration, Trust, Expectation For Performance, Willingness To Adoption

JEL Classification Code: M10, M11, M13, M15

1. Introduction

The convergence of advanced information technologies—such as artificial intelligence (AI) and big data—has played a pivotal role in enhancing business performance in the era of the Fourth Industrial Revolution (Duong, Vu, and Ngo, 2023). Among these emerging technologies, Radio Frequency Identification (RFID) has gained significant attention as a disruptive innovation that enables business operations within a ubiquitous computing environment. Not only public-sector organizations but also

commercial firms are increasingly exploring RFID adoption as a means of innovating business processes (Zhang et al., 2025; Masekwana & Jokonya, 2025; Hao et al., 2025; Zhou et al., 2025; Deng et al., 2025; Sung & Shin, 2022; Gantulga et al., 2022).

Despite this rising interest, the overall adoption rate of RFID remains relatively low. High initial investment costs, substantial expenses associated with integrating RFID into existing information systems, and concerns regarding privacy and security risks continue to hinder widespread implementation. Therefore, meaningful diffusion of RFID

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requires rigorous assessments of return on investment (ROI) and systematic countermeasures to address potential challenges.

When considering RFID adoption, companies primarily focus on evaluating costs, performance outcomes, and profitability. They typically proceed only when they possess sufficient confidence in the potential benefits of adoption. Importantly, RFID is not a standalone technology; it is embedded within broader business systems and must be seamlessly integrated with existing information systems to support efficient process management. Consequently, a firm's information technology (IT) resource capability and the RFID proficiency of its organizational members become critical success factors. Moreover, the integration of inter-firm business processes enabled by RFID can further enhance performance, highlighting the importance of collaboration among supply chain partners (Sabbaghi & Vaidyanathan, 2008).

Existing research on RFID spans implementation strategies, system development, strategic utilization, and business model innovation (Lee & Yuk, 2022). RFID implementation characteristics also vary across business domains—for example, production, distribution, and logistics—indicating the need for tailored strategies aligned with sector-specific objectives.

The purpose of the present study is to propose a strategic approach to RFID implementation. According to Poirier and McCollum (2006), establishing a solid information systems foundation is essential for initiating RFID adoption. When organizational members have confidence in the technology and expect performance improvements, successful implementation becomes more likely (Yoon & Yoon, 2021). In the context of supply chain management, however, strategic business alignment must precede technological considerations. That is, RFID should be employed not merely as an automation tool but as an enabler for achieving broader strategic goals. As a value-creation mechanism within supply chains, RFID becomes more powerful when supply chain partners engage in meaningful collaboration.

Prior studies on IT outsourcing and inter-organizational system operations have consistently shown that collaboration is central to successful digital transformation. Yet, in the context of RFID, much of the existing research remains overly technology-focused, often overlooking the collaborative dimension and failing to incorporate the diverse perspectives—positive, neutral, and negative—held by organizational members regarding RFID adoption.

To address these gaps, this study examines the roles of key cognitive factors—including RFID capability, information systems assurance capability, trust, collaboration, and performance expectancy—in influencing RFID adoption. Furthermore, drawing on Poirier and McCollum's (2006) argument that multiple viewpoints

should be considered, this study incorporates positive, neutral, and negative perspectives on RFID within organizational settings. By reflecting these situational characteristics, we aim to provide valuable insights for developing effective RFID implementation strategies for firms.

2. Theoretical Background and Hypotheses

2.1. Theoretical Framework Development

The present study is grounded in Cognitive–Behavioral Theory (CBT), which provides the overarching theoretical foundation for explaining how individuals form behavioral intentions toward new technologies. CBT posits that cognitive perceptions precede affective evaluations and ultimately shape behavioral intentions and behaviors (Hupp et al., 2008). This cognition-behavior sequence has been consistently supported in contemporary research across various behavioral and technological contexts (Berwian et al., 2025; Zhang et al., 2025; Duan et al., 2025).

