Drivers for RFID Implementations

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Abstract. This workshop paper studies drivers for RFID (Radio Frequency IDentification) adoption. The research in progress reported here puts forward several types of mindless and mindful decision making drivers. Hypotheses are tested using a questionnaire that was answered by 122 Chinese companies. The promise to reach higher efficiency seems to be the most important driver for mindful RFID adoption decisions. The early implementers were more driven to adoption by the promise of higher efficiency, better supply chain monitoring and better collaboration than late implementers. Tests show that mindless decision making shows up in RFID adoption.

Keywords: RFID adoption, survey, mindlessness, mindfulness.

1 Introduction

Radio Frequency Identification (RFID) technology is a tracking technology that can be used to create a network of things. Every object can be identified by reading the tag that is attached to it. This tag can contain any data valuable for the user. Data is transferred from the tag to the reader via radio-waves. Reading data thus not requires being in line-of-sight as bar-code technology does [1]. In general it can be stated that RFID has more potential to provide freedom and supply-chain visibility to any process [2] but it becomes much easier to implement when it is standardised.

Several organizations, such as the Massachusetts Institute of Technology's Auto-ID Centre and the International Standard Organisation (ISO), have been developing standards. It is obvious that standardisation of RFID is not an easy thing. The frequency is part of the complexity. For instance the North American standard for Ultra-high-frequency is not accepted in France as it interferes with French military bands [3]. One of the solutions to this issue was to design agile readers which could read several frequencies, therefore avoiding doubling costs of readers for companies dealing with international suppliers or buyers [2]. Furthermore, different types of waves have been categorized, each of them having their positive and negative sides [4]. Since it is a wireless technology, the environment, the air, the humidity, the components of scanned objects or containers can influence the signal. This prevents the possibility of a fit-to-all solution. Therefore, every usage needs a customised solution. Moreover, the lack of software dedicated to the integration of back-end applications

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has made the implementation difficult. Additional costs for programming can be necessary to match the languages of the software, and if this issue is not carefully considered, may threaten the implementation of the RFID system [2].

It is important to weigh costs against profits that can be achieved by the company. This Workshop paper reports on exploratory research-in-progress that investigates drivers of RFID adoption. In what follows, we first present the current state of RFID usage, to get an image of the advantages that can be achieved through RFID technology. After that, we present one specific theory that could help explain what drives companies to adopt RFID technology: the mindlessness/mindfulness theory. Next we put forward a number of hypotheses and the research methodology. Subsequently the research results are presented and discussed.

2 RFID in Practice

RFID technology was implemented by huge entities such as Wal-Mart [6] [7], the Department of Defence of the United States of America [8], Best-Buy [9] [10] in the USA, Metro [11], Tesco [7] and Marks & Spencer [7] in Europe. The Chinese government also applied the technology for its Identification Cards [12].

The global market of RFID including tags, systems and services was estimated to be of $4.93 billion in 2007, and to increase to $27 billion by 2018. In volume, the quantities of tags sold have more than doubled, from 2006 with 1.02 billion tags, 2008 is expected to have seen 2.16 billion tags sold [13]. Researchers have increasingly turned their attention toward this topic [14] and studied technical aspects, application areas, and security and policy issues. Ngai identified that 80% of literature has been oriented towards the tags and antennae and that the first step was to solve all technical issues, to focus later on the implementations and their outcomes [14].

Later in this paper we will present a survey we conducted on RFID in China. Therefore, it is interesting to shortly investigate the situation in China first. The Chinese market's value for RFID has become the largest in the world. In 2008, $1.96 billion were spent in the country. The delivery of identification cards, which is a gigantic project of $6 billion, accounted for $1.65 billion in 2008. Once these cards are delivered and requests for ID cards are saturated, the Chinese RFID market is expected to decrease below the US and Japan, but to keep on its fast growth. Table 1 shows how the volume of tags is expected to increase in every sector of the Chinese economy [15]. As the technology evolves, actors tend to get the best benefits out of RFID and look for new usage. Wireless information can provide benefits in a large amount of industries.

In the airlines and airports sector, RFID promises a better traceability during transportation and supply of numerous parts. RFID was applied by the McCarran International Airport and Hong Kong International Airport to tag baggage. Since airports represent a vast structure, RFID has been considered for managing food trolleys, enabling a fluid access to car parks, organising taxi arrivals, etc.

