RFID in Media: Trials in the Japanese Publishing Industry

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Abstract

In recent years, many industries considered RFID technology to offer potential for significantly improving supply chain management efficiency improvement. Between 2003 and 2006, the Japanese Ministry of Economy, Trade and Industry (METI) initiated and supported several RFID trials. One of the first trials using item-level RFID took place in the Japanese publishing industry.

Since the 1990s, the Japanese publishing industry, one of the largest publishing industries in the world, suffered sales decreases and slashed margins. Searching for a way out of this situation, governmental institutions, publishing industry associations, and individual industry players recognized the potential of RFID technology. They expected process enhancement and thus increased margins from books with RFID tags to be printed and shipped along the supply chain to the customer.

After introducing the fundamentals of RFID technology and of the Japanese publishing industry, this paper illustrates and analyzes the 2006 METI trials in the Japanese publishing industry. Following the case study methodology, it offers several explorative findings and closes with a summary and an outlook to further research.

Keywords: Radio Frequency Identification (RFID), Publishing, Supply Chain Management, Case Study, Japan

1 Introduction

Over the past decade, several industries have increasingly considered Radio Frequency IDentification (RFID) technology for supply chain purposes on a global scale. RFID, an innovation of the early 20th century, has touted to raise efficiency levels along the supply chain through increased speed and enhanced data quality. Vendors and consultants have claimed significant efficiency improvements which could change the economics of business in many industries.

Since the 1990s, the global publishing industry has experienced the advent of CD-ROM and Internet which were accompanied by a market downturn in traditional publishing of print products (Keh 1998; Mussinelli 2002). On the one hand, the publishing industry learned from that experience to be cautious with the adoption of further technological innovations. On the other hand, it looked for technology-driven process innovations to increase margins along its supply chain.

At the beginning of the millennium, RFID appeared on the radar screens of major publishing associations as technological innovation allowing for process improvements (Hicks 1999; Falk 2004). Based on promises of increased efficiency, publishers and retailers began to investigate how RFID technology worked and subsequently put it on their strategic agenda (Lichtenberg 2003).

The Japanese publishing industry, one of the largest in the world with about 4,500 publishers, 70 wholesalers, and more than 20,000 retail outlets including bookstores, second-hand bookstores, and libraries (JPO 2005), took a national and even global precursor role in testing

RFID technology along the publishing supply chain when it partnered with the country's strong RFID initiatives.[1]

This paper investigates the opportunities that publishing industries can gain from RFID technology and analyzes the RIFD related efforts taken by the Japanese Ministry of Economy, Trade and Industry (METI) in the Japanese publishing industry. METI undertook initial RFID trials between 2003 and 2005. In 2006, it then funded a large-scale item-level RFID project involving various players in the publishing context. In contrast to recent RFID trials focusing on logistics units in fashion (Loebbecke, Palmer 2006), fast moving consumer goods (Loebbecke 2004), pharmaceuticals (Smith 2005), and military defense goods (Smith, Konsynski 2003), the Japanese publishing industry focused its 2006 trial mostly on item-level application.

The remainder of the paper is structured as follows: Next, it offers a short overview of the case study methodology as research methodology of choice. It continues with introducing RFID technology for supply chain management and with outlining the basics of the Japanese publishing industry. The paper then illustrates and analyzes the METI's 2006 RFID trials along the publishing supply chain and provides several findings concerning RFID applications in media industries. The paper ends with a short summary and an outlook to further research.

2 Case Study Methodology

This paper applies a single fieldwork case study methodology as research method to reflect the reality of the Japanese publishing industry trialing RFID technology. The exploratory case

[1] Japan has actively fostered RFID, both in terms of R&D and practice since the late 1990s (Shirai & Johnson 2006). The Japanese RFID market for tags, other system components, and software is expected to grow from €64 million in 2000 to about €850 million in 2008 and €2.75 billion in 2013 respectively (METI 2006).

study methodology (Yin 1981; Yin 2003) is well suited to find answers to 'how' the Japanese publishing industry initially pursued RFID.