In the context of RFID adoption within organizations, CBT offers a robust explanatory lens: employees first develop cognitive evaluations of the technology—such as perceived capability, system reliability, trustworthiness, expected performance benefits, and collaborative readiness—which then influence their attitudes and willingness to adopt RFID. These cognitive appraisals directly correspond to the key constructs included in this study's research model. For example, RFID capability and information systems assurance capability represent cognitive assessments of technical readiness, while trust and collaboration reflect evaluative beliefs regarding the organizational and relational environment that supports RFID implementation. Expectation for performance (EP) further represents a cognitive prediction about future outcomes, aligning directly with CBT's emphasis on anticipatory cognition. Furthermore, CBT is particularly suited for examining positive, neutral, and negative viewpoints, as the theory emphasizes that individuals' pre-existing cognitive frames substantially shape how new information is processed and how adoption intentions are formed. Employees with positive cognitions toward RFID are theoretically more likely to build trust and perceive performance benefits, whereas negative cognitions may restrict cognitive processing and suppress intention formation—consistent with cognitive resistance mechanisms described in CBT literature.

By adopting cognitive–behavioral theory as the grand theoretical foundation, this study provides an integrated explanation for the hypothesized relationships among RFID capability, information system assurance capability, trust,

collaboration, performance expectations, and willingness to adopt RFID. The research model (Figure 1) depicts these theoretically grounded causal pathways, reflecting CBT's central mechanism that cognitive perceptions drive adoption intentions.

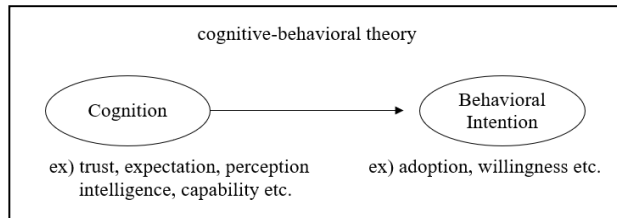


Figure 1: Theoretical Framework

2.2. RFID Implementation

RFID technology is increasingly being adopted across diverse industries, where it serves as an extension of existing information systems and functions as a value-creation tool within supply chains (Gantulga et al., 2022). By enabling real-time data capture, process automation, and enhanced visibility, RFID facilitates significant innovation in business operations. This potential for process improvement has led many companies to show growing interest in RFID-based solutions.

Reflecting this trend, a substantial body of research has examined RFID implementation from multiple perspectives, including technology application, system development, and performance enhancement (Lee & Yuk, 2022; Hou & Huang, 2006; Lin, 2008). Studies have also focused on the strategic utilization of RFID and the broader organizational and operational implications of its adoption (Lee & Yuk, 2022). Collectively, these studies underscore the importance of expanding RFID implementation to improve corporate performance across industries.

More specifically, several empirical studies have analyzed the determinants of RFID adoption in various countries and organizational settings. Shih et al. (2008) identified key factors influencing RFID diffusion in Taiwan, while Sung and Shin (2022) explored the conditions for successful RFID implementation in university hospitals. Pedroso et al. (2009) proposed a strategic plan to promote RFID acceptance in Brazil, and Brown and Russell (2007) investigated adoption behaviors among South African retailers. These studies illustrate the breadth of international research on RFID implementation and acceptance.

Despite these advances, the diffusion of RFID remains slow. Although prior studies highlight the usefulness of RFID for both firms and consumers, issues such as privacy and security concerns, integration complexity, and substantial IT investment requirements continue to impede adoption. Therefore, further research is needed to analyze

acceptance factors in greater detail and to develop context-specific strategies that reflect the situational characteristics of the organizations seeking to adopt RFID.

2.3. Opinion of RFID Technology

Although RFID technology offers notable potential, concerns continue to be raised regarding its adoption. These concerns often stem from the technical limitations of RFID systems, as well as skepticism toward the belief that RFID can serve as a universal solution for organizational challenges—an assumption critics describe as an overly optimistic view of technology. In practice, experts in various business sectors remain divided over the benefits, costs, and operational constraints associated with RFID implementation.

Conversely, proponents of RFID emphasize its advantages, particularly its ability to enhance supply chain visibility, improve information sharing, and strengthen inter-organizational collaboration. At the same time, some RFID specialists adopt a neutral stance, neither strongly supporting nor opposing the technology (Poirier & McCollum, 2006).

Recognizing these differing viewpoints, this study argues that positive, neutral, and negative perceptions of RFID technology each provide meaningful insights. Therefore, the present research seeks to examine the characteristics of RFID implementation by incorporating all three perspectives.

