

WHITE PAPER

A Field Experiment Report: Publishing of an Auto-ID Enabled Book

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ABSTRACT

This paper is to report our publishing experience of a book with an Auto-ID compliant RFID tag in the Japanese market.

Processes on the publishing of a book can be divided in to many phases. Let us assume the source tagging concept as one of the models for book and its distribution process. It first starts with numbering of a RFID, then the RFID tag is embedded in the physical production of a book, and finally sequence of testing to check if the RFID can be read properly even during the hard delivery processes would be performed. In addition to this, there are requirements on books from user side; libraries, marketing, and various other events including some applications at consumer's home, hopefully for the lifetime of the book.

Therefore, there have been active participants on the publishing industries for RFID-related testing in the past. Especially in Japan, partially because of Japan employing the resale price control system, the manufacturing and delivering process of books are different from ones in other countries. This difference should be studied carefully when designing the RFID related processes.

The actual publishing includes a lot of processes and players which have been missed to be involved during the past demo-based experiences. In order to experience these new experiences on the manufacture of a book, the Auto-ID Center Japan researchers have involved with the design of a process for a publishing company to publish a book with an Auto-ID compliant RFID with EPC™ numbering system.

The three issues are addressed in this paper:

1. Embedding the RFID,
2. Process for the resale price maintenance system, and
3. Information notice regarding the existence of the RFID in the book.

Since the book was published about two weeks before the time of writing this paper, this paper just report the manufacturing process and the notices supplied by us. Very preliminary information regarding the feedback or post analysis are discussed.

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Biography



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1. INTRODUCTION

On the 49th story of the Roppongi Hills building, there is a brand new library for scholars in this central part of the big city. Among the attracting unique features and systems of the library including its location, sparsely spaced layout of the bookshelf, and its 24hrs of operation, the fact that the books are maintained by the attached 13.56MHz RFID tags is one of the hidden unique features.

A very strong experiment of RFID on the retail shop model of a book store has been a strong demand from the industries. This is because very advanced marketing system is being employed in Japan as well as the negative fact that book stores are special retail shops where the number of shoplifting is relatively high. The experimental activities reported by Ishikawa et al. [ISHIKAWA03] is one of the leading example for such a demand.

There are a lot of important areas for the publishing experiments and a lot more process and function/industries should be involved on the actual publishing business. In order to increase the chances to learn from the experiences for the future Auto-ID deployment, This experiments reported in this paper, gathers experiences through publishing of an book with a certain scale, and being involved with the actual players of this kind of book.

Auto ID center Japan therefore decided to be involved on the project to attach an EPC™ tags to a book delivered in the real market, and tried to examine various problems on the process.

2. RFID AND THE PUBLICATION INDUSTRY

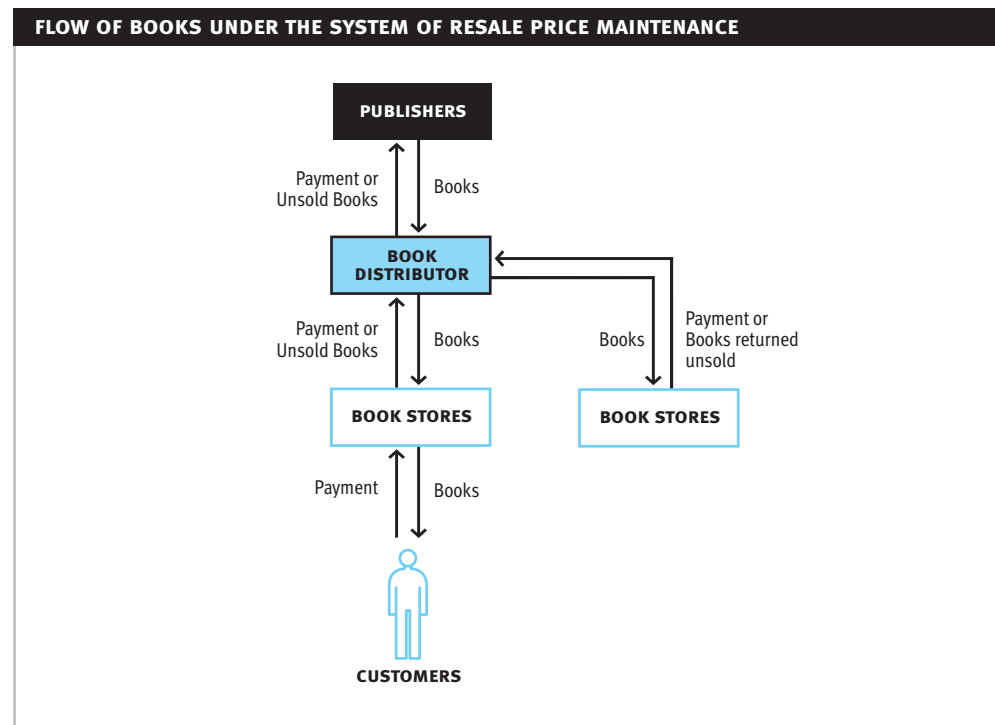
The publication industry in Japan has shown strong interests in attaching RFID to a book. In the publication industry, item-level management by RFID is proposed in order to reduce stockpile, prevent theft, and control rental goods.

