

## Adaptation of RFID Technology in Business Supply Chain Success: Empirical Findings from a Developing Country Logistic Industry

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### Abstract

*RFID has a significant impact on operational activities and is considered as an enabler for the development and support in becoming a lean organization in a highly dynamic business environment. The aim of this study is to examine the significant perceived factors, other than cost, which can enable a firm's supply chain system to adopt RFID technology successfully. The study is quantitative in nature. Primary data of 350 managers were analyzed. Data was collected through a structured questionnaire. Factor analysis and multiple regression analysis were used to examine the hypotheses. Empirical findings overall supported the TOE framework and Diffusion of Innovation theory. Analysis of perceived factors suggested that technological, organizational and environmental factors may influence on adaptation of RFID in successful SCM systems. Moreover, in-depth analysis shows that explicitness of RFID technology, encouragement for innovation, and environmental uncertainty are significant and positive predictors of adaptation of RFID. This research contributes empirical findings to help managers of large scale firms to consider studied factors in adaptation of RFID technology in their firm. Since very few firms have implemented RFID in supply chain process. Hence this study provides them a holistic picture which helps them in formulating a concrete strategy.*

**Keywords:** RFID, business success, technology adoption, technology-organization-environment framework, diffusion of innovation theory.

### 1. Introduction

Last decade witnessed increase in the usage of Radio Frequency Identification (RFID) of objects (Fuhrer, Guinard and Liechti, 2006). Earlier, Barcodes systems were in practice in organizations which has some limitations. However, RFID technology changes the face of organizational system due to its efficiency and vertical integration. This system detects the retrieve data remotely by using tags known as RFID tags or transponders. Thus the Radio frequency reader or transceiver receives the information by transformation of energy of radio frequency from the RFID chips.

This technology helps organization to integrate their supply chain systems. Huber et al. (2007) explored the linkage between dilemma of retailer and solutions provided by RFID solution providers to reduce product shrinkage. Hence needs and wants of stakeholders are satisfied by the adaptation of an RFID technology. Moreover, recently Global Standards One (GS1) recently endorsed the Generation 2 RFID and Electronic product code (EPC) which has positive impact on implementation of RFID technology in industries. However, organizations are still facing number of challenges that resist widespread adoption of RFID in retail industry. It includes cost of RFID implementation, lack of customer education, and unawareness with technology, these factors are at the initial stage of cycle of adoption in terms

of supply chain.

The significance of RFID is vital when combined with EPC. This combination provides the solution to the challenges faced by organization in the field of manufacturing, logistics, distribution, retail and security (Schuster et al. 2007). RFID technology is already being used in different industries. Adoption of new technologies and innovations are in practice by many organizations in order to take accomplish competitive advantage and to transform the processes inside and outside towards automation. These implementations act as strategic tool for benefit of any organization. Real time tracking, scheduling, planning, fast data sync and reporting etc. are few challenges which organizations are facing in supply chain and trying to overcome and automate these challenges, organizations are look forward to adopt innovative technologies which in the end gives competitive advantage in the market and effective and efficient performance. RFID technology benefits in reduction of costs, it enhance supply chain management effectiveness by boosting the ability to track goods and activities, distribution management and as well as monitoring theft prevention (Coustasse, 2013).

RFID technology provides featured alternative approaches in supply chain (Schmidt, Thoroe and Schumann, 2013). RLTS (Real-time Location Systems) locate objects in term of triangulation through implementation RFID (Radio Frequency

Identification) technology. Barcode provide elementary fall back scenarios, having operational differences. Organizations can overcome these flaws with the intervention of RTLS. RTLS entail RFID application along with the change in business design to overcome all the backflows, which enhance the performance of an organization.

RFID reduce labor cost since it has an ability to detect many objects at a time, unlike to barcode technology, so there's no need of a person to scan all the products individually (Hansen and Penasa, 2014). Automatically this may reduce the errors because of low human intervention also the expenses due to errors. RFID also helps in reduction of theft of products because it generates an alarm siren if someone may try to theft that product. RFID technology also ensure the product quality like organizations can monitor in manufacturing process as well as in supply chain process. RFID tags have an ability to store large amount of data due to its large storing capacity which helps in reduction of errors along with the security of RFID tags which is not easy to copy.