We gathered mostly qualitative data from publicly available and organizational sources. The data collection involved repeated formal and informal talks with senior executives and project managers as well as investigation of meeting minutes. Especially the informal settings facilitated that respondents talked about their personal perceptions and impressions of the project. METI officials reviewed the written up case to rule out factual errors.

Admittedly, single field work cases suffer from decreased generalizability compared to multiple case studies. However, due to the exploratory stage and no claims for generalizability, we consider a single case study suitable.

3 Technology and Industry Information

3.1 RFID Fundamentals

RFID technology allows for contact-free reading and saving of data via electromagnetic waves (radio frequency field). It uses RFID transponders, also called Smart Chips, which are tiny computer chips with an antenna. RFID transponders can be integrated into a wafer-thin paper tag or a reusable plastic hard tag. The RFID tags are attached to objects, individual items or logistic units such as cartons, palettes, and containers. Passive or semi-passive tags 'identify' themselves when they detect a signal from a compatible device, known as an RFID reader. As an RFID transponder passes through a radio frequency (RF) field generated by a compatible reader, it transmits its stored data to the reader. Thereby, it gives details about the item or logistic unit to

which it is attached. No line-of-sight is needed between transponder and reader. The radio signal goes through walls, cardboard, or clothing. Further, with RFID technology, one can read several items at a time.[2] From the RFID reader, data is usually transferred to a computer which then may hand the information to other systems, such as Enterprise Resource Planning, Customer Relationship Management, or Electronic Data Interchange to coordinate intra-organizational and inter-organizational supply chain processes (Loebbecke, Palmer 2006; Loebbecke et al. 2006).

RFID on item-level allows distinguishing every individual item. For instance, every copy of the newest Harry Potter book would have a unique RFID code, but all of them carry the same International Standardized Book Number (ISBN) and barcode (Lichtenberg 2003).

With those characteristics, RFID technology enables localization services determining where individual items are located in the supply chain at any time and in real time. By facilitating enhanced recycling of products, it helps to resolve environmental problems (Higashino 2006). RFID technology also facilitates enhanced management of product recalls and returns. Offering paperless transactions, RFID technology finally makes shipping tickets, delivery slips, and other vouchers useless (Higashino 2006).

In spite of those advantages, some factors have so far inhibited large scale RFID diffusion. Those factors are (1) the price of individual tags, (2) the development and integration of software, (3) the management and analysis of the vast amount of data gathered, and (4) a lack of industry specific technical standards (Lichtenberg 2003; Loebbecke, Palmer 2006).

[2] For more on RFID technology, see for instance, Shepard 2004. Regarding RFID applications in the supply chain, see Angeles 2005, Kaerkkaeinen and Holmstroem 2002, and Loebbecke 2006.

3.2 Japanese Publishing Industry Basics

The Japanese publishing industry, reaching about 6% of the size of the Japanese automotive or the electronic sector (in 2004 the Japanese automotive sector exhibited a turnover of €365 billion), comprises three levels of players. These are publishers, wholesalers, and retailers. They employ about 100,000 people. The top five publishers account for approximately 25% of the total sales (Japan Society of Publishing Studies 2004). Two of the 70 wholesalers, Nippan and Tohan, control 80% of the market (Matthews et al. 2002; Miyamoto, Whittaker 2005). The top three retailers control about 10% of the publishing retail market (Miyamoto, Whittaker 2005). With 18,000 retail outlets, Japan had twice as many publishing retailers as the UK and the US together.

With almost €10 billion revenue from book sales in 2005, books accounted for more than 40% of the Japanese publishing market. Despite the availability of several distribution channels for books, book publishers sell roughly 70% of books to wholesalers, who in turn sell about 65% to retail bookstores (Miyamoto, Whittaker 2005). Traditionally, the cooperation among publishers, wholesalers, and retailers in the Japanese publishing industry has been strong, involving exchange of human capital, cash infusion, and IT network building (Kornicki 1998).

