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## 1. Introduction

In the 1980s we witnessed a big boom of argument on joho-ka development, or the role of computerized information systems and their impact on the activities and organization of economic institutions, which might be called a 'joho-ka[2] fever'. Many discussed and expressed views on their impact and the direction both of the efforts of private institutions and of the government policies. A wide variety of studies and views were published by both many government study groups and private research institutions.[3] At the core of the boom was the discussion on the growth potential and future role of inter-firm computerized information system or information network and its impact on the overall economy, which focused particularly upon the role of VAN (Value Added Network) and suppliers of this function.

Focusing on the distribution sector where the impact of joho-ka would be the most remarkable, this chapter answers three questions: what has been realized in joho-ka by now and how? what would its future be? what should be the role of the government policies? The report of a FTC (Fair Trade Commission) study group (FTC [1989]) concluded: 'We expected to find that the recent development of inter-firm information network has had notable impact on economic activities in distribution sector... This development, however, is just at the beginning of the construction.' Despite the long-

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[1]Revised version of 'Ryutsu Bunya niokeru "Joho-ka" [Joho-ka Development in the Distribution Sector]' (in Miwa, Y. and K.G. Nishimura eds. Nihon no Ryutsu [Distribution in Japan], University of Tokyo Press, 1992). Prepared for Distribution in Japan, forthcoming from Oxford University Press.

[2] In Japanese, the suffix 'ka' attached to nouns means 'to make or put into' and corresponds to the English suffixes '-ize' or '-ification'. Therefore, 'Joho-ka' corresponds to 'informationize' or 'informationification'. 'Joho-ka fever' was a social phenomenon, and 'joho-ka' was the main slogan of the participants. As a result, this term was ill-defined.

[3] The volume of such publications shows that the boom reached its peak in 1984. Representing literature are Sogo Dehta Tsushin Netwaaku-ka Kondankai [1984] and MITI [1985].

lived big boom of argument throughout the 1980s, joho-ka's impact had not notably realized in the distribution sector.

Whatever the definition of joho-ka or information network is, the following three steps of development can be identifiable: first, introduction of computers to inside each firm; second, development of inter-linked use of computers within a firm; third, extension of this link to outside each firm and development of inter-firm computer connection.[4] The first two steps had proceeded gradually before the burst of joho-ka boom, and the focus of discussion was on the third step, with which many expected a further development in the first two stages.

Efficient management of a wide variety of information is the core of firm's task in the distribution sector, where firms introduce computers and construct and develop inter-firm computer networks in order to improve the efficiency of information management. Then, if joho-ka or the development of computer networks would have notable impact on Japan's economy, it is in the distribution sector where we should observe a clear result.[5] Therefore, an implication of above mentioned FTC report's conclusion is as follows: even in a field where we expected notable development we found no such progress. no clear impact was observed in the related fields, either. we may conclude that this also applies without modification to the rest of the economy.

An evaluation of the technological potentials underlying the development of joho-ka and a search for desirable policies of the government requires accurate understanding of the working mechanism of the distribution system to which joho-ka is expected to be applied. Our understanding,

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[4] In this chapter, I use the term 'joho-ka' as including all economic phenomena expressed by such terms as 'joho-ka', 'netwaaku-ka [networking]', and 'joho-netwaaku-ka [information networking]'. These terms, including joho-ka, has never been used with a clear definition. MITI [1985], for instance, titled 'The Present and the Future of Joho-ka in the Manufacturing Sector' to the first half of the section on 'Development of Joho-ka in the Manufacturing Sector and its Problems'(pp. 111-). '1. The Trend in Joho-ka within a Firm' introduces how firms use computers within each firm's boundary, and '2. The Trend in Inter-firm Networks' discusses the view of the development from intra-firm to inter-firm connections. The term 'network' has become the vogue in describing contemporary organizations, but this term again is seldom used with a clear definition. On this point, see Nohria [1992, p.12] and Miwa [1995, chapter 12, and in press].

[5] Another candidate is the financial sector.

however, of both the working mechanism of the distribution system and the function and roles of related firms within the system, is yet at a rudimentary stage,[6] and we need a specific device for this study. Efficient management of information is the core of distribution function, and the development of inter-firm computer links or networks have been expected to influence gravely both their overall function and roles of each participant, and inter-firm organization and figures of distribution channels. Therefore, examination of the following two issues will provide a clue to analyzing the basic character of the firm's tasks in the distribution sector and the determinants of organizational structure of distribution channels: first, why the development of inter-firm networks has been so slow, much slower than was expected? second, what are the factors which distinguish these fields from industries or firms where we observe a strong impact of joho-ka?

In this chapter focus is placed upon the distribution of two types of products, daily necessities and processed foods, rather than the distribution in general. I choose them for two reasons. First, they are the representative products sold in such retail stores as supermarkets, particularly GMS (General Merchandizing Stores), and convenience chain stores (CVS) with which joho-ka is most enthusiastically discussed within the retail sector. Second, these are the products whose handling costs tend to be high and is still increasing rapidly because of the great number both of traded items and of order entries and a wide variety of order sizes, and these are the fields where a very high proportion of products bears product bar code and many argued the potentials, necessity, and effectiveness of joho-ka. I take the distribution of airline tickets in the U.S. in the 1980s as a reference industry with successful development to compare with these two cases. Reference to this case shows why the development of joho-ka in these two distribution sectors have been much slower and therefore had less impact than was expected.