Many studies found cost of implementation as a major factor. However, there are several different factors of adoption cost which effect the adoption of RFID technology it includes development cost, initiation cost, switching cost, cost of capital, market uncertainty cost, implementation cost, relational cost and ethical cost (Smart, Bunduchi & Gerst, 2010). Internal development cost influenced large scale in AID labs, external development cost influenced adoption on driving efforts (retailers and suppliers) of an organization. Direct and indirect implementation cost have significant influence on adoption and Ethical cost can be considered but there's no significant influence on adoption of RFID technology.

In context of the above discussion research illustrated the influence of (RFID) Radio Frequency Identification implementation on operational activities enhance efficiency of organization and inventory control (Visich et al., 2009). Technological, environmental and organizational factor are considered to be the significant predictor in adopting RFID (Lin & Ho, 2009) Hence this study examine the level of significance of perceived factors which can affect the willingness in adoption of RFID technology in a successful supply chain management system.

## 2. Literature Review

RFID is general concept of technology to identify the object through radio waves (Auto-ID Center, 2002). RFID technology can assist in many entities and organizations, like patients and hospitals, customer/consumer and retailers, distributors and manufacturers all over the supply chain to understand effective and efficient productivity. RFID technology, especially in retail and logistics industry, offers a promise to close some of the information gap in the supply chain. As peripatetic technology, RFID can be used to enable real-time visibility and "free method" in the supply chain (Angeles, 2005).

A growing interest in RFID applications across all industries in the supply chain has been noticed (Sabbaghi and Vaidyanathan, 2008). Complete conspicuousness of accurate data of inventory throughout the entire supply chain to retail from producer to the store of factory warehouse, which brings opportunities for transformation and improvement of various processes of the supply chain.

RFID technology has copious benefits for consumer, retailers and suppliers over conquering the bar code technology. Few of these advantages include enhanced security, business operations' efficiency, customer service, inventory management & visibility and reduced costs for logistical operations (Collins et al., 2010).

Research findings suggested that RFID technology has association with supply chain information it enhance organization's TQM and JIT capabilities resulting in enhancement of organizational performance (Pamela et al., 2014).

## 2.1. Technology factor

### 2.1.1. Explicitness of technology

Information regarding innovation, latest technology plays a vital role in adoption of any relevant technology. Several studies have been done in past to analyze the impact of Explicitness of Technology to the acceptance of Radio Frequency Identification (RFID) technology.

Explicitness of Technology that is rendering to the amount of technology that can be codified and conveyed (Tsai and Ghoshal, 1998). Taylor and Murphy (2004) discussed the barriers to adopt e-business technology in small medium enterprise (SME) along the factors which support in adoption of ICT and e-business technology and concluded that accurate, clear information about the technology has positive attitude in adoption which means Explicitness of Technology has positive impact on willingness to adopt e business technology and ICT.

Further research had been done by Lin and Ho (2008) on intentions to implement green innovations by LSP (Logistics service providers). They studied about the variables which can effect in adoption of technology. They conclude with the positive relation between the willingness to embrace green innovation and explicitness of green innovative technology. This research found that high level of explicitness of innovation i.e. green practices which can support the transmission of technical knowledge which increase willingness to implement green practices.

After a year Lin & Ho (2009) studied enrapt on explicitness and accumulation of technology and found that it can assist in transferal of knowledge with-in a firm which escalate the willingness to implement RFID technology. To rise the company's implementation aim, the RFID solution providers may enhance the explicitness of RFID technology. However, some barrier in adoption of RFID technology can limits the maximum output which include lack of technical knowledge, skills and expertise and technical knowledge is essential in implementation of any innovative technology from different information sources (Golding, Papastathopoulos and Tennant, 2011).

### 2.1.2. Accumulation of technology

Accumulation of Technology rendered to amount of relevant technologies that an organization obsessed (Simonin, 1999). Its decisions are made conjointly and information found at early stage and implementation decision process in later stages (Wozniak, 1993). However there's positive impact of information and Accumulation of Technology in willingness to adopt latest technology.