Annually, Japanese publishers issue more than 75,000 new books and sell about 1.3 billion books with a variety of 1.2 million titles (Miyamoto, Whittaker 2005; JPO 2006a). Japanese book retailers either buy books or they make consignment deals, which allow them to return unsold issues to publishers. More than a third of the books delivered on consignment are returned.

In the 1990s, the Japanese publishing market faced a major decline, the first ever as far as industry representatives could remember. Main reasons for the decline were (1) decreasing personal income during recession, (2) spreading of the Internet and mobile phones, and (3) emerging library services as well as the newly introduced second hand book shops (Hanajiri

2003). Especially the book sector was hit by cheaper electronic forms of distribution (METI 2002).[3] Only in the new millennium, the Japanese publishing industry could stop the downtrend; in 2004, it grew for the first time in more than a decade (Miyamoto, Whittaker 2005).

4 The 2006 METI RFID Trial

4.1 Motivation

In 2003/2004, the Japanese publishing industry undertook METI-funded performance evaluations. The evaluations included all supply chain processes, paying special attention to store operations, redesign, and spotting and preventing book theft, and illegal book trade in second-hand bookstores and libraries (Hada et al. 2004). Results from the evaluations indicated ongoing challenges regarding RFID technology development and implementation on the one hand, and business process and system adaptation on the other. Building on those challenges, the Japanese publishing industry put several issues high on the agenda for further research. Those issues were (1) distribution inefficiency, not only because the Internet offered distribution costs far lower than the traditional multi-tier channel involving publishers, wholesalers, and local retail bookstores, (2) increasing book returns on consignment deals, and (3) large amounts of paper waste contaminated with plastic and silicon from RFID tags.

METI and the Japan Publishing Organization for Information Infrastructure Development (JPO)[4] took up the issues and at the same time reacted to the economic difficulties when they

[3] In Europe and North America, music and newspaper markets suffered the most from newly available electronic distribution opportunities (Rao 1999; Picard 2003).

[4] JPO, supported by a number of major Japanese publishers, aims to improve book distribution using modern technologies.

proclaimed faster and better inter-organizational coordination of all business processes along the publishing supply chain.[5]

In their quest for process improvements, METI and the publishing industry considered RFID technology and calculated an RFID business case for the Japanese publishing Industry. They quantified the potential of RFID technology and RFID-enabled processes: Concerning increasing sales of new books they anticipated about €1.2 billion per year based on better managing release dates and improved Customer Relationship Management. They forecasted process costs reductions from returned books to reach about €200 million per year. Finally they calculated book theft[6] decreases of about €290 million per year (JPO 2006a). They also forecasted shortened inspection time[7], better business processes security, and overall improved distribution and tracing systems (JPO 2006a). Altogether, the JPO projected the impact of RFID on the Japanese publishing sector to reach about €2.5 billion in combined sales increases and cost reductions (JPO 2006a).

Based on those impressive numbers, the Japanese publishing industry opted for an RFID implementation trial. However, RFID regulation was still rudimental and technology under continuous development. Therefore, only an RFID consortium involving industry associations and players, governmental institutions, and technology vendors could undertake any significant RFID trial and pay tribute to the immature and emergent status of RFID technology.

Indeed, taking the Japanese publishing industry as testbed, the consortium members pursued the first real-life test of supply chain wide item-level RFID implementation (Higashino 2006).

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5 Due to fixed book retailing prices in Japan, process improvement meant the only alternative to margin slashes in times of cost increases.

6 Book theft accounted annually for €13,375 per bookstore in Japan, calculating to an average theft / sales ratio of 24% (JPO 2006b).

7 RFID introduction allowed for a possible reduction of inspection time of 90% in the Japanese Publishing Industry (JPO 2004).