Whether the joho-ka is making a steady progress or is facing a great difficulty depends on the standard of judgement which differs greatly among

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[6] See Hart [1989] and Part IV of Miwa [1995].

its studies, reflecting the view of its technological potentials and the expectation of change in Japan's distribution sector. In what follows, I place emphasis on examining why the development has been so slow and what are the obstacles to be overcome for a speedier development rather than studying the debate over the standard of judgement. I also examine public policies for the development with which the technological potentials of joho-ka will be fully extracted.

Section 2 is for an introduction to the economics of information in distribution. Section 3, focusing on wholesalers, briefly describes the recent development of joho-ka in the distribution of two types of products, daily necessitates and processed foods, and investigates its underlying mechanism. Section 4 examines the demand side of the joho-ka development and shows that the wide difference in its demand price among related agents determines the direction and speed of the joho-ka development. Section 5 is a comparative study, referring to the U.S. airline ticket distribution. Section 6 is for concluding remarks and discusses the public policies for the further development.[7]

## 2. An introduction to the economics of information in distribution

Manufacturers, wholesalers, retailers and the like are found to form closely coordinated inter-firm relationships, which the term 'marketing channel' or 'distribution channel' symbolically reveals. They share the workload for various production functions or product flows, such as physical possession, ownership, promotion, negotiation, financing, risking, ordering and payment. As Stern and El-Ansary [1988, p.14] argued, 'the basic economic rationale for the emergence of channel intermediaries and institutional arrangements can be understood in terms of the need for

[7] With two reasons, the following discussion heavily depends on interviews, often informal, with business people and industry specialists. In many cases I need information on inside each firm or each group of firms which is often secret or unofficial, or at least unverifiable. The state of development is fluid, and newspapers and trade journals report primarily information on plans, quite often only a blueprint, and detailed description of and reliable data on the state is seldom available. Therefore, what follows may include lots of errors and preoccupied views. For this reason, I collect many detailed information on concrete cases, expecting the readers advice for correction and improvement.

exchange and exchange efficiency, minimization of assortment discrepancies, routinization, and the facilitation of search procedures'.

A marketing channel is organized and functions so as to minimize the costs for providing goods and services, where the activities of each decision unit are coordinated by a channel leader. As each production function within a channel includes flow and exchange of information as a basic component, the minimization of information costs or transaction costs, as the basic discipline, determines the behavior of firms within a channel, the organization of distribution industry, the function and organization of a channel including the role of a channel leader, and the function of the market itself. To study the working of this basic discipline, focus is placed upon the way and the underlying technology of information management; to transmit, gather, process various types of information, to exchange them with other trading agents, and to make their efficient and effective use. Today thus study of joho-ka is at the central focus.[8]

The basic view of this chapter is as follows. The information management is a basic role of firms within distribution channels and a major function of the market. Therefore, the determinants of the organizational structure of distribution channel are the character of relevant information, the system organized within a channel for information management, and the technological conditions underlying the system.[9]

In the case of the manufacturing ordinary products, we can evaluate the efficiency by comparing the actual state with the optimum calculated through production function or cost function. In the case of distribution, however, the core of producers' activities is information management, and information management technology basically determines their production or cost function. Here its efficiency evaluation requests a detailed investi-

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[8] Suppose instead, for instance, such a flow and exchange of information incurs only a small cost, or it hardly needs additional cost as relevant information is always a common knowledge. Here information cost to be minimized is so small that the role neither of the channel intermediaries nor of the institutional arrangements is non-existent.

[9] Other candidates are government regulations and characteristics of products under consideration.

gation of the characteristics of relevant information, the system for its management, and the technological conditions determining their choice. As development of joho-ka may change both the content of distribution services and the production function of distribution activities, it has a big potential impact on the efficiency of distribution system and public policies to support the development gather public attention.

3. Daily necessities and processed foods

Distribution of daily necessities and processed foods represents the sectors where business people speak much about joho-ka and we observe several industry-wide standardization attemps. Participants in a distribution channel can roughly be divided into three groups, manufacturers on manufacturing stage, wholesaler on wholesaling, and retailers on retailing, of which in this section I focus on wholesalers. This is for two reasons. First, as shown below, in these sectors wholesalers perform an important role because a wide variety of products manufactured by many producers are sold by a great number of retailers. Second, powerful members, usually big ones, both on manufacturing and retailing stages, particularly the latter, enthusiastically made efforts in developing joho-ka, and wholesalers are on the key position, receiving the influence of joho-ka from both ends, in determining the overall joho-ka development within a channel. In some cases they could have greatly promoted the development as a channel leader.[10]

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[10] The definition of wholesaler is neither always nor everywhere clear. The division of workload both between manufacturer and wholesaler and between wholesaler and retailer is determined by many conditions, including the historical path, and, therefore, greatly differs by countries, by industries, and by individual products. A distribution manager in one of the biggest manufacturer of processed food, in the interview with me, commented on the competition with home delivery transporters:

> Japan's wholesalers are characterized and supported by strong and long-term contracts or ties, called tokuyaku seido (literally, a system of special contracts), with manufacturers, and some may argue that they are agent-wholesalers of manufacturers. In countries without such close ties, like the U.S., those which have selling power and ability to pay can purchase goods at any time from any manufacturers. In Japan, however, this does not occur. With their highly organized network of physical distribution home delivery transporters had succeeded in taking a big share of specific product's distribution, like sermon. Once, however, they decide to challenge

3-1. Retailers' response

Recent notable observations at the retail stage are a rapid rise of diffusion rate of product bar code, and an increase of number of retailers and their shops equipped with point of sales (POS) system. The objective of POS system introduction varies by cases, and each retailer's objective changes with time and their development stages. At the start, however, in most cases the common target is to establish an effective system of sales-inventory control on piece basis, with which are aimed at decrease of loss from stockouts and reduction of inventory costs. Underlying this common target are the two factors.

