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Determinants of Continuance Intention of RFID in Australian Livestock Industry: An Empirical Study

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Abstract

The purpose of this study is to develop and refine a theoretical framework to examine the continuance intention of Radio Frequency Identification (RFID) technology in Australian livestock industry. A mixed-method research approach, consisting qualitative and quantitative, has been taken for this study. The findings of this study show that the continued RFID usage intention is influenced by satisfaction from current use, and confirmation of expectations. As a practical contribution, the findings of this study can be addressed by the Australian agricultural agencies as an acid-test of its current and future mandatory RFID policy. Policymakers can compare their experience with the findings of this study, evaluate the past, and reassess the future. As a theoretical contribution, this study is a first of its kind considering and incorporating 'adoption' in a confirmation-satisfaction framework to examine the continued usage behaviour of RFID.

Keywords

RFID, adoption, confirmation, satisfaction, continuance intention

INTRODUCTION

Radio Frequency Identification (RFID) is an automatic system that uses electromagnetic wave to read object from distance without having a contact and direct line of sight (Moon and Ngai 2008). Because of its extensive capability to track and trace objects, RFID has been popularly used in animal identification and farm management applications. Having pressurised by the important markets, Australia introduced the world's first and largest RFID-based animal identification system, called the National Livestock Identification System (NLIS) in 1999 and made it mandatory in July 2005 (for cattle) (Hossain and Quaddus 2011). The NLIS allows for rapid and accurate tracing of cattle in the event of a disease outbreak which saves the industry from financial losses because, during such a disease outbreak the importing markets immediately stop buying livestock products. As a legal requirement, all Australian cattle farmers have adopted RFID (with a few exemptions). Literature is not significantly loud with mandatory adoption-diffusion process of an innovation/ Information System (IS), except a few (Koh et al. 2010; Adamson and Shine 2003; Sørebø and Eikebrokk 2008, for example) which examine the adoption and continuance processes as discrete events. Scholars argue that though the initial adoption of an IS is important, the long-term viability and its eventual success depend on its continued use (Bhattacherjee 2001; Rogers 1995) and therefore these two decision-variables are related, not discrete. However, to be convinced for continued use, adopters' satisfaction is essential (Oliver 1980; Anderson and Sullivan 1993; Yen and Lu 2008). Most studies on RFID adoption (Cheng and Yang 2007; Lee and Shim 2007; Chang, Hung et al. 2008; Schmitt and Michahelles 2009) and consumer acceptance of RFID (Hossain and Prybutok 2008; Müller-Seitz et al. 2009) have dealt with various factors, dominantly in supply chain and logistics management, but none of those studies went beyond the adoption; the 'continued use' of RFID. Alternatively, the studies dealing with the 'continuance intention of RFID' concentrate on the *post-adoption* factors, completely ignoring the adoption stage as done by Chen et al. (2008). Chen et al.'s study examined the factors that contribute to the intention to continue using RFID technology in hospitals' emergency rooms. Moreover, though expectation is considered as a fundamental variable of continuance behaviour, no studies took initiative to explore what the adopters expect from an RFID system. This study examines the adoption and post-adoption behaviour of the organisations using RFID technology, taking the Australian livestock industry as the case subject.

The paper is organised as follows. The next section presents the background literature while developing the hypotheses followed by presenting the research method, results of the data analyses, and discussion of the results. This paper concludes with the implication and a conclusion section.

