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Frank Goethals

Yazgi Tütüncü

Chieh-Yu Lin

Alban Caron

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MINDLESSLY FOLLOWING PARTLY MINDLESS LEADERS THE CASE OF RFID IMPLEMENTATIONS

Frank G. Goethals^{1,a}, Yazgi Tütüncü^{2,a}, Chieh-Yu Lin^{3,b}, and Alban Caron^{4,a}
^aIESEG School of Management, 3 Rue de la Digue, 59 Frank G. Goethals^{1,a}, Yazgi Tütüncü^{2,a},
Chieh-Yu Lin^{3,b}, and Alban Caron^{4,a} 000 Lille, France
^bDepartment of International Business, Chang Jung Christian University, Taiwan
¹f.goethals@ieseg.fr; ²y.tutuncu@ieseg.fr; ³jylin@mail.cjcu.edu.tw;
⁴albancaron@hotmail.com

Abstract

This paper studies drivers for RFID (Radio Frequency Identification) adoption. The mindlessness/mindfulness theory is applied to the context of RFID implementation decisions. Several types of mindless and mindful decision making drivers are put forward. Hypotheses are tested using a questionnaire that was answered by 122 Chinese companies. The data shows mixed support for the applicability of the mindlessness/mindfulness theory. Companies which notice other companies adopt RFID technology are motivated to adopt the technology as well. Late RFID implementers seem to take decisions more mindlessly than early RFID implementers. Still, early RFID implementers also take decisions mindlessly. Neither late implementers nor early implementers can be qualified as being fully mindless: both groups also take decisions mindfully.

Keywords: RFID adoption, survey, mindlessness, mindfulness

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 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].

Clearly, RFID implementations take some doing. It is important to weigh costs against profits that can be achieved by the company. This paper reports on a research project 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 focus on one specific theory that could help explain what drives companies to adopt RFID technology. More specifically, Swanson and Ramiller [5] showed that many technology investments are characterized by mindlessness and the paper at hand investigates whether mindlessness also plays a role in RFID adoption.

RFID in practice

RFID technology was implemented by huge entities such as Wal-Mart [6] [7], the Department of Defense 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.

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

End User	Category	Application	Tag Volume
China Railway nationwide rollouts	Passenger Transport,	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 millions
Nationwide rollouts	Animal and Farming	Pet dog tagging	150 million
National Tobacco Project	Retail Consumer Goods	Anti-counterfeiting logistics	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

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].

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 Defense 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.

Hypotheses about RFID Adoption

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 and 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.

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. Five attributes characterize the best behaviour to achieve mindfulness in IT innovation [5]:

- *Preoccupation with failure* enables to keep a close eye on operations. Any quiet period would be considered as missing underlying troubles.
- *A reluctance to simplify interpretations* enables resistance to the simplified image of the organizing vision.
- *Sensitivity to operations* brings light on small details that, even though they appear to be minor, can actually have huge consequences.
- *A commitment to resilience* reflects the desire to use an adaptive and flexible way as unknown events are expected to be too numerous.
- *A reliance on expertise over formal authority* enables to apply the best answer to specific issues when one has more expertise than the actual responsible.

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. For example, a case study in the Cruise ship industry [28] pointed out that – although pallet-level-tagging might be appropriate in other cases – the implementation of pallet-level-tagging in this specific case could not be justified (but case-level-tagging could be feasible). The appropriateness of the technology depends on case-specific elements, such as the size of the

timeframe during which deliveries can happen (e.g. to the ship). The reason for this is that, if deliveries can happen during a longer time span, only one door and one portal per ship need to be used for delivery so that deployment costs would be lowered significantly.

Our study puts forward several hypotheses on RFID adoption, based on mindlessness/mindfulness theory. These are given in the following sections.

Signs of mindless decision making

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.

We define two subtypes of mindless decision making: internally-driven mindless decision making, and externally-driven mindless decision making. Externally-driven mindless decision making concerns requirements formulated by external parties to implement some technology, whereas internally-driven mindless decision making involves a free choice to behave mindlessly (e.g., to be driven by observation of competitor implementations).

