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Can Auto-ID make Trade Stable between Korea and China?

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Abstract

As increasing trade through the world, especially in food, asymmetry of information can make the trade shrink. With the industrial development, Korea's agriculture had shrunk dramatically. By the result of the nation's industrial restructuring, over than 3/4 of Korean food consumption comes from abroad. And China is an important source of agricultural product to Korea. Increasing family income and increasing importing food consumption, Korean consumers have been interested in food safety. Especially, after experiencing several cases like struggle for safety of GMO food, poultry influenza, lead contained Chinese fish import, mad cow disease, cheating origin, etc.

Obviously, those unreliable cases will hinder the increase of world free trade as well as the trust of two countries. Furthermore, distrust will be a cause of adverse selection.

So, it need to find a way to solve the distrust which caused by asymmetry of information. And automatic identification procedures can help mitigate asymmetry of information in trade. And it will make Korean consumers can avoid adverse selection.

This paper suggests adoption of Auto ID to encourage agricultural trade between Korea and China.

Key words : auto-ID, agricultural trade, food comsumption

I. Introduction

In 1992, Korea and China re-started their diplomatic relationship after a half century's severance of diplomatic relations. After 10 years eestablishment of diplomatic relations, two countries have built more important partnership in many aspects.

Trade volumes between two countries recorded rapid growth, annual growth rate of 31.9%, during the period of 1992 through 2000. By the result, now, China is the second largest exporting market to Korea, and the largest investing partner of Korea. In 1992, only 90 thousands Korean people visited China, but in 2001, 1.1 millions Korean visited the country.

To China, Korea is the fourth largest trading partner (2001), and the sixth largest investing companion in 2001. In 1999, 200 thousands Chinese people came to Korea, but in 2001, 480 thousands Chinese visited Korea.

With the industrial development, Korea's agriculture had shrunk dramatically. By the result of the nation's industrial restructuring, over

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than 3/4 of Korean food consumption comes from abroad. And China is an important source of agricultural product to Korea.

Frequently, international trade doesn't fit for Ricardo's Idea. And consumers' behavior doesn't obey the Kotler's principle either.

Increasing family income and increasing importing food consumption, Korean consumers have been interested in food safety. Especially, after experiencing several cases like struggle for safety of GMO food, poultry influenza, lead contained Chinese fish import, mad cow disease, cheating origin, etc.

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So, it need to find a way to solve the distrust which caused by asymmetry of information.

Recently, automatic identification procedures have become very popular in many service industries, purchasing and distribution logistics, industry, manufacturing companies and material flow systems. Automatic identification procedures exist to provide information about people, animals, goods and products in transit. Examples of auto-ID are includes; barcode system, optical character recognition (OCR), smart cards, RFID(radio frequency identification), and biometric procedures (fingerprint, voice recognition, etc).

Auto-ID is supposed to be a solution to prevent the adverse selection.

II. Auto-ID

2.1. Barcode System

Barcodes have successfully held their own against other identification systems over the past 20 years. According to experts, the turnover volume for barcode systems totaled around 3 billion DM in Western Europe at the beginning of the 1990s.

The barcode is a binary code comprising a field of bars and gaps arranged in a parallel configuration. They are arranged according to a predetermined pattern and represent data elements that refer to an associated symbol. The sequence, made up of wide and narrow bars and gaps, can be interpreted numerically and alphanumerically.

It is read by optical laser scanning, i.e. by the different reflection of a laser beam from the black bars and white gaps. However, despite being identical in their physical design, there are considerable differences between the code layouts in the approximately ten different barcode types currently in use.

The most popular barcode by some margin is the EAN code (European Article Number), which was designed specifically to fulfil the requirements of the grocery industry in 1976. The EAN code represents a development of the UPC (Universal Product Code) from the USA, which was introduced in the USA as early as 1973.

2.2. Optical character recognition

Optical character recognition (OCR) was first used in the 1960s. Special fonts were developed for this application that stylised characters so that they could be read both in the normal way by people and automatically by machines. The most important advantage of OCR systems is the high density of information and the possibility of reading data visually in an emergency (or simply for checking).

Today, OCR is used in production, service and administrative fields, and also in banks for the registration of cheques (personal data, such as name and account number, is printed on the bottom line of a cheque in OCR type). However, OCR systems have failed to become universally applicable because of their high price and the complicated readers that they require in comparison with other ID procedures.