2.4. RFID capability and ISAC

In this study, information technology resource capability is conceptualized as comprising two key components: RFID capability (RC) and information systems assurance capability (ISAC). In practice, RFID implementation does not involve building an entirely independent system; rather, it is typically integrated into or used to reinforce existing enterprise resource planning (ERP) systems or supply chain management (SCM) systems. For this reason, effective linkage between newly implemented RFID systems and existing ERP systems is essential (Hong & Kim, 2001). Also, Lim and Koh (2009) similarly emphasized that achieving organizational fit is a critical requirement for successful RFID implementation.

The notion of technological fit—particularly organizational fit for RFID—spans multiple dimensions, including systems, processes, and information alignment. To enhance this fit, organizations must systematically develop their information systems, manage operational processes consistently, and utilize generated information efficiently. Such efforts contribute to the stable operation of information systems, which in turn strengthens expectations for

improved corporate performance through RFID adoption (Lim & Koh, 2009).

In addition, organizational members' perceived trust in RFID has been shown to increase the likelihood of business innovation and performance enhancement (Angeles, 2009). This underscores the importance of RFID capability (RC) as a core factor influencing successful implementation. Beyond individual capability, successful RFID adoption also requires robust supply chain integration and a strong information technology infrastructure (Angeles, 2009). A well-developed IT infrastructure enhances system assurance, enabling more reliable and effective RFID system operations.

For firms considering RFID adoption, these capabilities collectively enhance expectation for performance (EP) and trust (TR)—two fundamental determinants of successful implementation. As discussed earlier, the relationships among ISAC, EP, and TR may differ according to organizational members' positive, neutral, and negative perceptions of RFID. Thus, understanding how these cognitive perspectives shape the influence of technological capabilities is essential.

Based on this discussion, the following hypotheses are proposed:

- (H1) *Organizational members' RFID capability (RC) positively affects expectation for performance (EP) across positive, neutral, and negative perspectives of RFID adoption.*
- (H2) *Organizational members' RFID capability (RC) positively affects trust (TR) across positive, neutral, and negative perspectives of RFID adoption.*
- (H3) *Organizational members' information systems assurance capability (ISAC) positively affects expectation for performance (EP) across positive, neutral, and negative perspectives of RFID adoption.*
- (H4) *Organizational members' information systems assurance capability (ISAC) positively affects trust (TR) across positive, neutral, and negative perspectives of RFID adoption.*

2.5. Collaboration

In this study, collaboration (COL) refers to the linkage of business processes, mutual consultation, and partnership among firms within a supply chain. In general, stronger inter-firm linkages and more effectively coordinated business processes lead to improved managerial performance. Such coordination is a key component of supply chain management strategies, and companies today invest heavily in these strategies—most notably through information technology initiatives aimed at supply chain innovation and enhanced organizational performance

(Kärkkäinen et al., 2007).

Collaboration plays an equally important role in RFID implementation. When firms within a supply chain successfully collaborate, RFID adoption can further strengthen visibility, information sharing, and process integration across organizational boundaries. This enhanced connectivity ultimately contributes to improved managerial performance (Lee & Park, 2008; Sabbaghi & Vaidyanathan, 2008).

Given this context, it is reasonable to expect that the effects of collaboration on trust (TR) and expectation for performance (EP) may differ depending on whether organizational members hold positive, neutral, or negative viewpoints regarding RFID technology.

Based on this discussion, the following hypotheses are proposed:

- (H5) *Organizational members' collaboration (COL) positively affects expectation for performance (EP) across positive, neutral, and negative perspectives of RFID adoption.*
- (H6) *Organizational members' collaboration (COL) positively affects trust (TR) across positive, neutral, and negative perspectives of RFID adoption.*

2.6. Trust and Expectation for Performance

In the context of RFID implementation, trust (TR) refers to organizational members' positive belief that RFID adoption will enhance and innovate business processes. Prior research on e-commerce shows that customer trust not only facilitates acceptance but also increases perceived usefulness (Pavlou, 2003). Similarly, in RFID implementation, when organizational members possess trust in RFID, their willingness to adopt the technology (WA) is likely to increase. Trust is also essential from the user perspective; for instance, in RFID-based customer service applications, consumers' trust in RFID plays a critical role in enhancing perceived usefulness (Lee et al., 2007). These findings indicate that the formation of trust is closely tied to successful RFID implementation.