First, an explosion of the number of product items in distribution, which again reflects two recent phenomena; an rapid increase of new products on the market, often called 'a new product rush',[11] and consumers with more differentiated and fluid taste. Since the beginning of the 1980s, a huge number of new products have been introduced into the market to meet the demand of consumers with differentiated and fluid taste rather than those with stable preference. It is hard for a supplier to catch such consumer's demand with small number of products as their taste is differentiated, and even when once a supplier catches a big market it is harder to keep the customers loyal to its products as taste is fluid. If a retailer fails in managing the inventory both on the shelves and in the backyard,

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wholesalers' position, the manufacturer-wholesaler ties make it hard to establish a well-organized integrated distribution system rather than one for mere physical distribution.

I am not emphasizing keiretsu, particularly its misconceived exclusive characteristic. One of the most striking characteristics of Japanese industrial organization is the predominance of stable, long-term inter-firm relationships which are non-exclusive. See Miwa [1995, pp.232-3]

[11] A small food retailer displays about 2,000 items in his shop, and a big supermarket holds more than 10,000. Kokubu, the biggest food wholesaler, distributes more than 100,000 items of food and liquor, of which more than 20,000 was newly introduced into the market in January-September of 1987 (Nikkei Konpyuta, hereafter 'NC', p. 95 of 4 January 1988 issue). In an interview with me, a manager in one of the biggest food wholesalers commented that, while in Japan of 100,000 items 28,000 were newly introduced in 1987, in the U.S. 1,700 items were newly introduced and 700 or 800 disappeared in 1986.

his shop will be filled with items few consumers demand, resulting in high stockout rate, a fall in sales/inventory ratio, and a decrease in the number of customers visiting the shop.

Second, a notable fall in computer related costs and a rapid rise in the product code diffusion rate. Thus, an explosion of the number of distributed items created the need for introducing computer dependent information management system, symbolically, POS system, and this second factor supported its diffusion. Figure 1 shows the rapid rise in the product code diffusion rate in two sectors under study and the number of shops using POS system.