Also, RFID has been considered as a technology that could have great results once adapted to the management of livestock. It can enable automation of farming activities such as weighing and feeding. Lack of traceability, fears of illegally imported meat and current health issues can be mitigated with a tag tracing the animal from its

origin [17]. In China, the number of pigs tagged is expected to reach a number of 1.3 billion every year by 2018 [15].

The difficulty with library management has been the large quantity of references. Often applied as a sticker in the inside cover of a book, RFID can speed-up the book identification, enable self checkout, fight book-theft, and sort and control the inventory faster [18] [19].

Table 1. RFID Projects in China planned for 2008-2018 [16]

End User	Category	Application	Tag Volume
China Railway nationwide rollouts	Passenger Transport, Automotive	RFID ticketing	3 billion
Nationwide rollouts	Animal and Farming	Live pig tagging	1.3 billion
Food and Drug Administration	Financial Security Safety	Anti-counterfeiting drugs	over 1 billion
Nationwide rollouts	Books, Libraries, Archiving	Book tagging	500 million
Major appliance manufacturers	Manufacturing	Product line management	hundreds of
Nationwide rollouts	Animal and Farming	Pet dog tagging	150 million
National Tobacco Project	Retail Consumer Goods	Anti-counterfeiting	37.5 billion packs
China Post nationwide rollouts	Land and Sea Logistics, Postal	Mailbag tracking	100 million
Chinese government mandate	Financial Security Safety	Firework Tagging	45 million
Level 3 hospitals rollouts	Healthcare	Hospital inpatient tagging	20 million
Major Sea Ports Rollouts	Land and Sea Logistics, Postal	Container Tracking	Tens of millions
Chinese Army	Military	Logistics	Tens of millions
Alcohol	Retail Consumer Goods	Anti-counterfeiting alcohol	Tens of millions

There have been studies about automatic identification of customers. Banks hope they can improve their services by identifying their customers as soon as they enter the bank via the tag mounted on their credit card [21]. Nowadays, over 17 million cards are in circulation with 95% of Hong Kong people aged between 16 and 65 using this system [16].

Healthcare industry has seen the use of RFID as a means to prevent errors which can have dramatic consequences in this industry. Hospitals have implemented RFID to monitor patient movements and to maximise room utilisation. The market of RFID tags and systems dedicated to healthcare is expected to increase from $120.9 million in 2008 to $2.03 billion in 2018 [22].

The increasing sizes of sea carriers and ports have encouraged the use of RFID to track containers [2].

Manufacturing has also been a relevant domain of RFID applications. This was especially the case in the car manufacturing industry as it requires a large number of parts and a strong flexibility to provide high diversity of models and options. RFID has been used to identify containers, pallets, organize the inventory better and track the forklifts [2].

The mandate issued by the Department of Defence of the United States is the most resounding example that military industry could show us. In extreme conditions, RFID enables a quick identification of the ammunition left, but also the food, water and other supplies that can be needed during military operations. It is also used to track shipments of containers [23].

Clearly, RFID technology could be useful in many companies. However, organizations often suffer from mindlessness behaviour when it comes to new technologies: they implement some technology because others have implemented it, without investigating whether such a technology investment really fits their specific company. Such

projects often fail. It is the goal of this paper to investigate whether the mindlessness theory also applies to the RFID technology. In what follows we first shortly present the mindfulness/mindlessness theory and develop hypotheses with respect to RFID adoption. Next, we present the research methodology and survey results and we discuss the results.

3 Mindlessness-Mindfulness Theory

One of the elements that will be considered in this paper to investigate adoption is the mindlessness/mindfulness theory. Here we shortly introduce that theory.

IT (Information Technology) innovations are supposed to be grounded in organizational facts and specifics, but often they are not. The mindlessness and mindfulness perspective enlightens the way in which a company may consider investing in a new technology and has been discussed by Swanson and Ramiller in MISQuarterly [5].

The mindless firm pays no attention to the firm's own circumstances. It engages in some innovation because it is impressed by success stories that appear to validate the innovation as a good or even an irresistible idea. It invests in some technology because 'everyone is doing it' or it is 'time to catch up'. The mindless firm typically turns to the dominant vendor within the industry, as there is no need to consider anything else. After all, the adoption decision was not guided by attention to organizational specifics. Assimilation is regarded as unproblematic: end-users will get some application and have to fend for themselves. If the end-user does not like the application, not the application is considered wrong but the user is considered to be at fault. The mindless firm believes that the technology under consideration is not critical to its distinctive competence ant it is content to be a follower rather than a leader. It will therefore wait for innovations to come to the firm, rather than seeking intelligence about innovations. It is confident that others will call the important innovations to its attention [5].