BACKGROUND LITERATURE AND HYPOTHESES DEVELOPMENT

In a mandatory environment as the users have no choice but to use and continue RFID use 'why should we care about study the factors of mandatory adoption then?.' Focusing on the adoption and continuance of IS in a mandatory environment may thus seems as "superfluous" (Sørebø and Eikebrokk 2008), which is not necessarily true. Hartwick and Barki (1994) refuted the assumption and perception that in a mandatory environment there will be little variance among the adopters in innovation usage. In reality the adopter choose different levels of adoption; some just adopt and use for the mandate purpose while others try to use it as much as possible. Thus, the degree of usage can be variable in a mandatory environment (Brown et al. 2002). Moreover, when the use is mandatory the user only can accept it, either reluctantly or whole-heatedly. If the user does not accept the innovation whole-heartedly he/she would suffer from job-dissatisfaction and un-loyalty and could delay or obstruct the implementation, and resent, underutilised or sabotage the innovation (Kimberly and Evanisko 1981; Leonard-Barton 1988; Brown et al. 2002). Similar interpretation is true for organisational adoption too. When government tries to make organisations to adopt an innovation and if the organisations are not convinced to use the innovation, they may label the benefits of the innovation as "hype" and try to convince other organisations against its use. To be convinced with continued RFID use, thus, the adopters' satisfaction is essential (Yen and Lu 2008; Oliver 1980; Anderson and Sullivan 1993). Researchers argue that in a mandatory environment the traditional notion of 'use' or 'adoption' or 'intention to adopt' are not the appropriate dependent variable (DeLone and McLean 1992; Rawstorne et al. 2000; Brown et al. 2002; Sørebø and Eikebrokk 2008), rather, the satisfaction derived from using the mandatory innovation is important. DeLone and McLean (1992) demonstrated that "user satisfaction is probably the most widely used single measure of IS success" (p. 69). This study thus intends to examine 'satisfaction' from and its consequences on RFID use.

One of the most popular theories dealing with the 'satisfaction' and future 'intention to use IS' is the Expectation Confirmation Model (ECM), proposed by Bhattacherjee (2001). ECM is a derivation of Expectation Confirmation Theory (ECT), which is also known as Expectation Disconfirmation Theory (EDT), initially proposed by Oliver (1980). ECT is a very popular theory generally used in marketing and consumer behaviour research to study consumer satisfaction and post-purchase behaviour (Oliver 1980; 1981, Anderson and Sullivan 1993; Oliver 1993). However, to fit into the IS contexts, ECT has been modified into ECM. For a comparative analyses between ECT and ECM, see Hossain and Quaddus (2011b).

ECM is predominantly concentrated on post-acceptance variables (such as 'post-usage expectations' rather than on 'pre-use expectations') because, ECM posits that the post-usage expectations are more important for IS use and "the effects of any pre-acceptance variables are already captured within the confirmation and satisfaction constructs" (Bhattacherjee 2001, p.355). However, scholars argue that the pre-usage expectations should not be underestimated, as has been done by ECM, because these are the basis of the expectation-confirmation process (Khalifa and Liu 2003). Similarly, Oliver and Burke (1999) emphasised that satisfaction is a function of pre-purchase expectations. Therefore, it is important to consider both pre-purchase expectations and post-purchase expectations in an expectation-confirmation process.

The migration from 'expectation' to 'perceived usefulness', as done by ECM, is not also unchallenged. Perceived usefulness, as proposed in ECM, is the perception about the IS that convince the prospective adopters, especially in a voluntary environment. Alternatively, in a mandatory environment, because the adopters are enforced to adopt the IS, they *desire* and/or *deserve* some positive outcomes (expectation) from the IS rather than just relying on the *perceptions*. Whitaker et al. (2007) stated that the "unfortunate" suppliers/producers who are "forced" to adopt RFID technology and had to bear the costs of RFID because of a partner mandate *expect* an early return on their RFID investments. Therefore, expectations are more logical to be considered especially in a mandatory-use setting. Moreover, theoretically, 'confirmation' is the difference between 'what was expected' and 'what is achieved' (Bhattacherjee 2001; Oliver 1980, 1993). Thus, by using the expectation measures the IS researchers may establish a subjective differences between the 'expectation' and 'performance' which can further be confirmed by the 'satisfaction' measures. Moreover, the ECM overstates the role of 'post-usage perceived usefulness' in the 'expectation-satisfaction-continued use' process; 'expectation' is more appropriate which includes diverse set of variables including usefulness, ease of use, compatibility, profit, risk, etc.

ECM defined *confirmation* as "the congruence between expectation and actual performance" (Bhattacherjee 2001, p.359) and removed the *performance* construct of ECT because ECM assumes that the influence of

perceived performance is already explained by *confirmation*. ECM posits that an individual user's intention for continued use of an IS is dependent on three variables: the user's level of 'satisfaction' with the IS, the extent of user's 'confirmation' of perceptions, and 'post-usage perceived usefulness'. The process by which an IS user reaches to continued use decision is as follows (Bhattacherjee 2001). First, after using an IS for a period of time, the user forms a conception of 'perceived usefulness' about that particular IS. Second, the user determines to what extent his/her perception of usefulness about that product/service has been confirmed, by comparing the performance of the product/service to the perception. If the user finds that the IS is as useful as he/she perceived, he/she forms a *notion* of 'satisfaction'. Finally, satisfied users *intend* to continue the usage of that product/service whereas dissatisfied users intend to discontinue the service. However, users' perception of usefulness also drives them directly to 'continuance intention' because when they find an IS is useful to their needs, they do not bother to go though the 'confirmation' process, but rather form a direct intention towards reusing the IS; and vice versa. Moreover, the 'confirmation' has an immediate effect on users' 'satisfaction' as well as a longer-term effect on their 'post-usage usefulness perception' (Bhattacherjee et al. 2008).