Research found that intriguing was that the existence of RFID knowledge within enterprise does not seem to devour to effect on the anticipated time of execution. An elucidation for this might be the accumulated knowledge which has no meaning to enterprise if the compatible products are unattainable or not technically mature or still extravagant to allow for a progressive return on investment (Tellkanp et al., 2006). Analogous to that, the reason for the influence of accumulation of technical knowledge on the perceived benefits escalate the willingness to adopt RFID technology. While perceived benefits establishes the inspiration for the acquisition of knowledge, which itself not adequate for premature implementation.

According to Lin and Ho (2009) companies can enhance their aptitude of implementing RFID technology by accumulating technologies correlated to RFID, encouraging and ancillary their team members (employees) to absorb latest technology, training and enlightening team members to become skillful educated employees. Indeed there's optimistic association amongst the experiences of bar code technology usage with inclination to implement RFID technology. Accumulation of Technology can assist in the transfer of knowledge within enterprise, which enhance the competence level to adopt any innovative technology through enlightening, training and development of their employees (Al-Zoubi et al., 2011).

## 2.2. Organizational factor

### 2.2.1. Encouragement for innovation

Higher management plays a vital role in adoption of RFID. Organization has to apply the essential efforts to reduce the internal resistance, fortifying essential resources, strategic planning, endorsing and encouraging their employees and building up the trust between their stakeholders, trading partners in order to take fruitful decision regarding adoption of RFID technology (Wu & Subramaniam, 2011). Furthermore, technology adoption competences can be enhanced by supporting and encouraging employees to adopt ICT in organizations (Zailani et al., 2006). According to Talukder, Harris and Mapunda (2008) management and incentives are key factors for smooth adoption processes. Managers are required to handle carefully on unveiling commitment to assist support and resources for innovative technology adoption. Perception of support from management, personal advantages behind the implementation/usage of innovative technology and allocation of adequate resources have positive attitude in implementation and usage of innovative technology. This contention was supported by Lin & Ho (2009) when found in their research that top management encouragement towards the innovation or innovative ideas give support and motivation to adopt new innovative logistics technology like RFID technology which enhance the overall supply chain performance. Furthermore, financial resources, institutional factors, strategic factors and technological factors along with company size and top management assist are essential characteristics of an organization which could influence willingness to adopt RFID technology among employee (Quetti and Pigni, 2012)

### 2.2.2. Quality of human resource

Technology adoption competences can also be increased by educating, instructing, training and developing their team members to adopt ICT. Organizational learning and knowledge management factors can effect e-business adoption (Lin and Lee, 2005). Researcher found that these factors are diligently associated to the level of adoption of e-business system, however, knowledge sharing didn't affect the level of e-business system adoption (Zailani et al., 2006).

Moreover, the influence of individual differences, which include gender, age, personal innovativeness and computer experience, on adoption of technology has also significantly affect (Yi, Wu and Tung, 2005). Innovation in organizations need to be integrated in work process of a firm are of little worth, if they are not implemented by employees (Talukder et al., 2008) training, support and incentive are considered to be the most significant organizational factor which can help in explaining the technology adoption among employees. Since training is directly related to the usage of technology hence training and educational sessions increase the awareness which enhance the competency level of using innovative technology in early stage of adoption. Learning by doing are coming from the educational institutes which provides the training sessions, campaigns, seminars and awareness programs regarding innovative technology (Goswami, Teo and Chan, 2008). Moreover, perception that implementation of RFID technology can be considered as progression in acquisition of learning options, which act as a driver in better decision making and enhance the possibility of achievements of their mission, vision and goals when the organization adopt the technology for applications which are more advanced.

Weng & Lin (2011) argued on the quality of human resources along with the encouragement for innovative ideas under the organization factor which has effect on willingness to adopt RFID technology. Competence level of innovative ideas, learning capabilities of resources and their availability plays key role in adoption of innovation. Hence organization who focused on

the training and development sessions and compose the systems which enlightened the adoption of innovation are more likely successful in adaptation.

## 2.3. Environmental factor

### 2.3.1. Governmental support

Government regulation have positive and negative affect on technology adoption (Scupola, 2003). Several researches have been reported the contribution of government to adoption of e-commerce and the implementation by conducting informational training sessions, campaigns and educating them to enhance the awareness of technology, financial support along with enhancing skill set and facilitating the local market to access the related technology.