Since the damage caused by theft at bookstore is on the rise, the introduction of a RFID system to prevent theft is a pressing issue for the Publication Industry Organization.

In the past few years, several field trials were carried out, but their objective is merely to measure the reading rate of tagged books, and the anti-collision performance of simultaneous reading.

“Resale Price Maintenance System” is in the system of distribution, which is employed in few industries in Japan such as books and cosmetics. In this system, retailers are not allowed to discount products. In return for such restriction, retailers can return products to producers. In the case of the publishing industry, returned books are re-distribute as if it were “new books”. This re-production is a responsibility of the publisher. Therefore it is publishing companies responsibility to fix and refurbish various parts of returned books. Now, the examination of the attached RFID, regeneration of the same ID, and refurbish of the new ID are all the publisher’s new role. This delay the entire process of resale price control system and therefore carefully has to be examined.

Figure 1: System flow of book supply chain. In Japan, book keeps its price by “re-sell price management system”.



3. FIELD TRIAL OVERVIEW

The purpose of our field trial is to explore the technical and social problems when attaching RFID tags to books in the real world.

6000 RFID tags (2.45GHz band Auto-ID EPC™ compliant tag produced by Alien Technology) were attached to all the book published so far.

These books are produced, distributed, and sold in exactly the same manner as normal books in the real market. Thus, it is to clarify various problems of books with RFID.

End-users are able to participate in events in the website, using EPC™. The events will be held to enable end-users to meet, cooperate and achieve a goal in the real world.

Our field test also focuses on examining the effect of products with RFID in a distribution process.

The following chapter discusses the several problem when RFID is attached to products in the real world, and also examines how to solve these problems.

Figure 2: "Internet no Fushigi Hakken-tai" book written by Jun Murai on our trial material.



4. TAG INSTALLATION ON A BOOK

There are a lot of alternative ways to process the actual implementation of a book with a RFID tag. The robustness of a tag is one of the big issues since the weight of piled books can be extremely heavy. The redistribution processes caused from the resale price control system is another big issue. The work described here on the 7000 book production was a very good lesson for the scalability of the production process in many senses.

4.1. Locating a Tag in a Book

Publishing industry is one of the industries who shows the strongest interests on the RFID technologies. The requirement always starts from embedding a tag into a book. Tag location issue is very important and most people seem to locate a tag at spine of the book. But the process of making books, spine of the book is easy to be damaged when packing, sorting, and other operation even though a spine is known as the most durable place of a book.

Also, a cover or a back cover can be considered as a place to attach a tag. In this case, it is necessary to have the structure which release a pressure from other books. In the preliminary experiment, when a tag was attached inside of the cover, all tags were damaged with pressure when books are piled up. The advantage of locating a tag in a cover is a big room. Any tags with larger antenna part can be accommodated in a cover. Multiple or alternative tags installation also is possible.

Therefore, in order to protect a tag from the piled pressure, we have decided to add a protector on a back cover to install a tag. This also benefit replacing role at the publisher when a book is returned by the resale price control system.

4.2. Tag Implementation and its Procedure

The book used for this experiment is a book for children, and the one objective of attaching a tag is to educate the RFID technology with real material (tag). Therefore, the EPC™ tag should be viewed even it is installed inside the cover with the use of a transparent film.

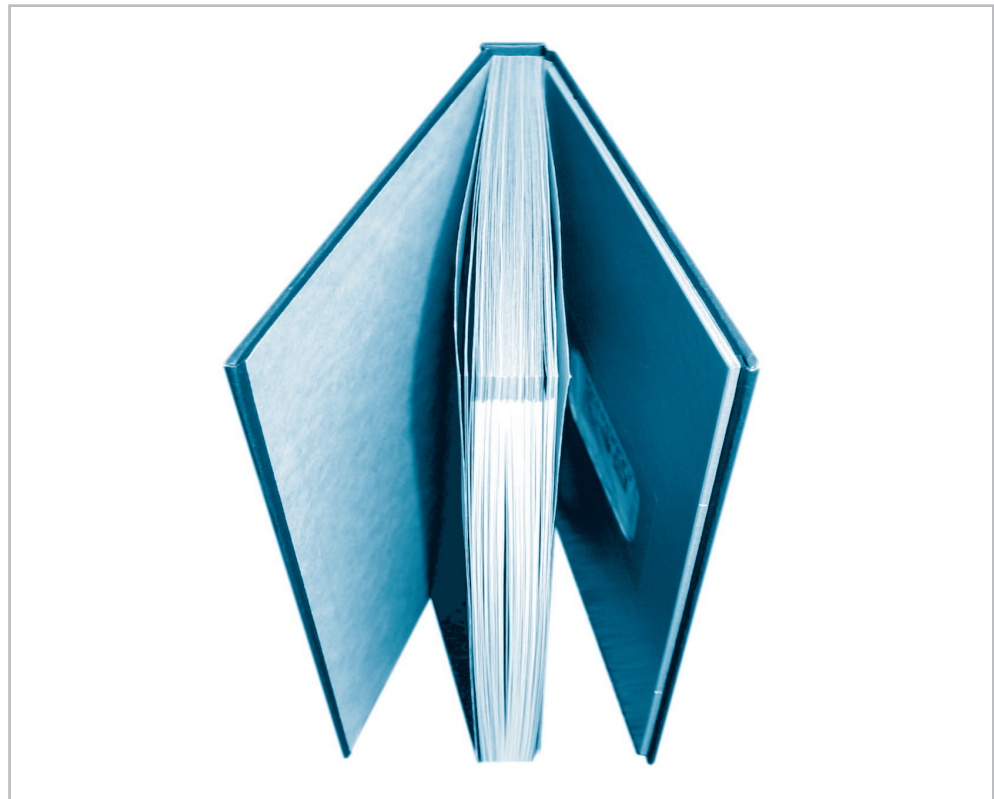
At this experiment, most of all operations are done by manual labor. Procedure of implementation is described as below.