The following paragraphs present the theoretical background of the relevant factors for RFID and develop the hypotheses.

It is believed that 'expectation' has a significant theoretical contribution to understand 'satisfaction' judgment (Wu and Padgett 2004). RFID expectations are the expected attributes of RFID that are derived by knowledge as well as through experience (during implementation and use). Among the main expectations trialability, relative advantage (Brown and Russell 2007), complexity, and compatibility (Chang et al. 2008; Schmitt and Michahelles 2009; Shih et al. 2008) are consistently used by the researchers. Some other attributes including profitability, cost, market penetration, and risk and uncertainty are also applicable for RFID adoption (Schmitt and Michahelles 2009; Hossain and Quaddus 2011a). Literature found that expectation influences RFID adoption (Khalifa and Liu 2003).

H1a: Expectation will positively influence RFID adoption.

It has been argued that expectation has a positive influence on confirmation (Anderson 1973) because while raising the expectations about a product may enhance the perception about the performance of the product which also increases the magnitude of confirmation.

H1b: Expectation will positively influence confirmation.

In literature, the effect of expectations on satisfaction is somewhat mixed. In an extension of ECT, named as "the Expectancy Disconfirmation with Performance Model", Oliver and Burke (1999) found a direct and strong effect of *expectation* on *satisfaction.* It is found by the literature that, users' expectation has a direct negative influence on satisfaction (Oliver 1993; Anderson and Sullivan 1993). Other studies found a direct and positive relationship between expectation and satisfaction (Oliver 1980, 1981; Churchill and Surprenant 1982). In this current study, it is posited that the more the adopters expect rationally from an RFID system the more they satisfied are, compared to those who do not have any expectations or less expectations from RFID.

H1c: Expectation will positively influence satisfaction.

In the context of RFID, because of its novelty and complexity, people may have *desires* from RFID technology during the pre-adoption stage but the realistic *expectations* are generated after using the technology, at least in a pilot stage. Like an IS, some expectations (about an RFID system) can also be developed/modified at the adoption stage when, for example, the adopters find that the RFID system is reaching to a considerable critical-mass. Therefore, the adoption stage itself is vital in examining its satisfaction behaviour. Conceptually, the continuance study ideally should start with the beginning point; the adoption. The examination of the effect of the initial stage on the later stages of the same process is imperative. This approach has been supported by Rogers' Innovation Diffusion Theory (IDT). IDT suggests that, after adopting an innovation, the adopters justify their adoption-decision at confirmation stage, and also reduce the dissonance level by seeking expert opinion. Therefore, the following hypothesis is developed:

H2: Adoption will positively influence the confirmation.

'Confirmation' is the evaluation of *actual experience* with *expectations*. Confirmation results when the perceived performance matches the expectations whereas disconfirmation results from a mismatch. As such, positive disconfirmation is expected to strengthen adopters' subjective response; satisfaction. According to ECT, consumers form a feeling of (dis)satisfaction based on their confirmation level; a moderate satisfaction level will be maintained by confirmation, enhanced by the delight of confirmation, and decreased by the disconfirmation (disappointment). Studies found the confirmation as one of the key variables affecting consumer satisfaction (Oliver 1980; McKinney et al. 2002). Many studies found a strong link between confirmation and satisfaction

(McKinney et al. 2002; Khalifa and Liu 2003; Yen and Lu 2008; Oliver 1980). Moreover, the direct effect of confirmation on continuance intention is also prominent (Yi 1990). Therefore:

H3a: Confirmation will positively influence the satisfaction.

H3b: Confirmation will positively influence the continuance intention.