4.2 Consortium Composition and Objectives

As initiating governmental agency, METI assigned responsibility for organizing the 2006 trials to heavyweights in the publishing industry. Several JPO member companies organized the trial, paper manufacturers, printing companies and book manufacturers, publishers including the three major players Kodansha[8], Shogakukan[9], and Shueisha[10], and bookstores. METI also invited technology vendor Hitachi, in charge of the RFID developments in Japan, to supervise the technological aspects of the trial.

METI and the other consortium members formulated a catalogue of trial objectives. The overarching goal was seamless sharing of information through the use of RFID. Building on trends in international standardization trends, the three main goals were to promote (1) fundamental R&D for inter-organizational coordination and information exchange on a global scale, (2) common cross-sector problem resolution with regard to the social acceptability of RFID technology, and (3) acceleration of RFID adoption and diffusion along the entire publishing supply chain as a role model for other industries (Higashino 2006). Two additional objectives were the creation of a new business model based on the technology innovation and the utilization of the newly available information for the marketing strategy of publishers (Fujita 2007).

4.3 Customer Privacy Context

During preparations in 2003 and 2004, METI acknowledged that the public closely related RFID technology to privacy. When RFID became a mainstream topic at the beginning of the

[8] Kodansha is one of Japan's largest publishing companies. In 2006, the company achieved revenues of more than €1.3 billion. It has a major joint venture with Walt Disney Company.

[9] Shogakukan has a market share of about 8% in the Japanese publishing market, specializing in schoolbooks, books for children, and encyclopedia. With about 69 magazines, 7,500 book titles, 10,900 comic book titles, 900 magazine books, 3,000 DVD and video titles, it achieves a turnover of about €1.25 billion.

[10] Shueisha specializes in Manga comics and other magazines.

millennium, customer privacy organizations and civil rights activists emphasized the danger of customer data being gathered, processed, and exploited without the customer even being aware. Specifically, RFID technology raised concerns that personally relevant data was stored on RFID tags and then acquired from the tag without customer permission. If customer data was stored on an RFID tag that contained an ISBN code, this would allow drawing conclusions on customers' shopping behavior and possibly on political and philosophical attitude, obviously implying serious privacy concerns.

The privacy topic gained public attention. Hence, in addition to PR efforts to create an atmosphere of transparency by individual companies and industry associations, in June 2004, METI and the Ministry of Internal Affairs and Communications (MIC) took matters into their own legislative hands. The two governmental agencies jointly established and released a *Privacy Protection Policy* with regard to RFID facing the consumer. The policy regulated to make attached RFID tags transparent to the user; it gave consumers the rights to nullify and delete or even remove RFID tags; it set restrictions for gathering and using personal customer information; and it ruled on the accountability of RFID tag issuers (Shirai & Johnson 2006). In the trial, project participants specified and even extended the overall privacy policy concerning two aspects. First, information stored on RFID tags should only include arbitrary numbers and letters required for the distribution process and exclude any personal customer data. Second, any information stored on the RFID tags should be deleted and the tags should be destructed before product delivery to the customer.

4.4 Technological Context

4.4.1 RFID Infrastructure in Japan

RFID implementation in the publishing industry required a commonly accepted product numbering scheme and an assigned frequency range for RFID systems to operate.

Product numbering scheme: The development of a common product numbering scheme began long before considerations to implement RFID technology. In 1977, the Japanese Distribution Systems Research Institute[11] founded the Distribution Code Centre - Japan (DCC-Japan) as national authority for product number coding. In 1978, envisioning the global scope of product numbering, the DCC-Japan joined the European Article Numbering Association (EAN).[12]

GS1, the successor of the EAN, considered mature and standardized product number coding inevitable for the identification of products on item-level along the entire supply chain. With a special focus on numbering possibilities associated with RFID technologies, in 2003 GS1 together with international research institutions founded EPCglobal. In January 2004, they set up a Japanese unit, EPCglobal Japan which promoted specific product numbering codes for use with RFID technology (Shirai & Johnson 2006).