Companies often choose to be mindless. After all, mindfulness represents a costly and demanding sensemaking regime. Mindful decisions are "discriminating choices that best fit a firm's unique circumstances, rather than familiar and known behaviours based on what others are doing". A mindful decision is based on elements grounded in the firm's own specifics and helps decide whether, when, and how the investment should be done.

Mindless decision taking might also show up in RFID implementation decisions. For instance, a company might blindly copy the pallet-level-tagging that is used in another company, while case-level-tagging would be better in their case. This could lead to project failure.

3.1 Mindful Decision Making

Mindful decision making is the way of deciding that is usually assumed to exist in reality: companies analyse their own situation and choose a technology that is suited to resolve their specific problem. A study that investigates the drivers for RFID adoption should thus in the first place consider mindful decision making. For early implementers the choice to adopt a new technology is more likely to be grounded in

organisational specifics because there is still little knowledge about successes that have been achieved with the new technology and it is thus still unclear whether the technology is likely to be appropriate for all companies. This is no longer true for late implementers. This leads to the following hypothesis:

H1: Companies that are still planning to implement RFID technology show less mindful decision making than companies that have already implemented the technology.

Companies can pursue different goals with RFID implementations. They could try to become more efficient, try to reach a higher quality, to monitor closely what others in a Supply Chain are doing, collaborate with other companies in the Supply Chain etcetera. Given the higher expected mindfulness of early implementers (and thus a better knowledge of the goals to achieve), we put forward the following hypotheses (related to hypothesis 1):

H2a: Early implementers were motivated more to adopt the technology by the promise of improved efficiency than late implementers.

H2b: Early implementers were motivated more to adopt the technology by the promise of improved quality than late implementers.

H2c: Early implementers were motivated more to adopt the technology by the promise of improved Supply Chain monitoring than late implementers.

H2d: Early implementers were motivated more to adopt the technology by the promise of improved inter-organizational collaboration than late implementers.

Inter-organizational practices seem more advanced and far-reaching than intra-organizational practices. Therefore, we put forward the following hypothesis:

H3: Achieving higher efficiency and higher quality are more important drivers for adoption than the ability to monitor others in the supply chain and to collaborate with them.

Given the fact that RFID technology is only now gaining momentum (The technology is currently at the start of the slope of enlightenment of the Gartner Hype cycle.), we expect this hypothesis to hold for both, early implementers and (relatively) 'late implementers'.

A mindful company would consider acceptance by users an important issue. According to the TAM (Technology Acceptance Model [24]), a technology is more likely to be accepted by users if it has a higher perceived usefulness and ease of use. The elements mentioned in the TAM should thus be considered when making an implementation decision.

H4a: Companies that consider RFID technology to be easy to use and useful are more likely to implement it.

Companies often make implementation decisions that may look useful and easy from a business standpoint while they neglect the technological complexity of the implementation. For example, many mergers and acquisitions went wrong (e.g. in the banking industry) because the difficulty of integrating the computer systems of the different companies was much more complex than assumed. As an extension to what is suggested by the TAM, not only the ease of use, but also the ease of implementation would thus be considered by a mindful company:

H4b: Companies that consider RFID technology to be easy to implement in their company are more likely to implement it.

3.2 Mindless Decision Making

This paper intends to report on research in progress concerning different kinds of drivers for RFID adoption, exploring the mindfulness/mindlessness theory. Therefore, we also put forward hypotheses related to mindlessness. Prior research often only considered either mindfulness or mindlessness. This paper intends to deal with both at once. Mindless behaviour can show in many ways and several variables should thus be considered when determining whether a company behaves mindlessly or not. Companies may be influenced to invest in a technology because it is fashionable. RFID, which is seen as a technological breakthrough, can be considered as *fashionable* and this aspect has to be considered as a variable possibly leading to mindless behaviour. The fact that the number of implementations can positively influence the perception and adoption of a technology is also described by the Mindlessness Theory. *Observations* of implementations done by competitors, buyers, suppliers and companies in other industries should thus also be taken into account when determining the role of mindlessness. Similarly, *demands* (e.g. from buyers) to implement the technology should be considered. We then define mindless decision making as decision making where such fashionableness, observations or demands play a role.