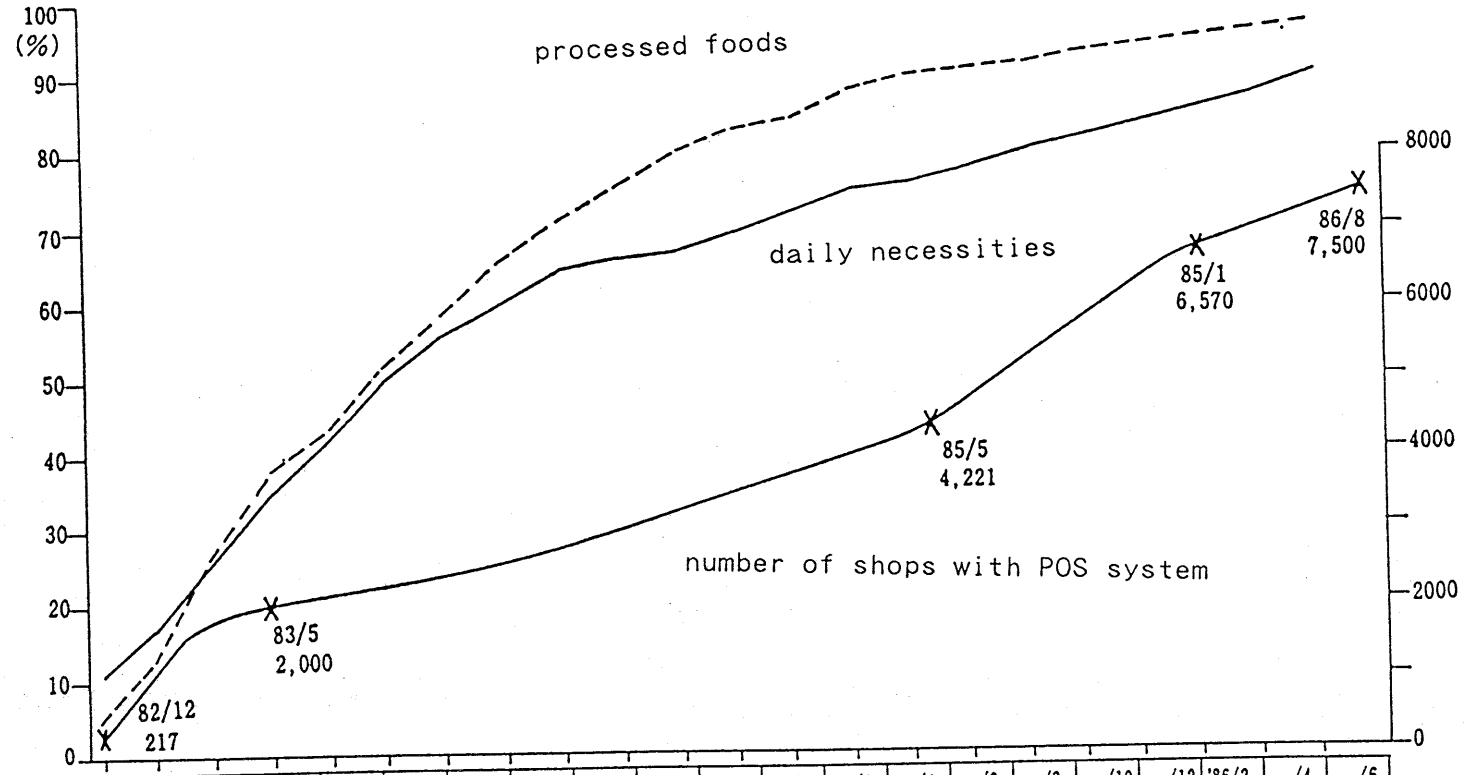
------ Figure 1 ------

The history of Ito-Yoka-do, one of the biggest GMS chains and regarded as one of the most successful front runners in joho-ka, shows an illustration. In the spring of 1982 when they started an overall business reform, they examined whether ordered items reached their shops on the scheduled date, that is, 2 or 3 days after the order date, in the right quantity, and they found that in only 40 percent of orders were prosecuted exactly as intended, therefore, in 60 percent of cases failed either in time or in quantity. With close examination they changed the basic contract with big suppliers, more than 1,400 wholesalers and manufacturers, and reduced the rate of delivery failure to 2 percent by the fall of 1985 when they introduced the POS system to all shops. On the process, for instance, they introduced a system to demand a penalty to failing suppliers, and established a system of 'madoguchi (literally, window)-wholesaler' which functions as a common agent for a group of suppliers to deliver to each shop. By the latter, they assigned one from 4 or 7 suppliers in each local area as an agent so that they rationalize the physical distribution system and reduce drastically the costs.[12]

With the introduction and sophisticated use of computers, retailers, particularly selected some, actively reacted to changing environment and

[12] For the details, see Kokura [1986] and Yahagi [1994].

Figure 1. Product Bar Code Diffusion Rate in Daily Necessities and Processed Foods (%), and the Number of Shops Equipped with POS system




| '82/12 | '83/12 | /4 | /6 | /8 | /10 | /12 | '84/12 | /4 | /6 | /8 | /10 | /12 | '85/2 | /4 | /6 | /8 | /10 | /12 | '86/2 | /4 | /6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.8 | 16.7 | 25.7 | 35.4 | 42.8 | 49.7 | 56.4 | 60.3 | 64.5 | 66.0 | 66.7 | 69.3 | 72.3 | 75.1 | 75.4 | 78.0 | 80.7 | 82.3 | 83.7 | 85.6 | 87.4 | 90.4 |

daily necessities

| '82/11 | '83/1 | /3 | /5 | /7 | /9 | /11 | '84/1 | /3 | /5 | /7 | /9 | /11 | '85/1 | /3 | /5 | /7 | /9 | /11 | '86/1 | /3 | /5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0 | 12.8 | 26.4 | 38.3 | 43.4 | 51.6 | 58.6 | 65.8 | 71.6 | 76.2 | 80.5 | 82.9 | 84.6 | 88.0 | 89.9 | 90.8 | 91.6 | 93.0 | 94.0 | 94.9 | 95.8 | 96.9 |

processed foods

Source: A. C. Nielsen Japan Co., adopted from Kuga [1988, p. 215]

improved the performance by reducing inventory, decreasing the stockout rate, and improving both in-shop inventory quality by speedily killing dead items and store merchandizing with better use of information from a wider source.[13]

3-2. Wholesalers' response to retailers' demand

Strong demand for and actual development of joho-ka among powerful retailers both changed the demand for wholesaler's services and created a new type of demand requesting their active response. Without the response, retailer's effort for joho-ka could not achieve good performance.[14] Prior to examining such issues as 'what were the wholesalers' response?' 'what worked as obstacles to their active response?' and 'why did joho-ka not developed among wholesalers?', note the following two points.

First, many argued as follows. With wholesaler's existence between manufacturer and retailer, we need system coordination or reorganization of systems on two stages, that is, between manufacturer and wholesaler and between wholesaler and retailer. This cost would induce an increase of direct trade between manufacturer and retailer, so-called nakanuki or disintermediation, making the role of wholesaler much smaller. In the two sectors under study in this chapter, however, this forecast has hardly materialized.[15]

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[13] An introduction of POS system by itself does not always make sense. Comments of industry insiders include, for instance, that most of those computers are covered with dust, that failing in managing the master file of product code, most computers are used only as counter registers, that they are useless because orders are not prosecuted as scheduled, and that the cost-performance is terrible as in most cases they can not make an effective use of accumulated data and information.

[14] For better understanding of this, imagine what would be the result of retailer's inventory reduction at the stage where wholesalers' delivery were neither reliable nor accurate. What would have occurred when Ito-Yokado reduced their inventory in 1982 when delivery failure rate was 60 percent?

[15] First, we observe many famous failures of direct trade attempts, which suggests that distribution through wholesaler is more efficient. Second, the number of suppliers to individual retailer suggests that in many cases trade via wholesaler as a node is more efficient. Even Ito-Yokado, which as mentioned in the text drastically reformed its overall business in the first half of 1980s and reduced the number of wholesalers in direct trade by adopting 'window wholesaler' system, (Kokura [1986, p.

