

# Potential Consumer Responses to RFID Product Item Tagging and Emergent Privacy Issues

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## ABSTRACT

*Using the theories of procedural justice/fairness, expected utility, and literature on consumer privacy, this study uses the survey method to measure consumer willingness to purchase radio frequency identification (RFID)-tagged product items within the Canadian context. Procedural justice/fairness is operationalized using the implementation of the Personal Information Protection and Electronic Documents Act (PIPEDA) enacted in Canada on January 1, 2004.*

## 1. INTRODUCTION

This empirical study seeks to understand how consumers will react to radio frequency identification (RFID) tagging at the product item level before this becomes standard practice when major retailers like Walmart mandates its implementation. This study uses the concepts behind procedural justice/fairness, expected utility theory, and consumer privacy protection to anticipate the public consumer reaction to product item tagging at the retail store and answer the following questions:

1. What impact will the implementation of procedural fairness have on the willingness of consumers to purchase RFID-tagged product items?
2. How will consumers respond to RFID tagging initiatives at the product item level?
3. Will there be differences in consumer responses?
4. How can retailers use the findings to design and plan RFID product item initiatives at the retail store level?

## 2. CONSUMER PRIVACY AND EXPECTED UTILITY THEORY CONCEPTS

Privacy has been defined as "...the ability of the individual to *control* the terms under which personal information is acquired and used..." (Westin, 1967, p. 7). Information privacy, in turn, has been clarified as "...the claim of individuals, groups, or institutions to determine for themselves when, how, and to what extent information about them is communicated to others..." (Westin, 1967, p. 7). On the basis of social science literature, Goodwin (1991) defines consumer privacy based on two dimensions of control: (1) control of information disclosure which pertains to capture and storage of shopper information in databases, and (2) control of unwanted intrusions into the shoppers' environment which pertains to receiving unsolicited promotional or advertising material. Research on consumer privacy has also shown that there are different consumer segments representing varying levels of information privacy sensitivity. In an earlier body of work, Westin (1967) considered "privacy fundamentalists" as those consumers who were very concerned about the use of their personal information so much so that they would not participate in online data collection efforts despite privacy protection measures that web sites might offer. Cranor et al. (1999) also describe this group and found that its members are twice as likely as other consumers to report having been a victim of invasion of privacy acts on the Internet. The polar opposite of this group are those who are "privacy unconcerned" or those who easily share personal information as they do not care about personal privacy. The "middle-of-the-roaders" are the "privacy pragmatists" who selectively share personal information depending on the expected perceived benefits they hope to gain in the exchange.

## 3. EXPECTED UTILITY THEORY

The expected utility theory or utility maximization theory presents the idea that consumers conduct a quick cost-benefit analysis procedure in their minds within the limits of the information presented to them before deciding to trade off some of their personal information in the marketplace (Rust et al., 2002). If the net expectation is positive or beneficial to them, they will engage in the information exchange transaction.

## 4. PROCEDURAL FAIRNESS/JUSTICE

The concept of "procedural fairness or justice" refers to the notion that the individual perceives a particular activity in which they are participating as being conducted fairly (Lind and Tyler, 1988). Providing the consumer or shopper with voice and control over outcomes appears to lead to their perceptions of procedural fairness (Lind and Tyler, 1988; Folger and Greenberg, 1985; Awad and Krishnan, 2006; Malhotra et al., 2004; Gunther and Spiekermann, 2005). Culnan and Armstrong (1999) point out that in the field of marketing, the principles behind "notice" and "consent," which are the hallmarks of the Fair Information Practices Act, operationalize procedural fairness. "Notice" means that when shoppers provide personal information to retailers or vendors, they have the right to know why the information is being collected, what will be done with the information, the measures taken to protect its confidentiality, the consequences of providing or withholding information, and mechanisms for addressing shopper complaints involving personal privacy should these arise (Culnan and Armstrong, 1999). "Consent" means that shoppers could control how the information they share will be used and be able to voice their dissent and stop the use of their personal information when the retailer collects the information for one purpose but uses it for another.

## 5. THE PERSONAL INFORMATION PROTECTION AND ELECTRONIC DOCUMENTS ACT (PIPEDA): THE CANADIAN CONTEXT

This study also makes reference to the Personal Information Protection and Electronic Documents Act (PIPEDA) passed in Canada last January 2004, as the legislation that seeks to protect consumer privacy in that country. Critical provisions in PIPEDA also embody the principles supporting the Fair Information Practices Act. Thus, compliance of retailers with PIPEDA will be a surrogate for the implementation of procedural fairness within a retailing shopping environment.

## 6. VARIABLES USED IN THE STUDY

This study focuses on whether or not there are significant differences between groups A (those who would purchase RFID-tagged items given the procedural item provision) and B (those who would not purchase RFID-tagged items given the procedural item provision) across a number of variables.