As stated above, mindless firms are content to be followers rather than leaders. Therefore, we would expect companies that have not yet implemented RFID technology (but plan to implement it) to show more mindless behaviour than companies that have already implemented it. To explore the field of mindlessness theory, we thus put forward the next hypothesis:

H5: Companies that are still planning to implement RFID technology show more mindless decision making than companies that have already implemented the technology.

The mindless company is said to regard assimilation as unproblematic: it is “a simple matter of rolling out the innovation to its end-users, who will in effect be left to fend for themselves. Initial confusion, frustration, or resistance may be dismissed as anomalous or attributed to shortcomings in the users themselves” [5, p 564]. While hypothesis 5 suggests that late adopters are more mindless than early adopters, we here investigate whether both, early and late adopters, can be considered mindless decision makers. We therefore hypothesize:

H6a: Early implementers would not be demotivated to use the technology if employees would feel threatened by it.

H6b: Late implementers would not be demotivated to use the technology if employees would feel threatened by it.

4 Research Methodology

A survey was conducted to test our hypotheses. A questionnaire was created with the aim of discovering drivers and inhibitors of RFID adoption by companies. It has been translated from English to Chinese and distributed to a list of 500 companies based in mainland China. The questionnaire was in Word format and sent by e-mail to the contact list. 136 questionnaires have been received back and 122 of them were usable. Questions were designed to provide all the information needed to test the hypotheses reported here and to test more advanced hypotheses in further studies.

Respondents evaluate different statements on a 7-point Likert scale ("1" meaning they strongly disagree with the statement and 7 meaning they strongly agree). We questioned different drivers that either motivated or would motivate the investment in RFID. We included a question asking if the person considered him or herself as the most knowledgeable to fill out the questionnaire. This enabled us to check whether the distribution of the questionnaire was well-targeted.

Respondents were mainly IT Directors (39%) and Responsible of Logistics (36%) with a less significant part of Managing Directors (14%), General Managers (8%) and CEO's (3%). The knowledge of each respondent regarding RFID was measured from 1 to 7 and resulted with a mean "knowledge" of 5.61 and a standard deviation of 0.74. A large majority of the companies stay open to new technologies but do not belong to the innovators (61%). 16% try to use the latest technologies, while, in the contrary, 22% avoid them. In our sample, 12% of the companies are using RFID technology. 13% plan to use it in the short term (within a year), 25% may use it within 5 years, and 4% dropped the project after trying. The biggest share is for the companies who are currently not planning to implement RFID technology (45%).

To test our hypotheses, we divided the sample in three different groups:

- *Group 1: the early implementers*. This group includes all companies which already use RFID extensively or plan to use it more extensively in the future and those that attempted to implement the technology in the past but dropped it (20 observations).
- *Group 2: the late implementers*. This group includes those running tests and which will start using it shortly and those planning to start using it the next few years (47 observations).
- *Group 3: the non-implementers*. This group includes companies that are currently not thinking about implementing this technology (55 observations).

To test the drivers and inhibitors we used the Student's t-test. This is the most "appropriate whenever you want to compare the means of two groups" and enables

to conclude whether these are statistically different from each other. To test the hypotheses, we mainly compared the means of groups 1 and 2, and the means of groups (1+2) and 3.

5 Research Results

Hypothesis 1 states that early implementers show more mindful decision making than late implementers. The test results in Table 2 confirm this hypothesis ($p<0.005$). The results are based on the average response of each implementer with respect to the four following questions: Were you motivated to start using RFID in your company because it allows you to ….

- be more efficient (e.t., material receipts,…).
- monitor closely what others in your Supply Chain are doing.
- collaborate with other companies in your Supply Chain.
- reach a higher quality.

Table 2. Test results for Hypothesis 1 (*no equal variances assumed*)

mean group1	*mean group2*	*t-value*	*df*	*Sig. (1-tailed)*
5.8625	5.4149	4.657	33	0.000

Early implementers thus show more mindful decision making than late implementers.

To test Hypotheses 2a through 2d, a t-test was performed to compare the mean replies on the four questions mentioned for Hypothesis 1 for early and late implementers. The results are shown in Table 3. The hypothesis is confirmed in 3 of the four cases. No statistical significant difference is detected between early and late implementers in the motivation created by the possibility to achieve a higher quality.