Second, even after an introduction of on-line ordering system or ordering system via inter-firm linked computer network, usually not all orders were carried out with it.[16] Economic benefit of introducing such a system, therefore, whether the benefit covers the cost, totally depends on the intra-firm organization and the state of inter-firm system coordination among related firms.

In the two sectors under study, daily necessities and processed foods, wholesalers, particularly through trade associations,[17] have made active effort in standardization for joho-ka, providing its operating manuals, and developed and made use of many varied VANs (Value Added Networks). Five factors can be identified for this development.

First, these are typical GMS and CVS items. The GMSs' share in their retail sales rose faster than their rising share in overall retail sales, which forced the suppliers of these products to comply with their requests. (i) GMSs strongly requested wholesalers rationalization of order-entry system, particularly by adopting on-line computerized one. Each GMS has

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82] comments that the basic policy of the reform was to reorganize physical distribution without changing trade flows.) did not increase the share of direct trade with manufacturers. An industry specialist explains that even the most rationalized CVS chain hoding 800 or 900 food items purchases them from not a few suppliers. It buys from the largest supplier less than 300 or 400 items and considers the further increase in concentration of suppliers to be costly. Third, while lead-time for delivery even by manufacturers becoming shorter, it does not necessarily promote direct trade between retailers and manufacturers. Although some stores have adopted a quick production system to provide fashion products in a short lead-time, a week for instance, for delivery including production time, in many cases its delivery to individual shops use retailer's distribution center, not having manufacturers send products directly to individual shops.

[16] A big wholesaler manager in daily necessities commented in an interview with me: we have no such cases with CVSs, but big GMS chains quite often give orders by phone as individual stores make many ordering mistakes.

[17] A wholesaler manager commented in an interview: 'Such a movement could not have occurred without a manufacturer's initiative. Today we have no choice but to rationalize by and for ourselves.' Another manager, however, argued: 'The number of manufacturers with which each wholesaler trades is large, and effort neither for standardization nor coordination of their in-house systems succeeded. Adopting the leadership of a manufacturer or an association of manufacturers only worsens the situation. Manufacturers' associations connected with The Federation of Daily Necessities Wholesalers' Associations in Japan [Zen Oroshi-Ren] counts thirteen, including each for soap and cleanser manufacturers, dentifrice manufacturers, and cosmetics manufacturers. No communication exists among them for system coordination.

developed its own intra-firm computerized information system, and has varied demand for computerized system to wholesalers. Without standardization, therefore, this process would make the burden too heavy for wholesalers.[18] (ii) In addition to the rise of GMSs' aggregate share in retailing, successful ones rapidly grew and expand their area of operation. They requested wholesalers with close trade relationship also to expand their operation areas. Wholesalers responded either by expanding their own area or by newly establishing close connection with other wholesalers. This process needs both intra-firm and inter-firm effective communication, increasing demand for standardization of in-house systems.[19] (iii) Trade volume per order has become smaller, and admissible order-delivery lead-time shorter, requiring higher precision. Suppliers responded in various ways, particularly in terms of efficient use of computers, which commonly demanded standardization of information systems.[20]

Second, these two sectors experienced rapid increase of products in the market, often called 'a new product rush'. All agents in their distribution channels, manufacturers, wholesalers, and retailers, being compelled to respond to this changing market because of the following two reasons, demanded system standardization. (i) The explosion of the product number increases their handling- and inventory costs. (ii) This explosion

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[18] A manager in a processed food wholesaler explains in his interview that over 90 percent of GMSs use on-line ordering system. Another manager argues that, as a wholesaler receives orders via on-line system from 50 to 100 GMSs, their burden is tremendous to matching each manufacturer's in-house product code with their own. Manufacturers' codes are not standardized, and in some cases the number of digits in a code for the same product is different among manufacturers. The numbers of retailers of daily necessities and processed foods are 300,000 and 700,000, respectively.

[19] We observe, for instance, formation of groups led by national wholesalers in processed food distribution, establishment of joint sales company by group of daily necessities wholesalers under which each wholesaler shares an area of operation, and change by wholesalers capable of providing services in wider area.

[20] 'Order per item' is an expression which characterizes the recent trend in distribution. A manager answered in an interview: 'On average over 40 percent of daily necessities wholesalers' deliveries were per item, rather than per carton. This ratio was over 90 percent for a wholesaler specialized in cosmetics. The average lead-time for GMSs orders for daily necessities was about 24 hours.'

requests speedier and more accurate evaluation of each product's marketability.[21]

Third, besides downstream GMSs upstream manufacturers also intend effective use of computerized intra-firm and inter-firm communication system. This arouses strong demand for standardization of systems within distribution channels, which without success tends to shift the burden to wholesalers in the middle of a channel. By leading the standardization and providing well-organized intermediating services, wholesalers could survive and even check the deterioration of their position within the channel.[22]

Fourth, these two sectors satisfy a condition for standardizing distribution systems: retailers usually sell manufactured products as they are, that is, with neither modification nor customization, and once agreed individual product code can be used as the basis of standardized system on all stages within a distribution channel.[23] This is manifested in the above mentioned rapid diffusion both of product code (JAN Code, Japanese Article Number Code) in these sectors and of POS system among retailers.