### 6.1 Basis for Grouping Respondents (Groups A and B): Response to Procedural Fairness/Justice item

The following conditions, which also represent key directives of PIPEDA, were hypothesized in this questionnaire item to operationalize the concept of "procedural

fairness/justice": 1) the retailer/firm informs shoppers fully about the collection of customer purchasing and profile information via RFID tags and how the collected information would be used; 2) the retailer/firm posts notices in areas of the store notifying shoppers of the use of RFID tags with certain products; 3) the retailer/firm allows shoppers to 'opt-in' or agree to cooperate with their data collection effort or 'opt-out' or choose not to participate in the data collection effort involving RFID tags; 4) the retailer/firm uses 'deactivation kiosks' in the store so that shoppers can deactivate RFID tags attached to products they purchased; 5) the retailer/firm distributes brochures clearly explaining how RFID tags work in the store, how tag readers work with the tags, what information is stored in the tags, what information about you will be collected from the tags, and what will be done with the information downloaded from the tags; 6) the retailer/firm posts notices in the store indicating that it is in compliance with the Personal Information Protection and Electronic Documents Act passed by the Canadian government in January 2004; 7) shoppers could control the types of products and services advertised to them as well as when and for how long advertising messages would be displayed on the screen; 8) shoppers could indicate what information in their customer profile could be used for marketing; and 9) shoppers could review the information in their customer profile and correct any errors. Study participants were asked to respond with a "yes" or "no" to this item called the "decision" variable: "If the rules and safeguards I've just mentioned [i.e., pertaining to the conditions previously listed] were adopted by companies offering (RFID-tagged products), how interested would you be in purchasing RFID-tagged products from those companies?" For the purposes of the rest of this study's discussion, the respondents who decided they would purchase RFID-tagged product items given the procedural fairness/justice conditions are referred to as "group A"; those who decided they would not purchase these items, in any case, are referred to as belonging to "group B."

## 6.2 Other Variables Used

T-tests and chi-square tests were used to see if there are significant differences between groups A and B across the following other variables used in the study. The first variable refers to the following specific conditions that respondents require, reflecting measures that they would want the retail store management collecting RFID tag information at the product item level to put into effect before they decide to purchase the RFID-tagged item: a) the retail store would inform respondents of the collection of their purchasing information through RFID tags and how it would be used; b) the respondents could control the types of products and services eventually advertised to them as well as when and for how long advertising messages would be displayed on the screen; c) respondents could indicate what information in their profiles could be used for marketing and what could not; and d) respondents could review the information in their customer profiles and correct any errors. Respondents were asked to indicate the importance of these requirements using a seven-point Likert scale, with "1" anchoring on "Not important at all" and "7" anchoring on "Very important."

The second variable refers to the following nine different retail shop scenarios described to the survey respondents that are expected to affect their decision to buy or not buy RFID-tagged items. In these scenarios, the retail store: (1) captures shoppers' purchasing behavior using RFID tags prior to, during, and after a sales purchase; (2) captures shoppers' purchasing behavior via RFID tags and stores the information in a database, which they will later sell to another firm; (3) captures shoppers' purchasing activities via RFID tags, stores the information in a database, and later uses the information to send shoppers more targeted advertising; (4) captures shoppers' movements in the store via RFID tags as they pick up store product items and put these back on the shelves; (5) captures shopper information via RFID tags embedded in their clothing or other personal items like wallets or purses; (6) collects shopper information via RFID tags and later associates sales transaction information with shoppers' personally identifiable information stored in a database; (7) uses RFID tags which cannot be disabled or "killed" prior to shoppers' purchase of items or exiting the store; (8) uses an RFID system that can pickup information remotely from store products without shoppers' knowledge or consent as they carry tagged items around the store; and (9) collects shopper purchase information via RFID tags and later links this information with certain personal data items such as their name, phone number, credit card number, etc.

The third variable refers to the following specific measures that the retail management might implement in the store that may encourage respondents to purchase

the RFID-tagged items: a) observance of PIPEDA by the retailer; b) allowing customers to "kill" or disable or remove the RFID tag after the purchase; c) allowing the opt-in/opt-out choice for the consumers regarding the information collected by the tag; d) allowing the customers to choose whether or not they will allow gathering of information by the RFID tag; e) manufacturers and retailers use clear, understandable labels indicating that a product is RFID-tagged; and f) manufacturers and retailers publicize using web sites, news releases, or other means, their policies concerning the use, maintenance, and protection of customer records that have information gathered by RFID tags. For each condition, respondents were asked whether or not they would be encouraged to purchase the tagged items.