2.3. Biometric procedures

Biometrics is defined as the science of counting and (body) measurement procedures involving living beings. In the context of identification systems, biometry is the general term for all procedures that identify people by comparing unmistakable and individual physical characteristics. In practice, these are fingerprinting and handprinting procedures, voice identification and, less commonly, retina (or iris) identification.

2.4. Smart cards

A smart card is an electronic data storage system, possibly with additional computing capacity (microprocessor card), which - for convenience - is incorporated into a plastic card the size of a credit card. The first smart cards in the form of prepaid telephone smart cards were launched in 1984. Smart cards are placed in a reader, which makes a galvanic connection to the contact surfaces of the smart card using contact springs. The smart card is supplied with energy and a clock pulse from the reader via the contact surfaces. Data transfer between the reader and the card takes place using a bidirectional serial interface (I/O port). It is possible to differentiate between two basic types of smart card based upon their internal functionality: the memory card and the microprocessor card.

One of the primary advantages of the smart card is the fact that the data stored on it can be protected against undesired (read) access and manipulation. Smart cards make all services that relate to information or financial transactions simpler, safer and cheaper. For this reason, 200 million smart cards were issued worldwide in 1992. In 1995 this figure had risen to 600 million, of which 500 million were memory cards and 100 million were microprocessor cards. The smart card market therefore represents one of the fastest growing subsectors of the microelectronics industry.

One disadvantage of contact-based smart cards is the vulnerability of the contacts to

wear, corrosion and dirt. Readers that are used frequently are expensive to maintain due to their tendency to malfunction. In addition, readers that are accessible to the public (telephone boxes) cannot be protected against vandalism.

2.5. RFID

RFID (Radio Frequency Identification) is a method of identifying unique items using radio waves. This technology has been attracting considerable attention with the expectation of improved supply chain visibility for both suppliers and retailers. It will also improve the consumer shopping experience by making it more likely that the products they want to purchase are available.

Recent announcements from some key retailers have brought the interest in RFID to the forefront.

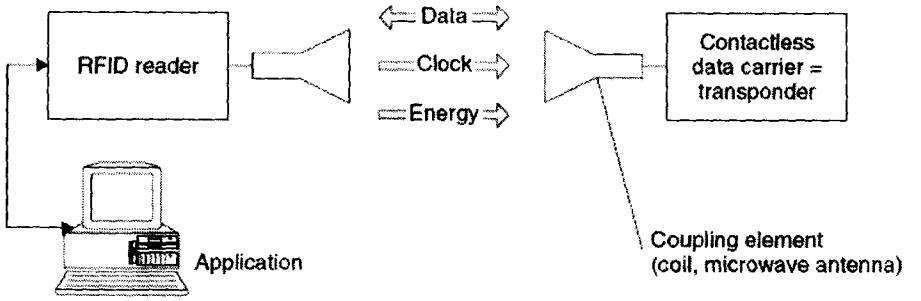
Typical RFID systems are made up of 2 major components: readers and tags. The reader, sometimes called the interrogator, sends and receives RF data to and from the tag via antennas. A reader may have multiple antennas that are responsible for sending and receiving the radio waves.

The tag, or transponder, is made up of the microchip that stores the data, an antenna, and a carrier to which the chip and antenna are mounted.

The interrogator or reader, which, depending upon the design and the technology used, may be a read or write/read device.

The transponder, which is located on the object to be identified, represents the actual data-carrying device of an RFID system, normally consists of a coupling element and an electronic microchip.

When the transponder, which does not usually possess its own voltage supply (battery), is not within the interrogation zone of a reader it is totally passive. The transponder is only activated when it is within the interrogation zone of a reader. The power required to activate the transponder is supplied to the transponder through the coupling unit (con-



(Figure 1) Reader and Transponder

Source: Klaus Finkenzeller, *RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification,* Second Edition, 2003 John Wiley & Sons, Ltd. 2003.

tactless), as are the timing pulse and data. RFID has benefits in many aspects(Table 1).

RFID technology is used today in many applications, including security and access control, transportation and supply chain tracking. It is a technology that works well for collecting multiple pieces of data on items for tracking and counting purposes in a cooperative environment.

There are many different versions of RFID that operate at different radio frequencies. The choice of frequency is dependent on the requirements of the application. Three primary frequency bands have been allocated for RFID use.

Applications for RFID within the supply chain can be found at multiple frequencies and different RFID solutions may be required to meet the varying needs of the marketplace.

Many of today's RFID technologies cannot reliably cover areas wider than 4 to 5 feet, making them unsuitable for wide openings that are the norm in manufacturing, distribution and store receiving dock environments. Since UHF (Ultra High Frequency) can cover portals up to 9 feet wide it is gaining industry support as the choice bandwidth for inventory tracking applications including pallets and cases.