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.

H1a: Companies that are still planning to implement RFID technology show more internally-driven mindless decision making than companies that have already implemented the technology.

H1b: Companies that are still planning to implement RFID technology show more externally-driven mindless decision making

than companies that have already implemented the technology.

Followers often make the assumption that the initial implementers did not behave mindlessly and that they, therefore, can be followed. This leads to a second hypothesis:

H2: Early RFID implementers do not make decisions mindlessly.

Mindlessness theory reveals that observing implementations by others could motivate companies to adopt some technology: 'if they are doing it, it must be good'. In this paper we investigate the role of four groups of 'others': competitors, buyers, suppliers and companies in other industries.

For early adopters there are only few implementations (if any) in their own industry. Therefore, if they would show mindless behaviour, it is likely to stem from observing companies in other industries. For companies who adopt the technology later, mindless behaviour would seem more justifiable if it would stem from observing behaviour of competitors (rather than companies in some other industry), which are at least in the same business. We can then put forward the following hypotheses:

H3a: Internally-driven Mindless decision making by early adopters is driven more by observing behaviour of companies in other industries than by observing competitors, suppliers or buyers.

H3b: Internally-driven Mindless decision making by late adopters is driven more by competitor behaviour observation than by observation of behaviour of companies in other industries, suppliers or buyers.

Signs of mindful decision making

The importance of the confirmation or disconfirmation of the mindlessness hypotheses mentioned above can only be estimated correctly if 'mindfulness' is assessed in the same study. According to the TAM (Technology Acceptance Model [27]), a technology is more likely to be accepted by users if it has a higher perceived usefulness and ease of use. A mindful company would consider acceptance by users an important issue. 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.

If late implementers are to be followers in the sense that they copy what others are doing, they should primarily be characterized by mindless decision making rather than by mindful decision making and they probably assume that early adopters make decisions mindfully. This leads to the following hypothesis:

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

Hypothesis 1 suggests late adopters show more mindless decision making than early adopters. The idea arises that decision making by late adopters might show no properties of mindfulness.

H6: Late RFID implementers do not make decisions mindfully.

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 and moreover to propose more hypotheses for 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.

Research Results

To test H1a (whether late implementers show more internally-driven 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 your competitors have implemented it,
 - it gives credibility to the organization and appears as technologically updated.

The results of the test are shown in Table 2. Hypothesis 1a is confirmed by the data ($p < 0.005$).

Table 2: Test results for Hypothesis 1a (equal variances assumed after successful Levene's Test for equality of variances)

mean group1	mean group2	t-value	df	Sig. (1-tailed)
4.3200	4.6723	-3.823	65	0.000

To test H1b (whether late implementers show more externally-driven 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 ...

- your important suppliers asked you to use it,
- your important buyers asked you to use it.

Table 3 shows there is no statistically significant

evidence that late implementers show more externally-driven mindless decision making than early implementers.

Table 3: Test results for Hypothesis 1b (no equal variances assumed)

mean group1	mean group2	t-value	df	Sig. (1-tailed)
4.1500	4.0426	0.761	38	0.226

To test H2 (early implementers do not make decisions mindlessly) the maximum score on the questions mentioned for H1a and H1b of each respondent was taken. It was investigated whether the average of those maximums was higher than '4', the neutral value. The results are shown in the top row of Table 4. The hypothesis can be rejected ($p < 0.005$). Early implementers thus also make decisions mindlessly.

We additionally tested whether taking the average score over all questions mentioned in H1a and H1b (instead of the maximum score) for each respondent would lead to the same conclusion, to investigate whether mindlessness is not just due to one single factor. The results of that test are shown in the second row of Table 4. Again, the conclusion is that early implementers make decisions mindlessly ($p < 0.005$).