Fifth, in these sectors standardized repeat transactions prevail, which make wholesaler's gain from computer investment great and expected rate of return on the standardization effort high. An extreme case is teiban [standing] products of GMSs and CVSs,[24] which becomes more

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[21] A manager in a big wholesaler commented that in about one year two thirds of new products in processed foods disappeared from the market.

[22] This can be clearly understood by regarding the process as a contest for the channel leadership. In establishing and developing an information system over a channel or in standardizing individual systems within a channel, a channel leader enjoys its advantage by taking his own system as the basis of the standardized total system. See the fifth conclusion of Stern and Kaufmann [1985].

[23] This point can be clearly illustrated by comparing with those unsuitable for standardization like fresh food, those requiring distributor's additional fabrication like steel products, and those packaged by a distributor with complementary services like an office computer with customized software. In these cases we face a substantial difficulty in standardizing products necessary to attach standardized product code.

[24] Teiban items are those under teiban system, where distributors in trade determine a group of products, spring and fall every year, for instance, and their approximate prices which they maintain for a year. In contrast to sectors where teiban prevails, retailers in home electronics products and furniture, for instance, average number of repetition in a certain interval is not large, and the rate of return on computer investment is relatively low. A manager in a large home electronics

extreme when linked with an automatic ordering system in individual shops, that is, a system ordering an addition when existing inventory falls below a predetermined level in each shop.

### 3-3. Wholesalers' response to manufacturers' demand

Introduction and development of computerized wholesaler-retailer trade links (joho-ka), particularly between wholesalers and both GMSs and CVSs, strongly forced firms, particularly wholesalers, to make effort in standardizing their intra-firm communication systems. Up to the present, however, their effort has not yet achieved notable success, and manufacturer-wholesaler transaction is rarely totally computerized. In two sectors under study, at least, computerization of inter-firm transaction between manufacturer and wholesaler is by far less developed than that between wholesaler and retailer.[25][26]

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manufacturer describes as follows: 'An average home electronics retailer sells 2 million yen a month in total value, that is, less than 100 thousand yen per day. Excepting such products as dry batteries and fluorescent lamps, few items are ordered more than 10 times in a month. Almost the same applies to apparel products.

[25] Therefore, I do not expect on the extension of the present development a realization of often discussed scenario; with the development of computerized direct manufacturer-retailer trade, wholesalers' role reduces to a simple communication node, something like an automatic information switching center.

[26] A manager in a big processed food wholesaler describes as follows in an interview: 'We receive over 90 percent of orders from GMSs via on-line system. In no case, however, such a system is used in ordering to manufacturers, still at the starting stage of its experimentation. Big manufacturers send us bills of goods via on-line system, and we developed a system to check those bills against payment bills. Today this system deals with transaction with over 20 manufacturers, yet we cannot use it for sending our orders.' Kirin Brewery, the largest brewery in Japan, receives orders via on-line system from only 10 wholesalers among its about 800 wholesalers in stable trade relationship [tokuyaku-ten or main wholesalers]. In Tokyo metropolitan area wholesalers receive via on-line system over 30 percent of orders from retailers. These big wholesalers have already developed their own computerized order entry system, which, however, does not help the introduction of on-line ordering system with Kirin for two reasons. First, Kirin itself competes with rivals with incompatible on-line systems, and an introduction of Kirin's specialized terminal to wholesaler's office might and would decrease their trades with its rivals. Second, most big wholesalers sell all kinds of foods, and the weight of their beer sales to the total is rather small, which makes an introduction of specialized purpose machine hardly useful for rationalization of wholesaler's business, therefore not profitable (see 'NC', 10 April 1989, p. 143).

The next description of the historical background, function, and temporary objective of PLANET, an intra-industry Value Added Network (VAN) or an intra-industry Electronic Data Interchange (EDI) system, in the daily necessities distribution illustrates the present state of on-line communication system for manufacturer-wholesaler transaction and the future of joho-ka development. PLANET was established in August 1985, and started its operation in February 1986.[27] Here I show in the order of the historical background, a factor facilitating the establishment, objective, and performance.

Two factors are crucial as the historical background. First, with the progress in information technology and the diffusion of computers, every economic organization, both intra- and inter-firm organizations, has strongly aimed at improving overall efficiency, from production to marketing and distribution, through an effective use of computers. They thought that, unless succeeded in coping with this development, they would not survive. Second, Kao, the largest manufacturer of the daily necessities, had succeeded in establishing a highly sophisticated computerized on-line information system over its distribution channel.[28] The other manufacturers, facing with this success, were seized with fear of Kao becoming more dominant and strongly inspired to follow it.

Lion, Kao's arch-rival, had also been eager to collect and exchange trade information with wholesalers, and at the time of PLANET establishment it had its special use computer terminal in 146 wholesaler's offices to collect data on their sales to retailers (via public telecommunication circuit). Uni-Charm Corporation, another daily necessities manufacturer, already installing similar relationship with 30 to 40 wholesalers and intending to increase the number of wholesalers with its special use

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[27] Thus, this organization was established just after rather than on the process to the peak of joho-ka fever, suggesting that it is organized with learning from trials and errors in joho-ka development. The initial investors were eight manufacturers and Intec Inc., a computer services or VAN company. At the end of 1987, additional four investors joined, and the number of customer manufacturers, including manufacturer investors, increased to 24. By 1994, the number of member manufacturers and wholesalers increased to 63 and 289 respectively (PLANET [1995, p.6]).