Satisfaction is defined as "the summary of psychological state resulting when the emotion surrounding disconfirmation expectations is coupled with the consumer's prior feelings about the consumption experience" (Oliver 1981, p. 27). It is treated as a collective outcome of perception, evaluation, and psychological reactions to the consumption experience with a product/service (Yi 1990). Satisfaction is an evaluative response concerning the expectations and confirmation. 'User satisfaction' is considered to be an important research agenda in IS due to its theoretical and practical significance (Khalifa and Liu 2003). Sørebø and Eikebrokk (2008) argued that 'satisfaction' is a more important factor than 'IS continuance intention' in a mandatory environment. Literature suggests that satisfaction is one of the most predictors of users' continued intention of an IS (Müller-Seitz et al. 2009; Khalifa and Liu 2003). Therefore, the following hypothesis is proposed:

H4: Satisfaction will positively influence the continuance intention.

Finally, facilitating conditions, also referred to perceived behavioural control (PBC), is a well-accepted variable considered for usage behaviour, not in intention behaviour though. However, studies that consider PBC as a combination of self-efficacy and facilitating conditions support the influence of facilitating conditions on the intention as well on actual usage (Bhattacherjee et al. 2008). Similarly, Venkatesh et al. (2003) familiarised the facilitating conditions on the intention study. The current study posits that the facilitating conditions influence the continuance intention of RFID. In the current context, facilitating conditions can be defined as the degree to which an organisation believes that its financial, organisational, and technical resources, technical know-how, and management readiness exist to support the use of an RFID system (Venkatesh et al. 2003). Facilitating conditions, here, includes the supply of required facilities without which the RFID cannot be used or its use would be discontinued. The hypothesis is proposed as:

H5: Facilitating conditions will positively influence the continuance intention.

Continuance intention is the dependent variable of this study. Studies indicate that continued usage behaviour determines the success of an IS and the actual usage behaviour is a result of the behavioural intention (Fishbein and Ajzen 1975). Behavioural intention is a measure of the strength of one's intention to perform a specific behaviour (Fishbein and Ajzen 1975, p. 288). In this current setting, intention for continued use of RFID is the outcome of the cognitive process of the organisation whether to use RFID or not. This study, however, deals with the intention not the actual continued use of RFID.

RESEARCH METHOD

Sample and Procedure

The research process for this study involved three distinct phases. First, an extensive literature review was carried out within innovation-adoption domain and then extended into RFID adoption issues. The second phase involved a qualitative field study to enhance the initial research model developed from the literature. For the field study, eight adopters of RFID technology from the Australian livestock industry have been interviewed using semi-structured interview technique. The interview guideline was prepared after having several discussions with Department of Agriculture, Western Australia (DAFWA), Meat and Livestock Australia (MLA), and experts from academic research. The factors from literature survey have been contextualised while a number of context-driven factors have been developed from the field study. In subsequent stages, the explored factors have been identified and were confirmed by the existing literature. Following the procedure of content analysis technique, this study compared the qualitative data with the theoretical framework as well as developed relationship between concepts. For details of the qualitative field study, see Hossain and Quaddus (2011). Based on the literature review and the field study the research model has been developed. The final phase of the research involved a quantitative survey to corroborate the research model.

For the survey, 2500 farms were selected randomly from the DAFWA's database and were invited to attend the survey if they *already have adopted* RFID. The mail survey-form included a web link so that the respondents could alternatively attend the online version. Concurrently, a web link was provided to the Sheep-CRC (Cooperative Research Centres) which they attached with each newsletter to the farms. Therefore, the survey is considered to be conducted in Australia; not constrained into WA and the sample-size and response-rate could not be established. Overall, 229 returned surveys were usable. This 223 satisfied the minimum requirement of data sample. The recommended sample size is ten times the number of items in the most complex formative

construct or the largest number of antecedent construct leading to an endogenous construct in the research model (Barclay et al. 1995). The data were analysed by partial least squares (PLS) based structural equation modelling.

Measures

The six factors described earlier (in Section 2) have been measured with great care. These factors were operationalised first from the literature which was further contextualised through the field study. All constructs have been considered as reflective constructs. The complete list of measures is shown in Table 1. Six-point Likert scale ranging from 'strongly disagree' to 'strongly agree' has been used to measure 20 items. Two items (of adoption) were measured using 'less than 1' to 'more than 5' scale.