Table 4: Test results for Hypothesis 2

	mean group1	Comp ared to	t-value	df	Sig. (1-tailed)
Max.	5.5000	4	11.052	19	0.000
Avg.	4.2350	4	4.064	19	0.001

Table 5: Test results for Hypothesis 3a

(mean value for influence of companies in other industries = 4.95)

	mean group1	t-value	df	Sig. (1-tailed)
suppliers	4.15	2.886	19	0.004
buyers	4.25	2.052	19	0.027
competitors	4.4	2.773	19	0.006

Table 6: Test results for Hypothesis 3b (mean value for influence of competitors = 5.02)

	mean group2	t-value	df	Sig. (1-tailed)
suppliers	4.6190	-3.420	41	0.001
buyers	4.6429	-2.284	41	0.014
other industries	5.1905	0.909	41	0.816

Table 4: Test results for Hypothesis 2

	mean group1	Comp ared to	t-value	df	Sig. (1-tailed)
Max.	5.5000	4	11.052	19	0.000
Avg.	4.2350	4	4.064	19	0.001

Table 5 shows the results of the t-tests done to test hypothesis 3a. Internally-driven mindless decision making by early adopters is driven more by observations of implementations done by companies in other industries than by observations of implementations done by competitors, suppliers or buyers ($p < 0.05$). No statistically significant differences are found between the role of suppliers, buyers and competitors for early implementers (results not shown in the table).

For late adopters, observations of competitor behavior became more important than observations of buyer and supplier behavior (see Table 6). However, no statistically significant difference was found between the role of competitor implementations and implementations done by companies in other industries (which are still statistically significantly more important than implementations of suppliers and buyers) to drive the implementation decision.

Test results (not shown in tables here) show that observations of implementations done by companies in other industries have a statistically significant motivation to implement the technology,

both for early implementers ($t=4.790$, $p=0.000$) and late implementers ($t=8.180$, $p=0.000$). For late implementers, observations of implementations done by competitors ($t=10.311$, $p=0.000$), suppliers ($t=5.758$, $p=0.000$) and buyers ($t=4.599$, $p=0.000$) also form a statistically significant motivation (i.e., response >4) to implement the technology.

The hypotheses mentioned above focus on mindless ‘motivators’. Swanson and Ramiller [5] also mention variables that could be seen as ‘signs’ of mindless behavior (rather than drivers). The mindless company is for example 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]. Both, early implementers and late implementers in our sample, seem to show signs of this. 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 7.

Table 7: Implementers would not be demotivated to use the technology if employees would feel threatened by it

	mean	compare d to	t-value	df	Sig. (1-tailed)
grou p1	2.6500	4	-9.000	19	0.000
grou p2	2.7021	4	-12.916	46	0.000

Table 8: Implementers would not be demotivated by implementation difficulties

	mean	compared to	t-value	df	Sig. (1-tailed)
grou p1	4.2500	4	1.314	19	0.204
grou p2	4.2128	4	1.567	46	0.124

Table 9: 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)
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5.9203	3.6226	18.537	120	0.000
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Table 10: 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

Similarly, the respondents were asked whether they would be demotivated to start using RFID technology if implementing the RFID technology next to the legacy system would be relatively difficult. Neither early nor late implementers would feel demotivated by this problem (value not significantly higher than 4, see Table 8).

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 9 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:

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

Table 11: Test results for Hypothesis 5 (no equal variances assumed)

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

Table 12: Test results for Hypothesis 6

	mean group2	compared to	t-value	df	Sig. (1-tailed)
Max.	6.2128	4	36.670	46	0.000
Avg.	5.4149	4	28.286	46	0.000

Early implementers thus show more mindful decision making than late implementers. We note that additional tests (with results not shown in the tables) reveal that late implementers in turn make decisions more mindfully than non-implementers ($t=11.876$, $p=0.000$) and that non-implementers

The test results, shown in Table 10, 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.

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. These results should, however, be seen in light of the test results on Hypotheses 5 and 6.

Hypothesis 5 states that early implementers show more mindful decision making than late implementers. The test results in Table 11 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.

make decisions more mindlessly than early and late implementers ($t= 10.577$, $p= 0.000$) (when we asked them hypothetical questions: 'would you be motivated...').