Hypothesis 3 suggests that companies would rather be motivated by quality improvements and efficiency improvements than by the possibility to collaborate with other companies and to improve Supply Chain monitoring. The results of the t-test that was performed to test this hypothesis are shown in Table 4 for the early implementers and in Table 5 for the late implementers.

Table 3. Test results for Hypothesis 2a, 2b, 2c and 2d (*no equal variances assumed*)

	mean group1	*mean group2*	*t-value*	*df*	*Sig. (1-tailed)*
Efficiency	6.75	6.13	4.922	43.041	0.000
Quality	5.55	5.34	1.278	37.594	0.104
Monitoring	5.50	5.04	2.707	40.587	0.005
Collaboration	5.65	5.15	3.027	41.968	0.002

As suggested in hypothesis 3, efficiency seems a more important driver than the possibility to monitor and to collaborate with other companies. However, the possibility to deliver a higher quality is not a significantly more important driver than the improved monitoring (except for the late implementers) and collaboration.

Table 4. Test results for hypothesis 3, early implementers

mean 1	*mean 2*	*t-value*	*df*	*Sig. (1-tailed)*
Efficiency: 6.75	Monitoring: 5.5	7.804	19	0.000
Efficiency: 6.75	Collaborate: 5.65	7.678	19	0.000
Efficiency: 6.75	Quality: 5.55	13.077	19	0.000
Monitoring: 5.5	Collaborate: 5.65	-1.000	19	0.165
Monitoring: 5.5	Quality: 5.55	-0.252	19	0.402
Collaborate: 5.65	Quality: 5.55	0.567	19	0.288

Table 5. Test results for hypothesis 3, late implementers

mean 1	*mean 2*	*t-value*	*df*	*Sig. (1-tailed)*
Efficiency: 6.13	Monitoring: 5.04	8.012	46	0.000
Efficiency: 6.13	Collaborate: 5.15	7.289	46	0.000
Efficiency: 6.13	Quality: 5.34	5.948	46	0.000
Monitoring: 5.04	Collaborate: 5.15	-1.219	46	0.115
Monitoring: 5.04	Quality: 5.34	-2.141	46	0.019
Collaborate: 5.15	Quality: 5.34	-1.386	46	0.085

Hypothesis 4a (concerning the role of perceived usefulness and perceived ease of use) was tested using the following questions: Do you agree on the following statement:

- RFID is a technology that is easy to use.
- RFID can be useful for your company.

The average of the replies to these questions was compared for two groups: the early and late implementers on one side and the non-implementers on the other side. The test results in Table 6 show there is a statistically significant difference between both groups ($p < 0.005$). Consequently, the higher the perceived usefulness and ease of use, the higher the chance a company is implementing RFID technology.

Hypothesis 4b (concerning the role of perceived ease of implementation) was tested using the following question:

Table 6. Test results for Hypothesis 4a (equal variances assumed after successful Levene's Test for equality of variances)

mean group1+2	*mean group3*	*t-value*	*df*	*Sig. (1-tailed)*
5.9203	3.6226	18.537	120	0.000

- Do you agree on the following statement: RFID is a technology that is easy to implement?

The test results, shown in Table 7, indicate there is a statistically significant difference between implementers and non-implementers ($p < 0.005$). Companies that find the technology harder to implement are thus less likely to have implemented the technology.

Table 7. Test results for Hypothesis 4b (*no equal variances assumed*)

mean group1+2	*mean group3*	*t-value*	*df*	*Sig. (1-tailed)*
3.94	2.68	8.214	116	0.000

The confirmation of hypotheses 4a and 4b reveals that companies generally show signs of mindful decision making: the higher the considered usefulness, ease of use and ease of implementation, the higher the chance the technology gets implemented.

To test H5 (whether late implementers show more mindless decision making than early implementers) the means of the answers to the following questions of groups 1 and 2 were compared: Were you motivated to start using RFID in your company because …

- companies in other industries are implementing it,
- some of your important suppliers have implemented it,
- some of your important buyers have implemented it,
- some of you competitors have implemented it,
- it gives credibility to the organization and appears as technologically updated.
- your important suppliers asked you to use it,
- your important buyers asked you to use it.

The results of the test are shown in Table 8. Hypothesis 5 is confirmed by the data ($p < 0.05$).