Technology providers are developing readers that work with multiple system protocols and frequencies so that users will be able to choose the RFID products that work best for their market and products.

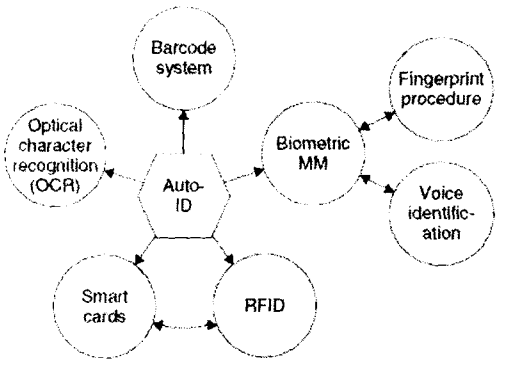
RFID is expected to provide huge advantages to manufacturers by offering the tools to better plan production and respond more quickly to market demand. It will facilitate automation of inventory counts and speed shipping and receiving at the distribution level. For retailers, it will help to reduce stock-outs, enable product tracking and potentially reduce theft and streamline the POS function. RFID will also open other merchandising opportunities and help with the overall consumer buying experience.

Due to the current cost of the technology (both tags and infrastructure), the initial phase of adoption for retailers is at carton and pallet marking applications. The current technology being adopted for carton and pallet labeling is passive UHF tags (850 MHz - 950 MHz). As the cost of tags and readers comes down, a wider adoption at the item marking level will develop.

In order for RFID to grow quickly, it is important that standards be developed so that the technology providers are working toward a common goal of providing low cost and compatible technologies. Not only will it drive down costs, but standards will also help users to reap the greatest benefit from their investment by providing value throughout the whole supply chain.

2.6. Comparison of Auto ID

As briefly, Auto ID can be viewed like figure 2. And each Auto ID can be compared as Table 1.



(Figure 2) Overview of Auto IDs

Source: Klaus Finkenzeller, *RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification*, Second Edition, 2003 John Wiley & Sons, Ltd. 2003.

(Table 1) Comparison of Auo ID systems showing their advantages and disadvantages

System parameters	Barcode	OCR	Biometry	Smart card	RFID systems
Typical data quantity (bytes)	1–100	1–100	—	16–64 k	16–64 k
Data density	Low	Low	High	Very high	Very high
Machine readability	Good	Good	Expensive	Good	Good
Readability by people	Limited	Simple	Difficult	Impossible	Impossible
Influence of dirt/damp	Very high	Very high	—	Possible (contacts)	No influence
Influence of (opt.) covering	Total failure	Total failure	Possible	—	No influence
Influence of direction and position	Low	Low	—	Unidirectional	No influence
Degradation/wear	Limited	Limited	—	Contacts	No influence
Purchase cost/reading electronics	Very low	Medium	Very high	Low	Medium
Operating costs (e.g. printer)	Low	Low	None	Medium (contacts)	None
Unauthorised copying/modification	Slight	Slight	Impossible	Impossible	Impossible
Reading speed (including handling of data carrier)	Low ~4 s	Low ~3 s	Very low ~5–10 s	Low ~4 s	Very fast ~0.5 s
Maximum distance between data carrier and reader	0–50 cm	< 1 cm Scanner	Direct contact*	Direct contact*	0–5 m, microwave

Source: Klaus Finkenzeller, RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, Second Edition, 2003 John Wiley & Sons, Ltd. 2003.

III. Adverse Selection

3.1. Adverse Selection

Adverse selection or anti-selection is a term used in economics and insurance.[1)]

It was originally used in insurance to describe a situation where the people who take out insurance are more likely to make a claim than the population of people used by the insurer to set their rates. For example, when setting rates for a life insurance contract, a life insurer may look at death rates among people of a certain age in a certain area. Now suppose that there are two groups among the

1) http://www.start2know.com/wiki/Adverse_selectio

population, smokers and non smokers, and the insurer can't tell which is which so they each pay the same premiums. Non smokers know that they are less likely to die than average and that they are cross subsidising smokers, so will be reluctant to insure themselves, while smokers will have a higher likelihood of claiming so will be more likely to buy insurance. The insurance company ends up with people with higher average mortality rates than allowed for when setting premiums.