Frequency range: Available frequency ranges were scarce when commercial RFID use came into play during the 1990s. In Japan, Ultra High Frequency (UHF) was mainly allocated to cell phone services. Only the frequencies 13.56MHz (HF) and 2.45GHz (UHF) were available for RFID. In April 2005, understanding the need for a globally harmonized RFID frequency allocation, the Japanese Ministry of Public Management, Home Affairs, Posts and

[11] The Japanese Distribution Systems Research Institute was founded in 1972 to investigate the potential of supply chain enhancements in many industries.

[12] In January 2004, the former European Article Numbering Association migrated to GS1.

Telecommunications released the 950 to 956MHz frequency range in the UHF band for RFID use (Hara 2003). As the frequency range lay within 860 to 960 MHz specified by EPCglobal, Japanese RFID implementations were compatible with other industrial nations.

4.4.2 Hibiki RFID Tag

To further tackle the technology issues foreseen for the RFID trials, in 2004, METI, Hitachi, and about 100 other Japanese companies from the semiconductor, electronics, printing, publishing, apparel, and logistics industries launched the national 'Hibiki project'. Funded with about €92 million from METI between 2004 and 2006, the Hibiki project aimed at developing and testing so-called Hibiki RFID tags, which were supposed to be low-cost, high-quality, multi-standard, re-writable, and designed for item level use.

The resulting Hibiki RFID tag coding complied with ISO and EPCglobal standards, which was a necessary condition for use in international transactions (Hara 2003). Further, resulting tag costs were as low as €0.05 (assuming an output volume of 100 million tags) compared to €0.10 to €0.15 for European or American tags. The low cost was achieved by a simple encoding scheme and by allowing for polymer-based printing[13] of RFID tag antennas (Hara 2003).

METI was satisfied with the Hibiki project results, and therefore solely promoted Hibiki tags for further RFID trials in the publishing industry.[14]

[13] Polymer printing utilizes organic and inorganic materials to print electrical circuits, thereby making large scale production feasible at lower cost compare to traditional production technologies.

[14] After the completion of the METI trials in August 2006, METI intended to further diffuse the Hibiki technology first to a broader array of industries in Japan and then also globally (Shirai & Johnson 2006).

4.5 Sub-Trials

The 2006 METI trial in the publishing industry consisted of five sub-trials: (1) the *Customer Order Tracking* sub-trial, (2) the *Sales Management System* sub-trial, (3) the *Store Operation and Customer Service* sub-trial, (4) the *Code System and Privacy Protection* sub-trial, and the (5) *Paper Recycling* sub-trial.

Ad (1) The *Customer Order Tracking* sub-trial (see Figure 1) involved printing and book binding companies, publishers, wholesalers, bookstores, and consumers. It denoted the tracking of customer orders of comic books. Hibiki RFID tags were attached to 100,000 comic books during the manufacturing process. Following ID issuance and code writing on the tag, publisher personnel inspected the comic books and assorted them in the distribution system.

A major purpose of the Customer Order Tracking sub-trial was to fix and maintain delivery dates across supply chain members. For instance, the printing and book binding company set a delivery date for the book to reach the wholesaler. The wholesaler then, based on that date, set a delivery date on which the book would reach the retailer. Finally, the retailer set a date for the book to be available to the customer for purchase.

The Customer Order Tracking sub-trial investigated the cost per customer order, the cost per retail service, and the cost for design and store layout of next generation bookstores. The sub-trial pointed to the duration of the product delivery process, the necessity of precise information entering, and the appropriate protection of private customer data as main problems.

Insert Figure 1 Here

Ad (2) The *Sales Management System* sub-trial involved all entities participating in the publishing supply chain, however excluding customers.