Government policy embraces government's training curriculum, financial support, specification and policy stability (Chang et al., 2006). Zailani et al. (2006) found that by providing support, encouragement policies and resources can influence in reinforcement of technology adoption. Government support in terms of finance, provide trial projects along with break in taxes to support the acceptance of technology practices implementation in organizations (Lin and Ho, 2008). Governmental regulation is a key driver for environmental management hence government efforts to guide and encourage organization in adoption of technology innovation plays significant role (Weng and Lin, 2011; Lai et al., 2014).

### 2.3.2. Environmental uncertainty

Environmental Uncertainty viewed as most pertinent environmental characteristics which affects decision making in a firm (Li and Atuahene-Gima, 2002). Environmental Uncertainty denoted as unpredictable and recurrent deviations in technological development, customer preference and competitive behavior perceive by the management.

Zhu and Weyant (2003) argued that the cost and demand uncertainty have a tendency to enhanced organization's intentions in adoption of innovative technologies. General market uncertainty can induce organization to act more antagonistic under certain conditions. They also argued that the impact of asymmetric information on private cost change the strategic behavior between the competitors which tends towards the surprising but interesting results that having accurate and enriched information could actually hurt an organization. Hence environmental uncertainty and adoption of innovation positive related (Naranjo-Gil, 2009).

Moreover, companies which are non-familiar with RFID technology and are on adoption stages are dependent on environmental uncertainties and competitive pressure (Jang, 2010). Researcher found the negative relationship between readiness to implement RFID innovative technology and environmental uncertainty.

Likewise, there is a negative connotation between adoption of innovation and perceived environmental uncertainty since the market uncertainty impact on adoption of RFID and found negative association with the adoption of technology (Lai et al., 2014). Further, decision of adopting RFID technology is independent on the competitors' decision making (Weng & Lin, 2011).

## 3. Method

### 3.1. Theoretical framework

This study empirically test a model for willingness to adopt RFID technology based on Technology-organization-environment framework from Innovation technology and Information System (Tornatzky and Fleischer, 1990). According to Rogers (2003) Diffusion of Innovation Theory best suitable to explain the

how, why and to what extent technology feast through different cultures. Wang et al., (2010) adopted Diffusion of Innovation Theory and TOE framework which elucidate association between the technology (advantage, readiness, and compatibility), organization (competence, firm size, top management support) and environmental factor (environment, trading partner pressure, information intensity, competitive pressure). Oliveira and Martins (2011) concluded the support of TOE framework and DOI theory with technology, organization and environmental factors that influence adoption of technology.

DOI theory and TOE framework support the research model for this research study which aims to identified the factors which have influence in the technology adoption i.e. RFID technology. These factors includes accumulation of related technology, explicitness of RFID technology, Environmental Uncertainty and Governmental Support, Quality of Human Resources, and Encouragement for Innovation. In context of the above discussion the proposed model is as follows:

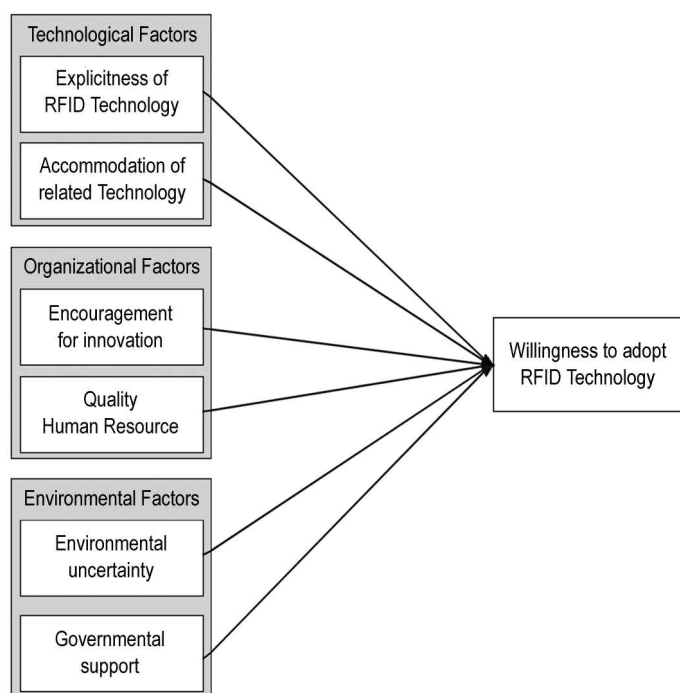


Figure1. Research framework

### 3.2. Research strategy

This research is quantitative in nature and examined the causal relationship between technological, organizational and environmental factors with willingness to adopt RFID technology. Primary data was collected through self-administered survey. Convince sampling method was used to collect the data. Total 350 senior managers were participated in this study. The already tested research tool was adopted for this research. Seven variables, which includes willingness to adopt RFID (04 items), explicitness of technology (04 items), accumulation of technology (03 items), encouragement for innovation (04 items), quality of human resource (04 items), governmental support (04 items) and environmental uncertainty (04 items). All items were scored on a five-point scale ranging from "1 = strongly disagree" to "5 = strongly agree".

### 3.3. Respondent profile

The respondents were senior managers working in 22 different sectors. The participation comprises 85% male and remaining 15% female. Moreover, among these companies 6% were operating since less than five years, 8.3% were operating between six to ten years, 26% were operating between 11 to 20

years and 57.7% were operating more than 20 years. In term of number of employees, 13.4% companies have less than 50 employees, 10.6% companies have 51-200 employees, 15.4% have 201-500 employees, 20.6% have 501-1000 employees and 38.9% have more than 1000 employees. In terms of experience in bar code technology, 35.4% companies don't have any experience and 63.4% companies have experience in bar code technology

### 3.4. Hypotheses

In relationship with the research framework, presented in figure 1 and literature review, presented in section 2, the following hypotheses are developed to examine the relationship among selected variables.

- H<sub>a1</sub>: Higher the explicitness of RFID Technology, higher the willingness to implement RFID Technology
- H<sub>a2</sub>: Higher the accumulation of related Technology, higher the willingness to implement RFID Technology
- H<sub>a3</sub>: Higher the Encouragement for Innovation, higher the willingness to implement RFID Technology
- H<sub>a4</sub>: Higher the Quality of Human Resource, higher the willingness to implement RFID Technology
- H<sub>a5</sub>: Higher the Environmental Uncertainty, higher the willingness to implement RFID Technology
- H<sub>a6</sub>: Higher the Governmental Support, higher the willingness to implement RFID Technology

### 4. Results and discussion

This sections report the empirical assessment of the hypotheses mention in section 3.4. To measure the reliability of the adopted questionnaire Cronbach's Alpha test was used to ensure that the values are greater than 0.7 (Sekaran, 2006). Cronbach's Alpha test confirmed that all variables are well above the standard level.

The total variance percentage is 66.29% which is above the standard. Table 1 shows Rotated Component Matrix in Factor Analysis it is concluded that all the variables have four components except Explicitness of Technology which has 3 elements and these components are independent to each other. These items are computed as one component on the basis of factors which are computed for further analysis correlation and multiple linear regression.

Table 2 shows the model summary, it is mentioned that that Durbin-Watson value 1.850 which lies in the standard range (1.5-2.5), hence concluded that there's no auto correlation. Results also elaborate the combine effect of independent variables on dependent variable which is described by coefficient of regression by adjusted R square. 0.277 hence 27.77% variance of Willingness to adopt RFID technology explains by independent variables EU (Environmental Uncertainty), EOT (Explicitness of Technology), GS (Governmental Support) and EFI (Encouragement for Innovation).

Table 3 represents the result of ANOVA. This table shows the significance level of independent variables that there's significant impact of EU (Environmental Uncertainty), EOT (Explicitness of Technology), GS (Governmental Support) and EFI (Encouragement for Innovation) on Willingness to adopt RFID technology.

Table 4 shows that Tolerance and VIF columns described the assumption of multi co-linearity. Tolerance value should be greater than 0.3 and VIF should be less than 10. Hence proved that there's no multi co-linearity.