Hypotheses 6a and 6b are confirmed by the data too. Both, early implementers and late implementers in our sample seem to show signs of not taking customer perceptions into account. When asked if they would be demotivated to start using RFID technology if they thought their employees would feel threatened by the implementation of the new technology, both groups gave a response that was statistically significantly lower than 4 (the neutral value). This is shown in Table 9.

Table 8. Test results for Hypothesis 5 (equal variances assumed after successful Levene's Test for equality of variances)

mean group1	*mean group2*	*t-value*	*df*	*Sig. (1-tailed)*
4.1714	4.3556	-2.011	65	0.048

Table 9. Test results for hypotheses 6a and 6b

	mean	*compared to*	*t-value*	*df*	*Sig. (1-tailed)*
group1	2.6500	4	-9.000	19	0.000
group2	2.7021	4	-12.916	46	0.000

6 Discussion and Limitations

A higher efficiency seems to be the most important driver for implementing RFID technology, both for early and late implementers. Contrary to what was expected, companies are not more motivated by the promise of achieving higher quality than by the possibility to better monitor the supply chain and to collaborate with other companies. The early implementers were more driven by the promise of higher efficiency, better supply chain monitoring and better collaboration than late implementers.

The fact that hypotheses 5 and 6a are confirmed seems worrying. It leads to the conclusion that mindless followers follow leaders that show mindless behavior. Late implementers might assume that early implementers did not take decisions mindlessly, but such assumption seems invalid. Mindless companies have been said not to believe they can get competitive advantages by implementing some technology [5]. Therefore, the test results seem to suggest that companies don't consider RFID technology as a technology that can give them competitive advantages. The fanaticism of early and late implementers 'to move forward' suppresses demotivations that could arise because of potential problems with employees. The fear from what other companies might achieve and the fear of missing an opportunity seems bigger than the fear from internal problems. Internal factors are supposed to be under control or are at least not supposed to cause big problems. This fits Swanson and Ramiller's view on mindless companies, which regard assimilation for example as unproblematic. On the basis of these preliminary results, more advanced research towards mindlessness is recommended.

While the fact that *mindless followers follow leaders that show mindless behavior* might be worrying, the confirmation of hypothesis 1 also points out that early implementers show more mindful decision making than late implementers. The followers thus at least follow leaders that seem *more* mindful than them. Neither early nor late implementers can be qualified as purely 'mindless' or 'mindful' decision makers. They combine both, characteristics of mindful and mindless decision taking. As mindfulness is an expensive approach, a 'healthy' mix of mindfulness and mindlessness may be appropriate. The mix is different for early implementers than for late implementers. Further research is needed to investigate the function describing the change

in mix. Also, further research is currently conducted to understand the consequences of the change in mix over time. For researchers this case illustrates there is no straight line between the perceived ease of use and perceived usefulness and the decision to implement the technology. Factors related to mindless decision taking are also part of the picture.

There are several limitations to the research reported here. First, the research was conducted in a single country. Prior research has shown that culture plays a role in technology adoption. Further research should investigate the role of mindlessness/mindfulness in other countries. Another limitation of this study is that it is not assessed which characteristics are most important in the decision taking: those pointing to mindless decision making or those pointing to mindful decision making. Further research is needed to reveal the relation between mindlessness, the size of the perceived 'requirement from the environment' to move on and the internal risks the company is willing to bear. Problems in the financial industry recently revealed that managers take big risks in an attempt to gain huge profits and that they get big bonuses for doing so. Mindlessness was stimulated. Mindlessly pursuing some opportunity that *may* be there is dangerous, especially if it is not decently investigated whether that opportunity is attainable for your specific company. Further research is needed on the right balance between mindlessness and mindfulness. This could lower the number of IT project failures and improve the image of the IT proficiency.

7 Conclusions

This Workshop paper presents the first results of research in progress from a survey conducted among 122 Chinese companies about drivers for RFID adoption. The paper considers drivers that could be related to both, mindful and mindless decision making. The promise to reach higher efficiency seems to be the most important driver for mindful RFID adoption decisions. The early implementers were more driven to adoption by the promise of higher efficiency, better supply chain monitoring and better collaboration than late implementers. The survey also indicates that late adopters show more mindless behavior than early adopters. Those early adopters also show signs of mindless decision making. Companies are motivated to invest in RFID technology if they observe others are implementing it. Our preliminary results point out that all implementers make the implementation decision part mindfully, part mindlessly.

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