For the sub-trial, 10,000 copies of the 'Encyclopedia of Health and Medicine' published by Kodansha Ltd were printed, tagged, and distributed along the supply chain. Information was gathered from the Hibiki RFID tags affixed to the Encyclopedia books and then passed to and processed by the sales management system. The information let publishers, wholesalers, and bookstores track returnable and non-returnable books and their respective status.

The overall objective for the Sales Management System sub-trial was to improve supply chain management efficiency. Participating parties aimed at improving supply chain flexibility, reducing book returns, and enhancing the management of returned books. Concerning upstream operations, publishers also sought advantages for printing companies and thereby contributed to optimized supply services.

The Sales Management System sub-trial showed that the availability of real-time information on inventories and on book returns on retail level allowed publishers and book printers improved future demand estimates and thus better allocation of production capacities.

Ad (3) The *Store Operation and Customer Service* sub-trial focused on retail bookstores and the interaction between retail personnel and customers (see Figure 2). The sub-trial examined the introduction of flatbed smart shelves which displayed information to both, consumers and retail personnel. For RFID-tagged books on the shelves, the inventory management system gave retail personnel the opportunity to observe daily and weekly book rankings in real-time and to analyze the relationship between customers' book browsing and buying. It allowed retail personnel to

send instant messages concerning growth rates, hit ratios, inventory levels, and out-of-stocks to the employees in charge of inventory management. The inventory management system also offered customers book rankings, summaries, and reviews as additional service.

The main objective of the Store Operation and Customer Service sub-trial was to achieve more detailed and objectified, even if qualitative, assessments of customer demand and to transform those assessments into quantitative information. The quantified analysis could then be passed along the supply chain. Eventually, the customer information application should improve customer services, and this lead to increased sales.

The Store Operation and Customer Service sub-trial indicated that customers readily adopted the customer service applications, thereby passing important information upstream along the publishing supply chain. Further, it showed that retail personnel utilized the newly available applications to paint a more realistic picture of future demand and future trends.

Insert Figure 2 Here

Ad (4) Also, the *Code System and Privacy Protection* sub-trial involved all supply chain participants. They agreed on a common coding system for publishing products compatible with the 512 bit Hibiki RFID tag memory[15]. The printing and book binding company attached the Hibiki RFID tags to the books. Publishers, wholesalers, and retailers implemented software for reading and interpreting the information stored on the tag.

[15] The memory of the Hibiki RFID tag was structured as follows: A security code segment consisted of 64 bits, a non-rewritable UII code segment held a total of 160 bits (including 128 bit of ISBN and serial numbers as unique item code segment, a 16 bit protocol control segment, and 16 bit cycling redundancy check), a tag code segment of 64 bits which tag manufacturers could integrate arbitrary information into, and 224 bits of user area segment for additional data.

The Code System and Privacy Protection sub-trial analyzed the trade-off between providing appropriate and reliable information on the one hand and securing customers' private data on the other hand. Especially the flatbed smart shelves offered information on customer behavior in the retail store prior to purchase. For instance, the information allowed tracking a customer route through the store after he had picked a book from a shelf.

Retail stores preserved anonymity of customer behavior by neither storing customer data on the tags nor matching purchase data to customer information upon checkout.

The sub-trial showed that, in order to fully comply with the Privacy Protection Policy, bookstores needed installations to void the tags before passing books to customers.

The *Paper Recycling* sub-trial concentrated on paper manufacturers, printing companies, and comparing book binding companies. It included a full-scale RFID roll-out in one paper manufacturing plant. The sub-trial experimented with various ways of attaching RFID tags to books in order to achieve environmental protection.

The Paper Recycling sub-trial demonstrated that RFID tags could easily be attached to and – more importantly in this sub-trial – also removed from various types of book covers so that they would not disturb the recycling process.