Results in table 4 also confirm that H<sub>1a</sub>, H<sub>3a</sub>, H<sub>5a</sub> and H<sub>6a</sub> are accepted whereas H<sub>2a</sub> and H<sub>4a</sub> are rejected and conclude that these two variables are insignificant in model. The results show that four variables Explicitness of Technology, Encouragement for Innovation, Governmental Support and Environmental Uncertainty have significant impact on Willingness to adopt

# QUALITY MANAGEMENT

KMO and Bartlett's Test = 0.777

Bartlett's Test of Sphericity (4458.129, df=391, sig. 0.000)

	Component							Cronbach's Alpha
	1	2	3	4	5	6	7	
GS_1:	0.905							
GS_2:	0.895							0.891
GS_3:	0.838							
GS_4:	0.821							
Efl_1:		0.789						
Efl_2:		0.754						0.812
Efl_3:		0.705						
Efl_4:		0.642						
EU_1:			0.773					0.751
EU_2:			0.729					
EU_3:			0.704					
EU_4:			0.532					
RFID_1:				0.832				0.82
RFID_2:				0.783				
RFID_3:				0.762				
RFID_4:				0.525				
EoT_1:					0.824			
EoT_2:					0.728			0.77
EoT_3:					0.692			
EoT_4:					0.587			
QoHR_1:						0.809		
QoHR_2:						0.748		0.762
QoHR_3:						0.748		
QoHR_4:						0.405		
AoT_1:							0.821	
AoT_2:							0.800	0.705
AoT_3:							0.706	

Table 1. Factor and reliability analysis

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.445 <sup>a</sup>	0.198	0.196	0.50338	
2	.490 <sup>b</sup>	0.24	0.236	0.49059	
3	.514 <sup>c</sup>	0.265	0.258	0.48349	
4	.535 <sup>d</sup>	0.286	0.277	0.47715	1.850

Predictors: (Constant), EU, EOT, GS, EFI  
Dependent Variable: RFID

Table 2. Model Summary

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	30.433	4	7.608	33.418	.000 <sup>e</sup>
Residual	76.042	334	0.228		
Total	106.475	338			

Predictors: (Constant), EU, EOT, GS, EFI

Table 3. ANOVA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
Variables in Model	Constant	1.809 <sup>a</sup>	0.276		6.548	0		
	EU	0.35 <sup>a</sup>	0.05	0.343	6.964	0	0.881	1.135
	EOT	0.187 <sup>a</sup>	0.046	0.2	4.049	0	0.873	1.146
	GS	-0.135 <sup>a</sup>	0.042	-0.148	-3.172	0.002	0.988	1.012
	EFI	0.144 <sup>a</sup>	0.046	0.152	3.156	0.002	0.916	1.092
Excluded Variables	QoHR	-0.101 <sup>b</sup>			-1.882	0.061	0.743	1.346
	AOT	-0.009 <sup>b</sup>			-0.193	0.847	0.904	1.107

a. Dependent Variable: RFID  
b. Predictors in the Model: (Constant), EU, EOT, GS, EFI

Table 4. Summary of Regression Analysis for Variables (N=350)

RFID technology. Model shows that there's positive relation of Willingness to adopt RFID Technology with Explicitness of Technology, Encouragement for Innovation and Environmental Uncertainty and negative relation with Governmental Support.

$$\text{RFID} = 1.809 + 0.187 (\text{EOT}) + 0.144 (\text{EFI}) - 0.135 (\text{GS}) + 0.35 (\text{EU})$$

This study supports previous researches related to Explicitness of Technology influence and found positive influence on willingness to adopt RFID technology. Higher level of explicitness resulted in knowledge/information sharing which have direct impact on willingness to adopt technology (Zialaniet et al., 2006). Lin and Ho (2009) studied in China the positive association of Explicitness of Technology on willingness to adopt RFID technology. In Pakistan study found no significant influence of Accumulation of Technology on willingness to adopt RFID technology. This study also support the findings of Al-Zoubi et al. (2011), Taylor and Murphy (2004) and Lin and Ho (2009) and found positive relation of Accumulation of Technology with willingness to adopt RFID technology, this might be due to several reasons, one basic reason seems that these states are more developed states in comparison with Pakistan, developed countries have more advanced systems, and technology which can easily accumulate any new technology. Difference may be occurred because of different states as well as the company size. Major portion of respondents of this study based on the companies which have employees more than 1000 which is also different in comparison with Lin and Ho (2009).