The fourth variable refers to the relative intrusiveness of RFID when compared to the following other technologies used by consumers: cell phones, debit/credit cards, automated teller machines, shoppers' loyalty cards, camera phones, and access-control badges. Respondents were asked to indicate if the RFID tags violated individual privacy "more than," "less than," or as much as each of these technologies.

The fifth variable is the privacy variable that covers a number of personal situations that give some indication of the privacy threshold of the respondent. (The detailed descriptions of these personal situations are given in the "Findings" section.)

And finally, the sixth variable is the respondents' perception of the effect of RFID-tagging at the case/pallet and individual product item levels on the final selling price of the tagged item. Respondents were asked to indicate if they thought RFID tagging would raise product prices, lower product prices, or have no impact on product prices.

## 7. RESEARCH METHODOLOGY

Undergraduate and graduate students at the Faculty of Business Administration, University of New Brunswick Fredericton were surveyed within the period 2004-2005. A brief lecture on RFID, its uses in supply chain management, and the provisions of PIPEDA was given. Short video clips on how RFID tags are deployed at the case and pallet levels in both the manufacturing and retail environments and the use of RFID tags at the product item level within a retail shopping scenario were shown to the respondents. Data analysis techniques used in the study include standard descriptives procedures (i.e., frequencies), reliability tests, t-tests, and chi-square analysis.

## 8. STUDY FINDINGS

A total number of 380 respondents in the convenience sample agreed to participate in the study with the following demographics: (1) gender: 172 females (45.1 percent) and 208 males (54.6 percent); (2) age groups: 18-22 years old, 266 (69.8 percent); 23-29 years old, 110 (28.9 percent); under 18 years old, 4 (1.0 percent); (3) years in college: one year, 67 (17.6 percent); two years, 104 (27.3 percent); three years, 114 (29.9 percent); four years or more, 83 (21.8 percent); (4) educational attainment: less than a college degree, 340 (89.5 percent); college degree, 35 (9.2 percent); master's degree, 4 (1.0 percent), and doctoral degree, 1 (0.3 percent).

Differences between groups A (those who would purchase RFID-tagged items given the procedural item provision and B (those who would not purchase RFID-tagged items given the procedural item provision) across a number of variables was investigated. The t-test was used to test the differences between groups A and B in their evaluation of the importance of the different requirements they would like to see the retail store's management put in place before buying tagged items. Chi-square tests were used to test the differences between each of the remaining five categorical variables and the general willingness of the respondents to purchase the tagged item represented by the variable, "decision," which divides the sample into groups A and B as previously explained given retail store conditions where the procedural justice measures are observed.

The following are the study's findings. T-test results show that groups A and B did not differ in terms of their perceptions of the level of importance of each of the four requirements they would like the retail store's management to take into consideration (i.e., the first variable). In terms of the second variable, those respondents who expressed willingness to buy tagged items under nine specific store retailing scenarios were also more likely to purchase the tagged items under general conditions, given the procedural justice provision (Table 1).

Table 1. Differences between groups A and B on their willingness to buy RFID-tagged Items under Specific Retail Shopping Scenarios and their Decision to Buy RFID-tagged Items with the Procedural Justice Provision

Variable	N	Shopper Decision (with Procedural Justice Provision)			Chi-Square	p
		Will Purchase RFID-tagged item	Will not pur- chase RFID-tagged item	Missing Values		
Store scenario 1: Store captures customer purchasing behavior by RFID tags prior to, during and after a purchase					31.746	.000
Will buy RFID-tagged item given store condition 1	215					
Actual						
Expected		194	21			
		172.6	42.4			
Will not buy RFID-tagged item given store condition 1	164			0		
Actual						
Expected		110	54			
		131.6	32.4			
Missing Values	1	1	0	0		
TOTALS	380	305	75	0		
Store scenario 2: Store captures customer purchasing behavior info using tags, stores it in a Database, and later, sells it to other firms					29.465	.000
Will buy RFID-tagged item given store condition 2	132					
Actual						
Expected		126	6			
		105.9	26.1			
Will not buy RFID-tagged item given store condition 2	248					
Actual						
Expected		179	69			
		199.1	48.9			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		
Store scenario 3: Store captures data on customers' purchasing behavior captured in RFID tags, stored in the database, and later, used by the store to send customers targeted advertising on products that may be of interest to them					36.120	.000
Will pay more for RFID-tagged item to get this benefit	168					
Actual		158	10			
Expected		134.8	33.2			
Will not pay more for RFID-tagged item to get this benefit	212					
Actual						
Expected		147	65			
		170.2	41.8			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		