[28] This is regarded as one of the most successful cases in joho-ka development in Japan.

computer terminal, found its cost very high because of wholesaler's resistance. Wholesalers have already installed Lion's terminal and feared, by accepting Uni-Charm's, a further increase of terminals in their offices and the explosion of their managing and operating costs. Wholesalers, therefore, strongly asked a joint use of standardized, unified system. The agreement between these two manufacturers on the joint use of Lion's on-line inter-firm information system (LCMS) resulted in the establishment of PLANET; PLANET inherited Lion's LCMS. Note the following three points.

First, before the joho-ka development, Kao had established its distribution channel with wholesalers exclusively distributing Kao's products, Kao's hansha [literally, sales company],[29] and it did not face wholesalers' resistance observed in Uni-Charm's case. The share of Lion's products in individual wholesaler's total sales is at most 30 percent, and computerizing the trade only with Lion does not improve the overall efficiency of wholesalers. Lion competes with Kao in overall channel efficiency rather than in that of their company, and it recognized this joho-ka bottleneck as a notable disadvantage.[30]

Second, firms, particularly manufacturers, agreed that joint use of information system would decrease the cost for maintenance and investment for renovation. (i) Between 1980 and the PLANET establishment, Lion spent 1 to 2 billion yen on the inter-firm on-line system development, most of which was on persuading, educating, and guiding wholesalers. Once born those costs by the first mover, the followers can dramatically decrease the burden. In other words, average cost decreases drastically with the number of participating manufacturers. The followers need only a much shorter lead-time for the system construction, too.[31] (ii) Before PLANET, Lion's

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[29] Strictly speaking, this hansha network covers the core portion of Kao's distribution, and distribution to small retailers pass smaller wholesalers, daiko-ten [literally, agents], which intermediate between hansha and retailers. The share of the latter is said to be 35 percent. The same as Lion and Uni-Charm's relationships with wholesalers applies to the latter.

[30] Lion's trade with those 146 wholesalers covers about 70 percent of its total sales. It faced the same difficulty when it intended to raise this share.

[31] A cosmetics manufacturer needed only a week to establish on-line link with over 40 wholesalers among over 300 PLANET member wholesalers.

LCMS was at the stage of collecting data on their sales to retailers and recording the results of stocking from manufacturers. Upgrading the system for on-line order entry and inventory retrieval would need a huge investment, which could be reduced through the joint use. (iii) Wholesaler's active response for coordination, particularly by reorganizing their intra-firm system, would reduce upgrading investment cost, and educating and guiding expenses. It would promote its effective use, too. This demands standardization of manufacturers' requests to wholesalers.

Third, Lion is the largest user of the distribution channel under study, and had the most advanced inter-firm on-line system among its rivals. Because of this, Lion's proposal to organize PLANET upon Lion's LCMS was a big invitation for its rival's participation. For rivals competition with such Lion's system was a challenging target, while organizing a joint system without Lion would be much harder and less profitable.

At the start, PLANET planned to collect and exchange the following four types of trade data.[32] (i) Data on orders: data on wholesaler's orders to manufacturers. Wholesalers send their original data to Intec, which are classified and allocated to individual manufacturer's mail-boxes. Each manufacturer pulls out them from its mail-box to their own computer, and uses them for efficient delivery. (ii) Stocking data: data on manufacturer's delivery of products to wholesalers, such as bills of goods and bills of sales. The data flows in the same way as in (i). (iii) Data on claims: data on manufacturer's claims to wholesalers. (iv) Sales data: data on the details of wholesaler's sales and delivery to retailers.

As mentioned above, before the PLANET, Lion and Uni-Charm used their on-line systems mainly for (iv). The immediate main objective of joho-ka,

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[32] PLANET plans its activities as follows. (1) Construction of inter-firm computer network, increasing the number of terminals in wholesaler's offices, and promotion of their joint use. (2) Promotion of standardization of communication protocol. (3) Development and maintenance of system both for order entry and for transmitting various kinds of bills. (4) Management of various kinds of standard code. (5) Consultation, and sales and maintenance of packaged software for assisting wholesaler's construction of in-house information system. (6) Provision of data on product master code, new product information, and information on manufacturer's sales promotion. (7) Provision, in the future, of automatic settlement system, and retailers' VAN system. This list suggests that from (1) to (6) are in their immediate need.

therefore, that of PLANET, is on-line exchange of order entry data, that is, (i). Receiving these data via on-line system would directly reduce manufacturer's operating cost, by reducing both man-hour inputs and wholesaler-manufacturer communication errors. As expected at the start upon the past history, however, realization of this objective has been hardly easy.[33] The number of manufacturers using PLANET for receiving ordering data in July 1986 was 8 and stayed 11 three years later, but the number began to grow from 16 in July 1990 to 38 in July 1994. The corresponding number of wholesalers sending ordering data via PLANET was 1 in 1986 and 31 three years later, and increased from 42 in 1990 to 128 in 1994. Both the number of members using stocking data and sales data has been much larger. For instance, the number of wholesalers using stocking data was 85 in 1986, 239 three years later, and 250 in 1994.[34]