4.6 Operational Results

Overall, the METI 2006 trial in the Japanese publishing industry indicated the technical feasibility of RFID item-level tagging to enhance order fulfillment and book tracking on their way to customers. It illustrated that Hibiki tags permitted a 100% reading rate and thus offered

excellent data quality. Each instance of a book could be identified. RFID technology contributed to accelerating numerous supply chain processes, such as delivery, order tracking, and inventory takes.

The positive results from the METI publishing trial other industries also considered deployment of Hibiki RFID tags.

5 Findings

Considering the findings from the 2006 METI trial in the Japanese publishing industry, we distinguish the general *trial context*, the *composition of participating organizations*, and the *competencies and resources* involved towards a blueprint for piloting RFID or other infrastructure technologies.

General trial context: From an intra-industry perspective, we found that the economic situation of the Japanese publishing industry supported the industry's willingness and readiness to engage in the METI 2006 publishing trial. With regard to an external perspective on the Japanese publishing industry, the technological progress made by foreign companies from various industries, e.g., pharmaceuticals, fashion, and automotives, and foreign technology vendors, provided the necessary encouragement and technological competition. Both, the internal and the external context, encouraged METI as governmental institution to initiate and support the RFID trial to strengthen the competitive position of the Japanese publishing industry and maintain the image of Japan as a technology powerhouse.

Trial composition: Government involvement increased private companies' willingness to participate. The companies perceived to be part of the regulation and lawmaking process. By

involving companies from several levels of the publishing supply chain, METI fostered trials along entire supply chain spanning systems, instead of running isolated tests at one company or simulations of supply chain partners.

Incorporating technology vendors in the project fostered development of new technological solutions to fit the specific situation and needs of the publishing industry. This appeared advantageous compared to adapting the entire publishing supply chain to existing technical solutions from other industries.

Competencies and resources: With the heterogeneous trial composition, each participant offered a different set of competencies and resources.

The state agencies could adapt the regulatory context as required for the trial. Reallocating frequency bands and defining a binding privacy policy made the trial technically feasible and enhanced the social acceptability of RFID technology. Besides its provision of the regulatory framework as a state agency, METI's project funding eased companies' willingness of to participate.

METI selected publishing companies with sufficient resources for undertaking the trial. The selected large publishers and wholesalers contributed their expertise concerning the relevant business processes in global publishing combined with providing insights needed to analyze and reconfigure business processes.

The world-class engineering skills of the technology vendors in developing the high-tech RFID systems played an important role. Their experience and large scale production facilities allowed for producing low cost RFID tags.

6 Summary and Outlook

This paper investigated the case of the Japanese RFID trial the in the publishing industry, initiated by the Japanese Ministry of Economy, Trade and Industry (METI) in 2006. It described book printers, publishers, wholesalers, and retailers in the trial spanning the entire supply chain. The paper investigated the potential of RFID with regard to several publishing specific processes and systems. It indicated that item-level RFID application in the publishing industry was feasible and held tremendous economic potential. The analysis of the trial context, the composition of participating organizations, and the resources and competencies of the players involved marked important aspects of the trial success.

To better understand the RFID opportunities in the publishing industry, one still needs to analyze whether industry-wide trials without state funding occur and lead to similar results. Further, one may investigate RFID technology trials on item-level in other media industries to validate the findings across products and possibly countries. However, due to the limited number of item-level RFID implementations available in the near future, comparative quantitative studies will have to remain limited. Researchers need to accept the limits of qualitative work.