Table 1. continued

Variable	N	Shopper Decision (with Procedural Justice Provision)			Chi-Square	p
		Will Purchase RFID-tagged item	Will not pur- chase RFID-tagged item	Missing Values		
Store scenario 4: Store collect customer information from RFID tags on products that customers pick up and put back on the shelves prior to the purchase transaction					17.210	.000
Will buy RFID-tagged item given store condition 1	198					
Actual						
Expected		175	23			
		158.9	39.1			
Will not buy RFID-tagged item given store condition 1	182					
Actual						
Expected		130	52			
		146.1	35.9			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		
Store scenario 5: Store collects customer information from RFID tags attached to clothing items and other items carried in purses or bags					12.425	.000
Will buy RFID-tagged item given store condition 2	61					
Actual						
Expected		59	2			
		49.0	12.0			
Will not buy RFID-tagged item given store condition 2	319					
Actual						
Expected		246	73			
		256	63			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		
Store scenario 6: Store has RFID system that collects customers' purchasing data that is later associated with personally identifiable information in a database					17.634	.000
Will pay more for RFID-tagged item to get this benefit	104					
Actual		98	6			
Expected		83.6	20.5			
Will not pay more for RFID-tagged item to get this benefit	276					
Actual						
Expected		207	69			
		221.5	54.5			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		

Table 1. continued

Variable	N	Shopper Decision (with Procedural Justice Provision)			Chi-Square	p
		Will Purchase RFID-tagged item	Will not pur- chase RFID-tagged item	Missing Values		
Store scenario 7: Store uses RFID tags on products which cannot be disabled or “killed” prior to the customers’ purchase of items or when they leave the store					8.018	.005
Will buy RFID-tagged item given store condition 1	68					
Actual						
Expected		63	5			
		54.6	13.4			
Will not buy RFID-tagged item given store condition 1	312					
Actual						
Expected		242	70			
		250.4	61.6			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		
Store scenario 8: Store uses an RFID system that can pick up information from store products without customer knowledge or consent as they carry these tagged items around the store					19.033	.000
Will buy RFID-tagged item given store condition 2	144					
Actual						
Expected		132	12			
		115.6	28.4			
Will not buy RFID-tagged item given store condition 2	236					
Actual						
Expected		173	63			
		189.4	46.6			
Missing Values	0	0	0	0		
TOTALS	380	305	75	0		
Store scenario 9: Store captures customer purchasing information through RFID tagged product items and later links this information with customer personal data such as name, phone number, credit card number, etc.					14.485	.001
Will pay more for RFID-tagged item to get this benefit	50					
Actual		50	0			
Expected		40.1	9.9			
Will not pay more for RFID-tagged item to get this benefit	329					
Actual						
Expected		254	75			
		264.1	64.9			
Missing Values	1	1	0	1		
TOTALS	380	305	75	1		

In terms of the third variable, respondents who admitted being encouraged to purchase tagged items if the retail management implements six specific measures in the store are also more likely to purchase the tagged items in, in general, given the procedural justice provision.

Regarding the fourth variable, there were no significant differences between groups A and B in their perceptions of the intrusiveness or privacy invasiveness of RFID technology compared to cell phones, debit/credit cards, automated teller machines, shoppers' loyalty cards, camera phones, and access control badges.

Concerning the fifth variable, which is the privacy variable covering a number of personal situations, selected items within the "privacy variable" construct significantly distinguished group A from group B: (1) refusal of the person to give out personal information to a firm; (2) use of an unlisted home phone number; (3) refusal of the person to be included in a mailing list put out by a firm which is later used for promoting products or services; (4) use of television to help the person purchase something from a home shopping club; (5) use of a toll free phone number to purchase a product or service. Study respondents who fit the following profile were also more likely to purchase tagged items given the procedural justice provision: (1) gave out personal information to a soliciting firm; (2) have a listed home phone number; (3) agreed to be part of a firm's mailing list for promotional purposes; (4) used the television to buy a product or service; and (5) used a toll free phone number to buy a product or service.

Finally, concerning the sixth variable, there were no significant differences between groups A and B in their perceptions of the effects of RFID-tagging at the case/pallet and individual product item levels on the final selling price of the tagged item in retail stores.

## 9. IMPLICATIONS OF FINDINGS

This study's findings support the concept that consumers do exercise their "privacy calculus" by anticipating costs and benefits before giving away personal information, and that the consumer population is segmented between those who are more privacy sensitive and those who are less so. One should, however, bear in mind that this study's findings cannot be extended to the wider population as they have been based on a convenience sample of fairly young and well-educated participants who are more open to the use of emerging technologies in the marketplace.

Retailers should initially address the consumer segment that will potentially be more responsive to product item tagging initiatives at the retail floor. Assuring the delivery of benefits to this segment and soliciting their "buy-in" in the use of RFID in the retail floor could pave the way towards chipping away at the resistance of the more privacy conscious group.

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