RFID technology is increasingly being applied across various business processes, and its evolution into Internet of Things (IoT) technologies has expanded its potential value. Studies across multiple industries have confirmed that RFID adoption can create business value, reduce costs, and improve managerial performance. Moreover, Prater and Frazier (2005) argued that RFID enhances the usefulness of retailers by strengthening supply chain integration through electronic inter-firm linkages. Given this evidence, it is reasonable to expect that trust (TR) and expectation for performance (EP) will influence willingness to adopt (WA) of RFID depending on whether organizational members

hold positive, neutral, or negative perceptions of RFID.

Based on this discussion, the following hypotheses are proposed:

- (H7) Organizational members' expectation for performance (EP) positively affects willingness to adopt (WA) RFID across positive, neutral, and negative perspectives.
- (H8) Organizational members' trust (TR) positively affects willingness to adopt (WA) RFID across positive, neutral, and negative perspectives.
- (H9) Organizational members' trust (TR) positively affects expectation for performance (EP) across positive, neutral, and negative perspectives.

3. Research Model and Method

3.1. Research Model

The research model is as shown in [Figure 2].

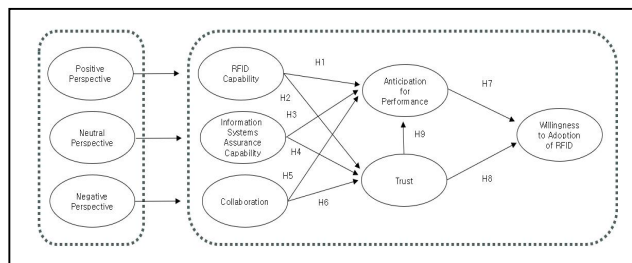


Figure 2: Research Model

3.2. Measurement and Survey

This study constructed measurement scales by adapting and refining validated items from prior research. The measurement items for each construct are summarized below.

First, organizational members' willingness to adoption (WA) refers to organizational members' intention to adopt RFID within firms planning future implementation. Items were adapted from Brown and Russell (2007), Lin (2008), and Lee and Shim (2007) to fit the context of this study.

Second, organizational members' collaboration (COL) captures the extent of inter-organizational business process integration and interaction through information technologies. Measurement items were derived with reference to Yang et al. (2008) and Vachon and Klassen (2008), and subsequently modified for the current research context.

Third, organizational members' perceived trust (TR) represents the belief among organizational members that RFID technology will contribute to improved business

performance. Items were modified from Pavlou (2003) and Lee et al. (2007) to reflect the scope of RFID implementation.

Fourth, organizational members' information systems assurance capability (ISAC) refers to a firm's capability to operate information systems effectively in conjunction with RFID technologies. Items were developed based on Angeles (2009) and Lim and Koh (2009), and tailored to the context of this study.

Fifth, organizational members' RFID capability (RC) denotes the technological and operational capability required for effectively utilizing RFID systems within the organization. Items were adapted from the concepts of IT assurance capability presented in Stratman and Roth (2002), DeLone (1988), and Marchand et al. (2001).

Sixth, organizational members' expectation for performance (EP) refers to organizational members' anticipation of performance improvements resulting from RFID implementation. Measurement items were drawn from Lim and Koh (2009).

Seventh, organizational members' view according to the RFID implementation reflects positive, neutral, and negative viewpoints regarding RFID adoption within companies. Based on Poirier and McCollum (2006), items were developed to assess these three perspectives.

All variables were measured using a seven-point Likert scale, ranging from 1 ("strongly disagree") to 7 ("strongly agree").

Data collection was conducted through a professional research agency using an online survey. Respondents were screened to ensure that they were currently employed and worked in firms planning to adopt RFID technology in the future.

3.3. Methodology

In this study, the PLS-SEM approach was employed to examine the causal relationships among the independent and dependent variables. PLS-SEM is widely utilized across various academic fields due to its ability to generate robust and meaningful results even with relatively small sample sizes (Hair et al., 2013). Given the nature of this study and the sample characteristics, the use of the PLS-SEM method is particularly appropriate and meaningful.

Details regarding the sample characteristics are provided in Appendix 1.

4. Results

4.1. Measurement Model

In this study, the reliability and validity of the constructs

were assessed through the measurement model. First, internal consistency reliability was evaluated using Cronbach's alpha (CA) and composite reliability (CR). According to Hair et al. (2013), values of 0.7 or higher for both CA and CR indicate adequate reliability. As shown in Table 1, all constructs exceeded the recommended thresholds, confirming sufficient reliability.