In the usual case, a key condition for there to be adverse selection is an asymmetry of information - people buying insurance know whether they are smokers or not, whereas the insurance company doesn't. If the insurance company knew who smokes and who doesn't, it could set rates differently for each group and there would be no adverse selection. However, other conditions may produce adverse selection even when there is no asymmetry of information. For example, some countries require health insurance providers to insure all who apply at the same cost. In this case, there may not be an actual asymmetry of information, the insurance company may know who is or isn't a smoker, but the insurer not being allowed to act on that information, there is a "virtual" asymmetry of information.

3.2. Agricultural Trade Between Korea and China

After 1992, trade volume between Korea and China had been growing rapidly. During the period of 1992 through 2000, trade volume between two countries recorded rapid growth, annual growth rate of 31.9% (Table 1).

〈Table 2〉 Chinese Exporting Items to Korea(US$ 100Mil.)

Item	1995	1996	1997	1998	1999	2000
Textile	160.0	162.0	186.0	136.0	177.0	238.0
Metal Products	141.0	124.0	169.0	73.0	92.0	134.0
Mining Products	85.0	113.0	130.0	86.0	79.0	113.0
Electronic Appliances	61.0	98.0	127.0	114.0	171.0	255.0
Chemical Products	57.0	53.0	55.0	44.0	56.0	71.0
Agricultural & Aquatic Products	27.0	32.0	69.0	46.0	39.0	87.0
Total Exports	669.0	751.0	912.0	629.0	781.0	1,129.0

Source: www.kitra.com

〈Table 3〉 Chinese Agricultural Products Exporting Items to Korea(US$ Mil.)

	1997	1998	1999	2000	2000.9 (A)	2001.9 (B)	B/A (%)
Agricultural Products	933.5	621.6	551.6	1,152.0	816,562	647,949	-20.6
Livestock Products	47.8	13.8	15.1	23.4	15,314	23,965	56.5
Forestry Products	298.3	138.9	214.7	282.6	206,665	233,390	12.9
Aquatic Products	272.1	197.3	413.8	486.8	363,208	457,988	26.1
Total	1,551.7	971.6	1,195.1	1,944.8	1,401,749	1,363,291	-2.7

Source: www.kitra.com

Agricultural product is an important exporting item to China (Table 2). As Korea's industrial restructuring, agricultural sector is shrinking continuously. It means Korean food market will remain an attractive market to China in the future.

Korean food market must import over than 3/4 of her food consumption. Since Korean consumers have to be supplied imported food, the single most important concern of Korean consumers is "food safety". In case of Chinese agricultural product, by the lack of traceability, adverse selection can be arisen in the marketplace.

3.3. Application of the Concept

The concept of adverse selection has been generalized by economists into markets other than insurance, where similar asymmetries of information may exist. For example, George Akerlof developed the model of the "market for lemons." People buying used cars do not know whether they are "lemons" (bad cars) or "cherries" (good ones). The sellers, on the other hand, have this knowledge. At any given price, the sellers will be more likely to sell lemons than cherries, keeping the good cars for themselves. Thus, the buyers will learn to presume that all or most used cars are lemons. This depresses the price of used cars, so that even more of the cherries are held off the market. The "price mechanism" fails to keep the lemons off the market, even in a competitive market. Instead, they dominate the market. Guarantees are needed.

The above concept can be applied to Korean food market. When the asymmetries of information exist, Korean consumers can not have information of the origin. So, they will buy "lemons" instead of "cherries", and this will cause of falling price of "cherries'. Furthermore, because the consumers doesn't want to buy "lemons', they may buy food that come from other countries which can trust by assurance of information.

It shows the adverse selection which induced by asymmetry of information can crowd out "cherries".

IV. Conclusion

4.1. Conclusion

After 1992, Korea and China have built more important partnership in many aspects including economic cooperation.

Trade volume between Korea and China grows rapidly, but some troubles are observed.

Although the distrust is still remained, in food market, trade between two countries will be profitable to each others. To build trade reliance, asymmetry of information should be removed by information systems like SCM (supply chain management). Automatic ID system will be the infrastructure of information assurance in trade. Auto ID included barcode, OCR, smart card, and RFID. Adoption of auto

ID will cut costs, shorten times, improve quality, while improve service quality through supply chains.

Due to the technical availability, and information capacity RFID is recommended to encourage agricultural product trade promotion.

4.2. Problems and Limitations

To obtain the benefits described above, standardization must fulfilled first. Standardization should be covered through production, logistics, transaction, and information. And international standard must be set and be obeyed.

In spite of discussion above, this paper has a limitation as just a pilot work. So, it needs to conduct an empirical study to adopt RFID or auto ID system in agricultural trade between two countries in the near future.

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