Table 1. List of measures and relevant references

Construct	*Measures*	*Sources*
Expectation	Competitive advantage in market Positive return on investment (ROI) Increase labour productivity Increase profit Better faming by accurate information Reduce animal theft	Shih et al. 2008; Bhattacherjee et al. 2008; Venkatesh et al. 2003; field study
Adoption	It is critical to adopt Have been using RFID for <> years Have been using RFID in <> applications	Brown and Russell 2007; Bhattacherjee et al. 2008; Venkatesh et al. 2003
Confirmation	Experience with RFID is better than expected Experience with RFID is *just* what was expected Overall, most of the expectations are met	Bhattacherjee et al. 2008; Bhattacherjee 2001
Satisfaction	We are satisfied with our decision to use RFID Our choice to use RFID was a wise one If to choose it again, we would **not** adopt RFID	Bhattacherjee et al. 2008; Bhattacherjee 2001
Facilitating Conditions	Financial and quality human resource Potential financial profit vs. associated risks Support from external environment External interventions	Bhattacherjee et al. 2008; Venkatesh et al. 2003
Continuance Intention	Intend to continue rather than discontinue RFID use Intention is to use RFID than any alternative way If we could, we would **discontinue** using RFID	Bhattacherjee et al. 2008; Bhattacherjee 2001

RESULTS

Evaluating the Measurement Model

The research model consists of 22 observed variables. As par the PLS procedure (Barclay et al. 1995), this model was tested for item reliability, internal consistency, and discriminant validity to assess the measurement adequacy of the model. The item loading of each item was obtained from the bootstrapping results of PLS. Following the recommendation of Igbaria et al. (Igbaria et al. 1995), one item was discarded with loading below 0.5. The discarded item belonged to the construct 'adoption' and inquired about the duration of RFID use. The revised model with 21 observed variables was again tested using PLS and all items passed the item-reliability test. Internal consistency and the Average Variance Extracted (AVE) of each construct were measured to establish the convergent validity of the constructs. The recommended value of internal consistency is 0.7 or greater (Barclay et al. 1995) and AVE is at least 0.5 (Fornell and Larcker 1981). The results (in Table 2) show that internal consistencies and AVEs of all constructs are significantly high which means that convergent analysis for all constructs of this model is satisfied.

Table 2. Internal consistencies and AVEs		
Latent variable	*Internal consistency*	*AVE*
Expectation	0.927	0.681
Adoption	0.707	0.574
Confirmation	0.780	0.547
Satisfaction	0.908	0.767
Facilitating Conditions	0.880	0.649
Continuance Intention	0.848	0.651

To establish discriminant validity, the square root of the AVE was compared to the inter-construct correlations. According to Barclay et al. (1995), the model is assessed to have acceptable discriminant validity if the square-root of the AVE of a construct is larger than its correlation with other constructs. Table 3 shows that the square root of AVE is greater than the off-diagonal elements across the row and down the column which confirms the establishment of the discriminant validity at the construct level, which means that all the latent variables are different from each other.

Table 3. Correlation of Latent Variables and the Square Root of AVE						
	Expectation	*Adoption*	*Confirmation*	*Satisfaction*	*Facilitating Conditions*	*Continuance Intention*
Expectation	**0.83**[1]					
Adoption	0.403	**0.76**				
Confirmation	0.300	0.565	**0.74**			
Satisfaction	0.272	0.679	0.646	**.88**		
Facilitating Conditions	0.188	0.138	0.148	0.206	**0.81**	
Continuance Intention	0.198	0.568	0.528	0.602	0.075	**0.81**

Testing the Structural Model and Hypotheses

The structural model deals with testing the hypothesised relationships. A bootstrapping procedure was used to establish the significance of the path coefficients and the weights of the dimensions of the constructs. Hypotheses and corollaries testing were performed by examining the sign and significance of the path coefficient, and the weights of the dimensions of the constructs respectively. The results detailing the path coefficients and *t*-statistics are summarised in Table 4. It is observed that hypotheses H1a, H2, H3a, H3b, and H4 were supported (significant *t*-values and path coefficients) while H1b, H1c, and H5 were rejected.