Table 1: Reliability and Validity

Variables	AVE	CR	CA
(1) EP	0.71	0.92	0.90
(2) WA	0.72	0.93	0.91
(3) ISAC	0.78	0.94	0.91
(4) TR	0.74	0.92	0.88
(5) RC	0.76	0.90	0.84
(6) COL	0.76	0.90	0.84

Next, discriminant validity was assessed through correlation analysis. Discriminant validity is established when the square root of the average variance extracted (AVE) for each construct exceeds the correlations between that construct and all others (Hair et al., 2013). As presented in Table 2, the square root of each construct's AVE (reported on the diagonal) was greater than the corresponding inter-construct correlations. Therefore, the results confirm that the measurement model demonstrates adequate discriminant validity.

Table 2: Corelation and AVE

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) EP	0.84*					
(2) WA	0.65	0.85*				
(3) ISAC	0.46	0.51	0.88*			
(4) TR	0.73	0.61	0.39	0.86*		
(5) RC	0.56	0.61	0.51	0.53	0.87*	
(6) COL	0.66	0.63	0.52	0.63	0.63	0.87*

※ * Square root of AVE (average variance extracted) value

4.2. Structural Model

The structural model was evaluated using the PLS-SEM method, and the bootstrapping procedure was applied due to the relatively small sample size (Hair et al., 2013). The results of the hypothesis testing based on the path coefficients are summarized as follows.

First, both H1 (RC → EP) and H2 (RC → TR) were supported. Notably, RFID capability (RC) exerted a stronger influence on trust ($t = 2.71^{**}$) than on expectation for performance ($t = 1.78$).

Second, H3 (ISAC → EP) and H4 (ISAC → TR) were not supported, indicating that information systems assurance capability did not have a significant effect on

either expectation for performance or trust.

Third, H5 (COL → EP) and H6 (COL → TR) were both supported. Collaboration (COL) significantly influenced expectation for performance ($t = 3.31^{**}$) and trust ($t = 6.55^{***}$), with its effect on trust being particularly stronger than its effect on expectation for performance.

Finally, H7 (EP → WA) was supported ($t = 4.19^{***}$), indicating that expectation for performance positively influences willingness to adopt RFID. Also, H8 (TR → WA) was also supported ($t = 2.40^*$), confirming that trust contributes to willingness to adopt. In addition, H9 (TR → EP) was supported ($t = 7.22^{***}$), demonstrating that trust significantly enhances expectation for performance.

Table 3: PLS Results

Model	Total Group		
Hypotheses	β	t	Result
(H1) RC → EP	0.11	1.78	Rejected
(H2) RC → TR	0.21	2.71**	Accepted
(H3) ISAC → EP	0.09	1.36	Rejected
(H4) ISAC → TR	0.04	0.51	Rejected
(H5) COL → EP	0.23	3.31**	Accepted
(H6) COL → TR	0.48	6.55***	Accepted
(H7) EP → WA	0.44	4.19***	Accepted
(H8) TR → WA	0.28	2.40*	Accepted
(H9) TR → EP	0.50	7.22***	Accepted

※ $t > 3.30$ (***) $p < 0.001$, $t > 2.56$ (**) $p < 0.01$, $t > 1.96$ (*) $p < 0.05$
 ※ R squares: EP (0.62), TR (0.43), and WA (0.46).

4.3. Analysis of Positive Aspect

As noted earlier, the research model demonstrated sufficiently high explanatory power. The PLS-SEM results for respondents holding positive views toward RFID technology are summarized as follows.

First, H1 (RC → EP) was not supported ($t = 0.08$), and H2 (RC → TR) was also not supported ($t = 1.92$), indicating that RFID capability did not significantly influence either expectation for performance or trust among respondents with positive perspectives.

Second, both H3 (ISAC → EP) and H4 (ISAC → TR) were rejected, indicating that information systems assurance capability did not significantly influence either expectation for performance or .

Third, H5 (COL → EP) was supported ($t = 2.45^*$), and H6 (COL → TR) was strongly supported ($t = 3.83^{***}$). These findings show that collaboration (COL) plays an important role in enhancing both expectation for performance and trust, even among organizational members who already view RFID positively.