The second factor of this study is organizational factor, which comprises of two variables Encouragement for Innovation and Quality of Human Resources. Findings of this study related to organizational factor is somehow in line with past researches like Wu and Subramaniam (2011), Talukder et al.(2008), Weng and Lin (2011) and Quetti and Pigni (2012) that top management support in terms of appreciation, rewards, helps employees when they face any problem, encourage to learn any new information or any kind of support have positive influence on willingness to adopt technology in Pakistan as well in term that higher the encouragement for Innovation higher the willingness to adopt RFID technology. Whereas this study examined no significant effect of Quality of Human Resource on willingness to adopt RFID technology unlike Yi et al.(2005) and Weng & Lin (2011) which found influence of Quality of Human Resource on willingness to adopt technology however Estrin, Foreman and Gracia (2003) concluded that internal stakeholders including owners, managers, and employees are busy in their operational activities, they are occupied by multiple tasks, responsibilities and have incredible pressure to be highly productive. They feel that they don't have enough time to experiment any new system/technology they are not willing to move towards new system/technologies and keep working with same old technology/system. According to Khilji (2001) Pakistan market is quite different from other countries, in-fact Pakistan's human resource department are not efficient to hire quality resources. Being highly populated state with high growth in Pakistan, this state has large manpower in all different fields. Due to intervention of Pakistan's government in HR policies, organizations face hitches to hire talented candidates in their respected fields which cause many projects failure in Pakistan.

Environmental factor, studied in this study, established influence of both variables i.e. Governmental Support and Environmental Uncertainty on willingness to adopt RFID technology. According to Chang et al., (2006) and Lai et al., (2014) Government plays an import role in any development activity. Scupola (2003) deliberated that government policies have both

negative as well as positive relation with adoption of technology. In Pakistan this study revealed the negative association of Governmental Support towards willingness to adopt RFID technology. Another variable of external factor i.e. Environmental Uncertainty is also contradictory with respect to different states. According to Li and Atuahene-Gima (2002) Environmental Uncertainty plays an important role in decision making of technology adoption. Lin and Ho (2009) revealed the negative association of Environmental Uncertainty with willingness to adopt RFID technology in China logistics industry, researcher also mentioned the reason that might be negative association was there due to small and medium sized organization. Naranjo-Gil (2009) studied the factors which have significant impact of environmental factor (Uncertainty and Market Concentration) on adoption of innovation in public sector organizations which found the positive significant relationship between environmental uncertainties on technology adoption. Whereas in Pakistan this study has more respondents from large sized organizations and revealed the positive association of Environmental Uncertainty with willingness to adopt RFID technology.

There are many differences in the countries with respect to culture, development, capital, environment, nature of human and many other factors. Some of the responses are similar in Pakistan in comparison with other countries and some are in contrast. This study also revealed the presence of willingness to adopt RFID technology based on several factors cost, technology, organization, human resource, environment, government, nature of business and many others, few of them had discussed in this study and found some positive influence on willingness to adopt RFID technology and barrier (Governmental Support) as well.

## 5. Conclusions

The findings provide empirical evidence in support of TOE framework and Diffusion of Innovation (DOI) Theory with technology, organization and environmental factors that influence adoption of technology. This study determined the influence of technological factors on willingness to adopt RFID technology and found explicitness of technology has positive relation with willingness to adopt RFID technology. This study found that encouragement for innovation has positive association with willingness to adopt RFID technology. Moreover, environmental factor have influence on adaptation of technology. RFID technology helps to store data remotely and retrieve that data by using devices. It is an enabler for supply chain management hence in recent times all the industries of supply chain has keen interest in adoption of RFID technology. Usage of RFID technology supports TQM, JIT, and overall operational performance of a firm.

Findings reveal that organizations should more focus on explicitness of technology which help in adoption of new innovative and technology at workplace. Organization should also provide support their team members through rewards, incentives, recognition, and freedom for the innovative employees. This study shows the positive association of encouragement for innovation with willingness to adopt RFID technology.

Lastly, RFID technology has positive influence on efficiency and effectiveness of the production which enhanced supply chain performance along with organizational performance. It benefits the consumer, retailer and supplier which enhance the level of security, customer service, inventory management, operational efficiency, visibility and reduction in operational cost.

**Q-as**

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