1. Stick a RFID tag on a transparent seal and make it label form. The EPC™ number and its check-sum are printed with digits on the seal at this time. This is a way for a user who does not have RFID-reader but who want to entry the code manually for the various testing event. These written numbers also are used for proof of the data when EPC™ tag is broken.
2. EPC™ number is burn to the EPC™ tag using the interrogator.
3. A pair of cardboards is used to protect a tag. One cardboard has a hole to insert a tag and protect it. Another cardboard is worked as a base. A tag is located at the center of hole and paste up to the base. The tag is sealed over a transparent film to protect from touching.
4. The cardboard with EPC™ tag is binding at back cover of the book.
5. After bookbinding, every book is checked again.

Figure 3a: Tag is implemented at inside of back cover.



Figure 3b: Back cover is twice as thick as front cover to protect a tag.



5. THE PROBLEM REGARDING BUSINESS PROCESS AND PRACTICES

Under the Resale Price Maintenance System, books are sold at fixed price, which benefits publishing companies. In return, publishing companies need to accept the returning of books which are not sold at book stores without any penalty on bookstores.

Returned books are re-distributed as if it were “new books”. For instance, publishing companies often refurbish various parts of books.

Under the system, once an RFID is attached to a book, that RFID should be examined whether it works or not when returned to publishing companies. If RFID does not work, the company should be responsible for attaching new RFID. Thus, RFID on books must be easily removed once needed.

6. MESSAGES TO TRY TO BUILD AN “INFORMED CONSENT” OF THE EXPERIMENT

Even when RFID tags are embedded in products, there is no visible response expected. Without proper messages explicitly state the fact that a product is with RFID, it is difficult for end-users to use or disable the embedded RFID tag in the product.

Therefore, we tried our best to provide the consumers about the information that the product is with an RFID tag, explanation of it with the reasons, and instructions how to disable it.

Also, the end-users have the right to know whether the product they purchase is with or without tags, and also the right to know what information is stored on the tag. End-users can judge if they should use RFID tags attached to products or not, after comparing the merit and the demerit of RFID tags.

In our field trial, we provide end-users with the information about RFID in the following ways.

1. Messages of explanations in front and back side of sleeve
2. Inserted paper of instruction how to disable the tag and its information
3. Interactive questions and answers on the web site of the publisher
4. Since the book is about technology, one of the column inside of the story.
5. Also, the tag is installed in a visible way: the reader can transparently see the existence of the tag and its contents.

In the future, it is necessary to provide end-users with the information about what kind of RFID is attached to products, and what information is exchanged between RFID and reader. We should continue to examine further as to what information should be informed.

In the case of portable goods like books, there is a possibility that the data on RFID tags is destroyed by a reader. Since the reader is not existing very much on the time of the field test, it was impossible to kill tags in future expected places like bookstores.

Consequently, we inform end-users of the three ways to kill tags.

1. Wrap tags with aluminum foil

This method aims to avoid the radio-wave from the interrogator. It is easy to make a foil to jacket-style. Therefore this method is most suggested way to protect the tag from anonymous interrogators.

2. Send a book to the publishing company and ask them to kill tag

The EPC™ tags could be killed by an interrogator. If the user wants to kill the tag as functionally, this method is applied but it has much time to wait. Because, interrogator is not prepared at the bookstore but at the publish company. Therefore, this method is not suggested to all people.

3. Remove the tag.

This is most easy way to disable the tag, but it is not recoverable way and the shape of the book is destructed. This method is written, but it is not suggested way to all people.

7. CONCLUSION

In our field trial, EPC™ tags were attached to books exactly when they were produced on the ‘source tagging’ model.. It was proved that it is necessary to protect RFID tags when attached to books. In addition, it was made clear that RFID tags on the scroop of books are quite possible. Various ways to disclose the fact of the existence of the RFID on the book and various educational procedures have been proposed.

The experiments achieves:

1. Scale of 7000 copies of books,
2. Involvement of the real players; publishers, commissioners, distributors, retailers and customers,
3. The resale price control system consistency, and 4) education to control the tags by the consumers.

8. ACKNOWLEDGMENT

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