Table 4: PLS Result (Positive, Neutral, & Negative Aspects)

Model	Positive Group (n=104)			Neutral Group (n=132)			Negative Group (n=14)		
	β	t	Result	β	t	Result	B	t	Result
(H1)	-0.01	0.08	Rejected	0.21	2.35*	Accepted	0.17	0.39	Rejected
(H2)	0.27	1.92	Rejected	0.11	1.37	Rejected	0.60	1.57	Rejected
(H3)	0.06	0.46	Rejected	0.22	2.67**	Accepted	0.06	0.13	Rejected
(H4)	0.00	0.01	Rejected	0.16	1.52	Rejected	-0.28	0.65	Rejected
(H5)	0.26	2.45*	Accepted	0.19	2.25*	Accepted	0.23	0.46	Rejected
(H6)	0.44	3.83**	Accepted	0.49	5.28***	Accepted	0.32	0.64	Rejected
(H7)	0.46	4.01***	Accepted	0.39	2.59*	Accepted	0.61	1.73	Rejected
(H8)	0.26	2.35*	Accepted	0.30	1.65	Rejected	0.14	0.31	Rejected
(H9)	0.60	6.89***	Accepted	0.29	2.81**	Accepted	0.56	1.17	Rejected
※ R squares	EP (0.66), TR (0.41), WA (0.46).			EP (0.54), TR (0.44), WA (0.54).			EP (0.56), TR (0.36), WA (0.51).		

Lastly, H7 (EP → WA) was supported ($t = 4.01^{***}$), and H8 (TR → WA) was supported as well ($t = 2.35^*$), suggesting that both expectation for performance and trust significantly increase willingness to adopt RFID within the positive viewpoint group. In addition, H9 (TR → EP) was supported ($t = 6.89^{***}$), demonstrating a strong positive effect of trust on expectation for performance within the positive group.

4.4. Analysis of Neutral Aspect

As shown in Table 4, the explanatory power for the neutral group was found to be sufficiently high, indicating that the model adequately explains RFID adoption among respondents with neutral perceptions. The PLS-SEM results for this group are summarized as follows.

First, H1 (RC → EP) was supported ($t = 2.35^*$), whereas H2 (RC → TR) was not supported ($t = 1.37$). These findings suggest that, RFID capability contributes to expectation for performance and does not contribute to trust.

Second, H3 (ISAC → EP) was supported ($t = 2.67^{**}$), but H4 (ISAC → TR) was not supported ($t = 1.52$). The findings suggest that, within the neutral group, information systems assurance capability contributes to expectation for performance but does not significantly shape trust.

Third, H5 (COL → EP) was supported ($t = 2.25^*$), whereas H6 (COL → TR) was supported as well ($t = 5.28^{***}$), indicating that collaboration plays an important role in fostering both expectation for performance and trust among respondents with neutral views of RFID.

Lastly, with regard to RFID adoption, H7 (EP → WA) was supported ($t = 2.59^{**}$), while H8 (TR → WA) was not supported ($t = 1.65$), suggesting that both expectation for performance does not increase willingness to adopt RFID and trust significantly increase willingness to adopt RFID within the positive viewpoint group. In addition, H9 (TR → EP) was supported ($t = 2.81^{**}$), demonstrating that trust positively influences expectation for performance even within the neutral group.

4.5. Analysis of Negative Aspect

In addition, looking at the explanatory power of the negative group, the explanatory power was found to have sufficient explanatory power for RFID adoption.

Looking at the PLS-SEM results of the negative group, H1 (RC → EP, $t = 0.39$), H2 (RC → TR, $t = 1.57$), H3 (ISAC → EP, $t = 0.13$), H4 (ISAC → TR, $t = 0.65$), H5 (COL → EP, $t = 0.46$), H6 (COL → TR, $t = 0.64$), H7 (EP → AW, $t = 1.73$), H8 (EP → TR, $t = 0.31$) and H9 (EP → EA, $t = 1.17$) were rejected. As a result, all hypotheses were rejected. It was found that there were no significant causal relationships among RFID capability, performance expectations, information systems assurance capability, trust, collaboration, and willingness to adopt RFID.

5. Conclusions

5.1. Discussions

This study examined the characteristics of RFID adoption by comparing positive, neutral, and negative viewpoints. The key findings and interpretations are as follows.