Table 4: Evaluation of the research hypotheses for the antecedent factors			
Hypothesis	*Path Coefficient*	*t-value*	*Result*
H1a: Expectation to Adoption	0.402	7.22	Supported
H1b: Expectation to Confirmation	0.087	1.16	Rejected
H1c: Expectation to Satisfaction	0.085	1.40	Rejected
H2: Adoption to Confirmation	0.531	9.42	Supported
H3a: Confirmation to Satisfaction	0.621	16.25	Supported
H3b: Confirmation to intention for Continued Use	0.241	2.67	Supported
H4: Satisfaction to Continuance Intention	0.457	5.08	Supported
H5: Facilitating Conditions to Continuance Intention	-0.056	0.79	Rejected

$p<0.005$

R^2 for Confirmation = 32.6%, R^2 for Continuance Intention = 39.9%

The results provide a partial support for the research model. One indicator of the predictive power of path model is to examine the explained variance or R^2 values (Barclay et al. 1995). The results indicate that the model explained 40% of the variance of the Continuance Intention, satisfying the required value of 10%. Figure 1 depicts the proposed model.

[1] Bold diagonal elements are the square root of AVE

DISCUSSIONS OF FINDINGS

From the results, generally, it is observed that expectation, confirmation, and satisfaction but the facilitating conditions have significant influence on continuance intention of RFID in livestock farms. The results of the data analyses show that, overall, the research model partially explains the continuance intention of RFID in livestock farms. We now discuss the results in detail.

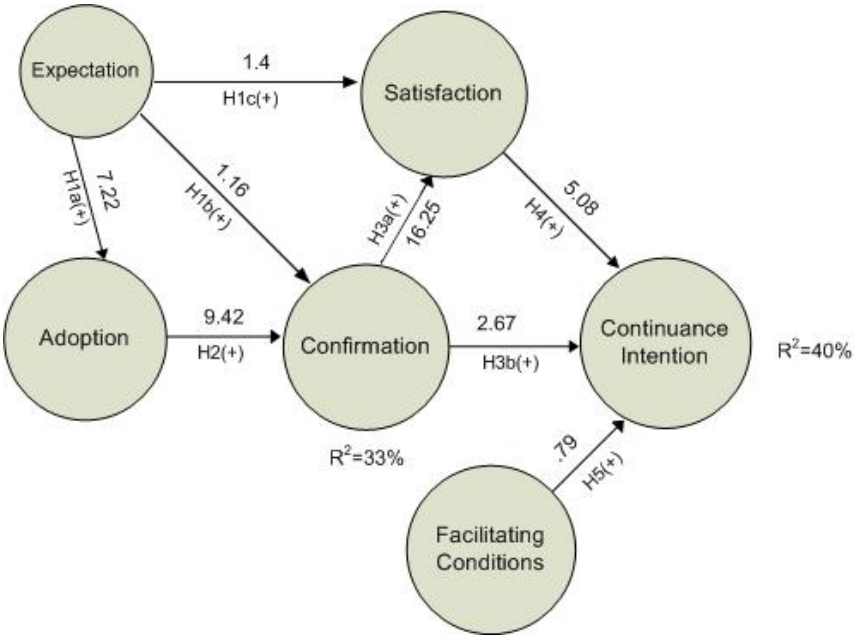

Figure 1. The Continuance Intention Model for RFID

From the field study, it was found that the respondents emphasised more on 'expectations' than what they 'perceive' from RFID-based livestock identification and management system. As raised by the field study, the 'adoption-continued use' process ideally should include pre-adoption expectations as well as post-adoption expectations because the respondents found that the pre-usage expectations are the basis of most post-usage expectations. This is supported by Oliver and Burke (1999). For instance, initially, reducing animal theft was one of the greatest motivations to adopt RFID. Later, the farmers found that RFID tags cannot reduce the animal theft (unless the bolus rumen tags are used, which are least-used and difficult to apply) because the burglars may cut the ear, destroy the RFID tag, and apply a new tag. Thus, the initial expectation is modified. Now the farmers, who want to adopt RFID in sheep management, do not expect anymore that RFID will reduce theft, which is more rational. The inclusion of both pre-and-post types of expectations, thus, improves the measurement of the 'expectation', 'satisfaction', and 'continued usage intention' construct because irrational or irrelevant measurement items (in this case, animal theft) are excluded from the 'expectation' variable.