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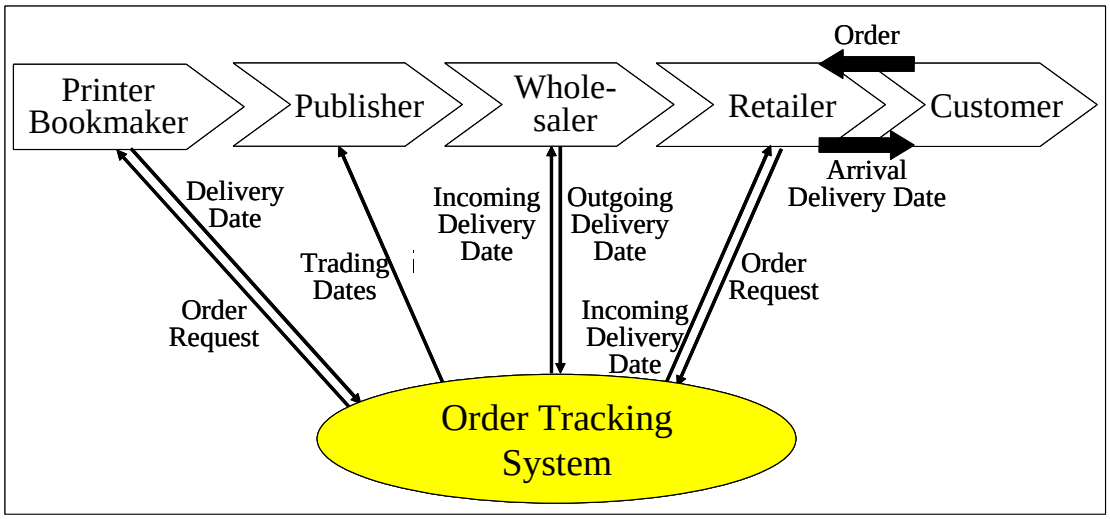

Figure 1: Customer Order Tracking, after JPO 2006b

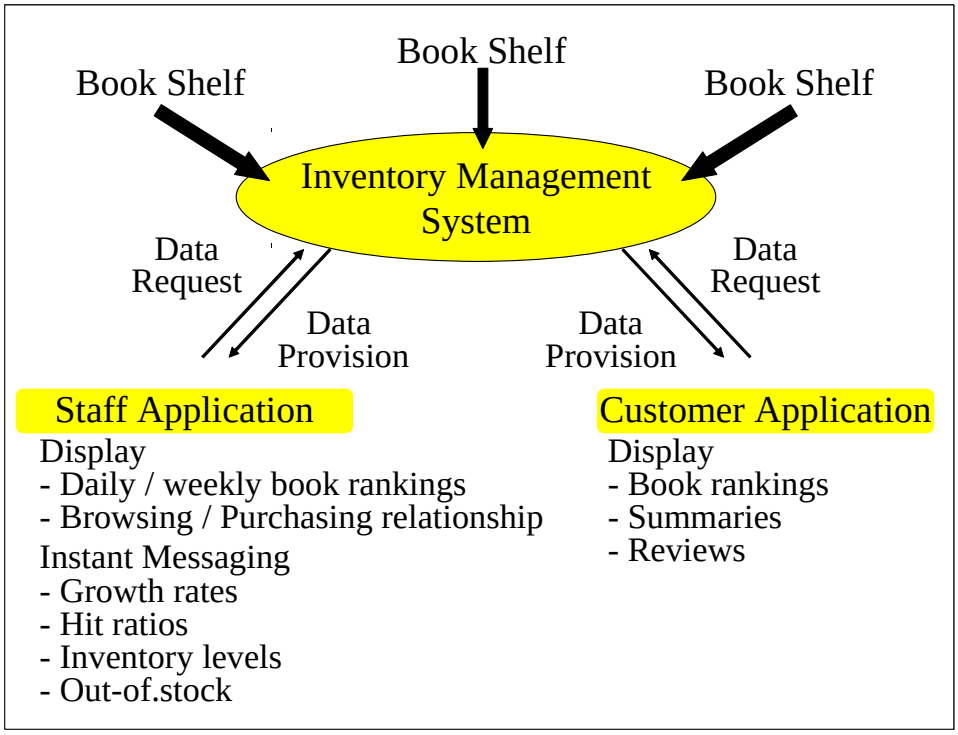

Figure 2: Store Operations and Customer Service, after JPO 2006b.