Finally, the responses to the four questions mentioned with hypothesis 5 were compared to the

neutral value '4' to test hypothesis 6 (that late RFID implementers do not make decisions mindfully). The top row of Table 12 takes into account the maximum values given per respondent on one of the four questions. The second row considers the mean value given per respondent on the four questions. Both tests indicate that late implementers make implementation decisions mindfully.

Discussion and limitations

The fact that hypotheses 1a and 2 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. The main mindlessness driver is the observation of behavior of companies in other industries. Probably early implementers hope to get a competitive advantage by introducing some practice in their industry which proved successful in another industry. Another important mindlessness driver, especially for late implementers, is the competitor's behavior. Companies can only get a competitive advantage if they function differently from their competitors. Mindless companies have been said not to believe they can get competitive advantages by implementing some technology [5]. Therefore, it is no surprise that late implementers base mindless decisions on observations of competitor behavior, rather than buyer or supplier behavior. The fact that late implementers' decisions are still driven by implementations done in other industries could be a consequence of the fact that some late implementers still want to get competitive advantages by using the technology in a new way in their industry and that RFID implementations currently are not yet that old that we can talk about really late implementers.

The fanaticism of early and late implementers 'to move forward' suppresses demotivations that could arise because of potential problems with employees and legacy systems. 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.

This paper thus shows a number of drivers for companies to make decisions mindlessly (like behavior of companies in other industries) and shows signs of mindless decision making (e.g. regarding assimilation as unproblematic). The

important conclusion is that early implementers also take decisions mindlessly. Late implementers should be aware of that. On the one hand, mindless decision making is a dangerous regime and following some mindless leader seems even more dangerous. On the other hand, if the leader is doing some practice mindlessly, his practice might fail (because it does not fit his enterprise) whereas the practice might succeed in the follower's company (by coincidence). A follower thus still has a (small) chance of getting a competitive advantage by copying the innovator.

While the fact that *mindless followers follow leaders that show mindless behavior* might be worrying, our research 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. This mix is different for early implementers than for late implementers. This change in mix over time seems logical: the more prior implementers have used the technology successfully, the smaller seems the chance of the implementation going wrong in your company and thus the less sense it makes to pursue expensive investigations whether the technology would be beneficial to your company. The function describing this change in mix over time should depend on the technology that is considered: the more adaptation is needed to the specific company, the more risky is mindless decision making (and the higher competitive advantages can become). Further research is needed to investigate the function describing the change in mix.

One strength of this paper is that it considers both, mindlessness and mindfulness, in the same study. A study focusing on only one of the two could lead to wrong conclusions: our study indicates that mindlessness and mindfulness do not exclude each other. Researchers should thus note that detecting mindfulness in some case does not mean there is no mindlessness (and the other way around). For researchers it is also important to note that there is no straight line between the expected technology acceptance by users 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. Straub [24], for example, applies Hofstede's dimensions

[25] to compare the diffusion of e-mail in Japan and in the United-Sates, and puts forward the significant role of ‘uncertainty avoidance’ in the adoption process of communication media. More recently, Bartikowski, Fassot and Singh [26] extended the TAM model to integrate a dimension entitled “cultural adaptation”. 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. We believe such a comparison based on survey data would be incorrect, as companies probably tend to gloss over mindless behavior and thus probably automatically give lower scores to factors pointing at mindlessness.

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.

Conclusions

This paper presents findings from a survey conducted among 122 Chinese companies about drivers for RFID adoption. More specifically, the applicability is tested of Swanson and Ramiller’s mindlessness/mindfulness theory. The data gives mixed support for the applicability of the theory in the context of RFID implementations in China. The survey indicates that late adopters show more mindless behavior than early adopters. Importantly, those early adopters also show signs of mindless decision making! That is, mindless followers follow leaders that take decisions partly mindlessly. Companies are motivated to invest in RFID technology if they observe others in other industries are implementing it.

Our research also points out that neither late nor early implementers can be qualified as fully mindless decision makers. All implementers make the implementation decision part mindfully, part mindlessly. Early decision makers make their decisions more mindfully and less mindlessly than late implementers. A healthy mix between mindless

and mindful drivers is important. The evolution of this mix over time for some technology should be a function of the specifics of that technology and is the topic of further research.

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