The findings of this study supported the significant influence of expectation on adoption. This finding was also supported by the field study. The farmers intend to adopt RFID once they realise some expected benefits using this technology. The more they expect, the more quickly they adopt RFID. It is confirmed by the field study that the farms with less information and thus with less expectations were the laggards. However, this study failed to find a relationship between expectation and confirmation. Confirmation is a process-stage where the adopters adjust their expectations and find required actions. Conceptually, the confirmation and expectation are two different facets of the continuance process. Therefore it is not logical to posit that the more the adopters expect, the more likely that their expectations will be confirmed. This finding is supported by Oliver (1980) who also argued conceptually and proved empirically that expectations and confirmation are unrelated.

This current study found that adopters' satisfaction is not influenced by expectations. This finding is supported by Oliver and Bearden's study (1983). This finding implies that satisfaction is the judgment of the organisations in relation to the performance of RFID; the judgment is made through the 'confirmation' process.

This study finds that confirmation is the next-immediate stage of RFID adoption-continuance process. After adopting the RFID technology, the adopters evaluate their adoption decision; whether they are getting the things

which they expect during pre and post-adoption. If they find a mismatch, they intend to either discontinue its use or seek expert advice to restructure their expectation tool. In a mandatory environment, like in our case, the adopters do not have any choice but to continue RFID use though still they decide the level of RFID use. RFID use primarily is dependent on satisfaction from current use; the satisfied adopters are more likely to implement RFID in innovative applications. On the contrary, the dissatisfied farms intend to discontinue (though they cannot because of the mandate) and do not apply RFID technology in non-mandatory applications. This study finds that disconfirmation plays the most significant role in satisfaction process; the more the expectations are confirmed the more satisfied the adopters are and the more they intend to continue RFID use. This argument is also postulated by UTAUT model (Venkatesh et al. 2003). It can be explained that, to intend to continue RFID use, the adopters do not depend on external variables because they already have been using RFID technology; their satisfaction judgement is much more important in the continuance decisions.

This current study opposes other similar studies (Koh et al. 2010, for example) that recommend that 'a model about mandatory use should include and/or end with 'system use' as the ultimate criterion variable- not the 'intention''. This study argues that in a truly mandatory setting the 'actual use' is constant but the 'intention to use' is variable. In this context, the usage data may provide misleading information regarding the behaviour of the users whereas the intention variable depicts the actual behaviour. Though such intention does not affect the use (because of mandate) but, more importantly, influences other decisions including the extended use of the innovation/IS which is even more important for the success of an IS (Bhattacherjee 2001); whereas, the actual use may not influence such decisions.

CONCLUDING REMARKS

Implications

In this paper, the factors for continued usage intention for RFID are discussed in a new setting; in the livestock industry with a mandatory environment, which is unexplored in literature. The first significant theoretical contribution of this current research is the inclusion of adoption in the continuance intention process, in order to study the continuance intention of RFID technology. It is found that 'adoption' initiates the 'satisfaction-continuance' process. The more the adopters are satisfied the more they intend to continue RFID use. Another intellectual contribution of this study is to consider 'expectation' (at pre and post adoption stages) rather than the post-usage perceived usefulness in the adoption-continuance process, as done in most IS researches.

As practical contribution, the Australian government and its agencies may consider the findings of this study as an acid-test of its mandatory RFID strategy. Using the results of this study the agencies may predict the future of RFID technology and consider instigating appropriate policies. As this urges, the government agencies and the RFID vendors should emphasise on developing rational expectations about RFID technology because expectation is the basis of continuance behaviour. Similarly, the deploying authorities of RFID technology should examine the satisfaction status of the organisations and subsequently work on the antecedents of satisfaction to ensure the continued use of RFID technology in the targeted application.

Limitations

As one of the limitations, this study focuses on the behavioural 'intention to use' not the 'actual usage behaviour' of RFID, believing in that behaviour is a result of behavioural intention, as proposed by TRA (Fishbein and Ajen 1975). However, merely the *intention* does not drive to *decision;* instead, along with *intention* some other factors affect the real repurchase/continuance *decision* (Bhattacherjee 2001). The factors for actual continued usage behaviour of RFID need to be explored, in future.

Conclusion

This study used a research model that was developed from Expectation Confirmation Theory (ECT) and Expectation Confirmation Model (ECM), with a few modifications. The constructs and the variables were developed from a comprehensive literature review which were validated and enhanced by a field study. The major theoretical contribution of this study is the inclusion of 'adoption' in the continuance study. This effort makes a contribution to RFID and expectation-confirmation literature. The government agencies and RFID vendors may examine the findings of the RFID users' experience to develop their future RFID strategy.

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