First, for the overall sample, RFID capability significantly influenced EP and TR, whereas ISAC did not. This suggests that employees' operational familiarity and perceived competence with RFID plays a more critical role than the stability of the IT infrastructure. In early-stage or pre-adoption environments, employees tend to rely more on their perceived readiness rather than organizational system readiness, which explains why RFID capability—but not ISAC—drove EP and TR. Collaboration (COL) significantly influenced both EP and TR, indicating that RFID adoption is fundamentally a relationship- and process-coordination issue, rather than a purely technical deployment. TR and EP both increased willingness to adopt, highlighting that adoption is more strongly driven by perceived organizational benefits and psychological

confidence than by system assurance.

Second, in the positive group, ISAC again did not predict EP or TR. Because these respondents already hold favorable attitudes toward RFID, information system assurance capability becomes less salient, and their trust is shaped more by RFID capability and inter-firm collaboration. The strong influence of COL on both EP and TR suggests that even enthusiastic users depend heavily on visible cooperation, data sharing, and supply chain alignment to form confidence in RFID. This aligns with SCM literature, which emphasizes that technologies like RFID create value only when embedded in collaborative networks.

Third, in the neutral group, ISAC significantly predicted EP but not TR. This group does not possess strong initial opinions, so system reliability plays a larger role in shaping performance expectations, but is insufficient to build trust. RFID capability increased EP but not TR, implying that technical readiness alone is not enough to generate confidence. COL again strongly influenced both EP and TR, reinforcing that business process integration and inter-organizational alignment are central mechanisms through which neutral stakeholders evaluate RFID. For this group, EP had a slightly stronger effect on WA than TR, suggesting that when attitudes are undecided, pragmatic performance expectations outweigh emotional or relational trust.

Fourth, in the negative group, none of the hypotheses were supported. From a psychological and behavioral perspective, this suggests the presence of a cognitive resistance barrier, in which negative attitudes inhibit the formation of performance expectations or trust regardless of organizational capability. This aligns with cognitive-behavioral theory, which posits that strong negative cognitions restrict individuals from processing or accepting new information. As a result, even high levels of capability, system assurance, or collaboration fail to influence EP, TR, or WA of RFID. In this group, willingness to adopt of RFID is so low that it effectively blocks all cognitive pathways

5.2. Implications

From the empirical results discussed above, this study provides several meaningful implications.

First, the attitude of organizational members is crucial in RFID adoption. The positive and neutral groups demonstrated distinctly different perceptions of RFID compared to the negative group, suggesting that internal viewpoints substantially influence adoption dynamics. Across groups, the findings indicate that companies should prioritize collaboration among supply chain partners and strengthening organizational members' RFID capability when pursuing implementation.

In addition, expectation for performance (EP) was found to play a more influential role than trust (TR) in driving WA

of RFID. This implies that firms should design RFID implementation strategies centered on creating tangible performance outcomes, as higher EP directly increases adoption willingness. In other words, when employees clearly recognize the performance benefits enabled by RFID, organizations are better positioned to proceed with successful implementation.

Furthermore, this study highlights the importance of examining RFID adoption through an academic lens that fully considers situational characteristics. These results contribute to theory by demonstrating the necessity of developing context-sensitive RFID strategies and by offering a conceptual foundation for advancing future research on RFID implementation across varying organizational environments.

Second, this study proposes an RFID implementation strategy that incorporates both technical and managerial factors. The empirical findings emphasize that, in practice, business-oriented considerations outweigh purely technical ones in determining successful adoption. Thus, effective RFID strategies should integrate supply chain collaboration, organizational readiness, and performance-driven planning rather than relying exclusively on technological capability.

These insights provide academic implications by demonstrating that future research on RFID adoption must account for both technological and managerial dimensions. The study also offers a foundation for promoting ongoing scholarly work on comprehensive RFID implementation strategies.

5.3. Limitations and Research Directions

This study has several limitations that provide opportunities for future research.

First, the data used in this study were collected from a survey company's panel. This limits the generalizability of the findings, and caution is needed when applying these results to real-world business contexts involving RFID implementation. Future research should adopt more systematic and diverse data collection methods to enhance external validity.

Second, this study surveyed employees from firms preparing to adopt RFID technology. Respondents were classified into positive, neutral, and negative perception groups, and group differences were examined using the PLS-MGA (partial least squares multi-group analysis). However, no statistically significant differences were observed across the three groups, as shown in Appendix 2. One possible reason is the relatively small sample size within the negative-perception group. Another factor may be the heterogeneity of firms across a wide range of industries. Therefore, future research should collect a more balanced sample across the three viewpoints within a specific industry

context and conduct more rigorous group comparison analyses.

Third, the results of this study were based solely on organizational members' perceptions of RFID implementation. As such, differences in willingness to adopt (WA) related to varying levels of RFID knowledge were not considered. Moreover, RFID implementation strategies may differ substantially across organizations. This study did not account for firms' financial characteristics or organizational conditions, which may influence RFID adoption. Future studies should design research models that incorporate organizational characteristics such as technological readiness, financial capability, or internal process structure.

Fourth, RFID systems in companies typically operate through integration with existing information systems. Therefore, the situational characteristics of a firm's IT infrastructure play an important role in RFID adoption. However, this study did not incorporate the specific IT environments of firms preparing to adopt RFID, representing a limitation. Future research should incorporate a broader range of IT contextual variables to better reflect the technological conditions influencing RFID adoption.

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Declarations Ethics

Approval and Consent to Participate

This study did not involve human participants or animal subjects.

Competing Interests / Conflicts of Interest

The authors declare that they have no competing interests.

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Author Contributions

Dr. Lim designed the study, conducted the survey data analysis, and wrote the initial draft. Dr. Yoo fundamentally revised and rewritten in the research process.

Data Availability Statement

The datasets used during the current study available from the authors on reasonable request.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

The first author used ChatGPT for the translation of the

initial draft. And, during the revision process, the manuscript was fundamentally revised and rewritten by the authors.

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Appendixes

Appendix 1: Sample Information

Features	Distribution	Frequency	Percent
Age	20-29	80	32.00%
	30-39	80	32.00%
	40-49	57	22.80%
	Over 50	33	13.20%
Business Types	Machine	24	9.60%
	Metal-related	20	8.00%
	Electrical & Electronic	71	28.40%
	Textiles	8	3.20%
	Chemical	5	2.00%
	Food and beverage	15	6.00%
	Miscellaneous goods	1	0.40%
	Distribution and retail	30	12.00%
	Non-metals	7	2.80%
	Service	57	22.80%
	Logistics	12	4.80%
position	Employee	95	38.00%
	Chief of staff	13	5.20%
	Deputy employee	38	15.20%
	Chief of a department	31	12.40%
	Deputy director	14	5.60%
	Team leader	24	9.60%
	Head of department	23	9.20%
	Executive	8	3.20%
	CEO	4	1.60%

Features	Distribution	Frequency	Percent
employee size	Under 100	100	40.00%
	Under 500	67	26.80%
	Under 1,000	30	12.00%
	Under 5,000	19	7.60%
	Under 10,000	10	4.00%
	Over 10,000	24	9.60%
work experience	Under 5 years	104	41.60%
	Under 10 years	67	26.80%
	Under 15 years	34	13.60%
	Under 20 years	22	8.80%
	Under 25 years	12	4.80%
	Under 30 years	4	1.60%
	Over 30 years	7	2.80%

Appendix 2: PLS-MGA Analysis (Difference)

	DIF (NEG- NEU)	2-tailed (NEG vs NEU)	DIF (NEG- POS)	2-tailed (NEG vs POS)	DIF (NEU- POS)	2-tailed (NEU vs POS)
(H1)	-0.036	0.865	0.182	0.579	0.218	0.133
(H2)	0.488	0.172	0.330	0.339	-0.158	0.315
(H3)	-0.168	0.627	-0.001	0.985	0.167	0.263
(H4)	-0.434	0.311	-0.275	0.477	0.159	0.287
(H5)	0.037	0.776	-0.030	0.937	-0.066	0.631
(H6)	-0.167	0.852	-0.118	0.927	0.049	0.739
(H7)	0.224	0.479	0.151	0.615	-0.072	0.682
(H8)	-0.162	0.758	-0.120	0.838	0.041	0.821
(H9)	0.270	0.504	-0.045	0.983	-0.315	0.021*

※ Difference=DIF, Negative=NEG, Positive=POS, Neutral=NEU