In the processed food sector, the corresponding movement has been much weaker. FINET began its operation in October 1986, to which nine manufacturers and Intec Inc. invested. Upon the experience in PLANET Intec proposed to major food manufacturers such as Ajinomoto and Nichirei to establish an EDI system, particularly focused on frozen food distribution. While the number of both manufacturers and wholesalers in this sector are

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[33] At the end of 1987 a core member manufacturer used PLANET for (i) to (iv) with 5, 126, 6, and 54 wholesalers respectively. This is not because the small number of member wholesalers, that is, 215 at this moment. Among 2,000 to 3,000 daily necessities wholesalers, each PLANET member manufacturer directly trades with about 1,000, and the aggregate share of trade with top 100 wholesalers was 90 percent. Thus, most large and powerful wholesalers had already joined it by this time. From the wholesaler's side, however, the total picture looks different. Even a small wholesaler in this sector trades with over 100 manufacturers, and a large one with 300 to 400. The number of member manufacturers, particularly those using PLANET for ordering data exchange, was too small to cover the investment cost for adjusting their in-house system to PLANET, hard to contribute to efficiency improvement of wholesalers. Even when member manufacturers would have agreed on cooperation in joint use of collected data on their own sales, the coverage of these data would be too narrow to function as a strong incentive for wholesalers' active response. Information drawn from these data would be less valuable than wholesaler's own because of this narrow coverage, although they are complementary. Consequently, it seems to be difficult, depending upon these data, to make merchandizing proposals to wholesalers, and unimaginable to make them directly to retailers. As a result of such wholesalers' interest, coupled with the past history, the manufacturer mentioned in the text keeps on-line link with another 30 wholesalers via other VAN companies such as Fujitsu-FIP and Kyodo-VAN, in addition to 54 via PLANET.

[34] PLANET [1995, p. 8]. Note that those figures count all participants using the system whatever their share to all transactions.

much larger than those in daily necessities sector, the numbers of member manufacturers and wholesalers in 1994 are 45 and 150 respectively, less than those, 63 and 289, in daily necessities, and the number of kinds of data exchanged on the system, 4, is smaller than 8 in the daily necessities.[35]

### 3-4. Brief Summary of Section 3

We examined the development process and the present state of joho-ka in two sectors of distribution, daily necessities and processed foods. They are representative GMS and CVS products where product bar code is widely used. As GMSs and CVSs are based on chain operation and suitable for computerized data communication, particularly inter-shop EDI, joho-ka fever focused on these distribution sectors. Satisfying several conditions for joho-ka development, however, even in these sectors joho-ka development has been quite slow, much slower than had been expected ten years ago. This slow development is particularly obvious in manufacturer-wholesaler transactions.

## 4. Joho-ka and On-line-ka: demand price of system development [system-ka]

Discussion up to the previous section will arouse the following comments: 'Joho-ka is not the same with on-line-ka. The latter is only a part of the former. Though inferior in speed and efficiency of communication, we can make progress in joho-ka through an exchange of magnet tapes or floppy disks.' 'The basic problem is what kind of useful information we should draw from collected data and how to make its effective use, rather than how to construct a system for data collection. Data precious for many is merely

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[35] PLANET [1995, p. 6]. The number of foods wholesalers is said to be about 20,000 (another figures are 54,000 shops and 37,000 to 38,000 firms), one digit larger than that in daily necessities. As a result, third-tier dealers, that is, a wholesaler buying from wholesalers which buy from wholesalers, are popular in this sector and, comparing with the daily necessities where secondary dealers rather than third-tiers are popular, a distribution channel is long and complicated. The number of food retailers, 700,000, is also larger than that in daily necessities, 300,000. On these points, see Miwa [1991b, p. 12, note 43].

a collection of rubbish for those unable to make their effective use. Moreover, unless clearly defined the effective use, we cannot even design an efficient and effective system for data collection, and data collected through ill-designed system are again a collection of rubbish.' 'Recently we had too much talks about on-line-ka or networking, which caused a widely spread misunderstanding that construction of inter-firm on-line links would provide immediate big benefits. A set of conditions must be satisfied for them to be beneficial. Before inter-firm system construction, we should reorganize activities and information flow within a firm. Otherwise, inter-firm links would only arouse and amplify a flood of noise. Famous successful cases, only a few in number, have mostly been famous, prior to the outburst of on-line-ka fever, for their success in such in-house reorganization.'

The joho-ka concept had become fashionable and trendy, and we observed in this fever the same situation as that Nohria [1992, p. 3] described in his comment on the network concept: 'Anyone reading through what purports to be network literature will readily perceive the analogy between it and a "terminological jungle in which any new comer may plant a tree." This indiscriminate proliferation of the network concept threatens to relegate it to the status of an evocative metaphor, applied so loosely that it ceases to mean anything.' In the joho-ka fever in the 1980s, like in any other big booms, many talked about it with such ill-defined concepts as joho [information], joho-ka, and network-ka, attaching them many differentiated images. Some even argued that in the near future a successful joho-ka retailer, with analyzing collected data on the buying behavior of individual consumers, will be able to, making a precise forecast on each individual's behavior, fantastically improve their efficiency in merchandising and marketing. With these various arguments most firms were compelled to think about joho-ka, and many actually joined this fever.

What I intend in this chapter is not to discuss what the joho-ka fever and movement has been,[36] but to search for a clue to the study of the determinants of organizations in Japan's distribution channels. For this I investigated in Section 3 what occurred in the distribution sector under this fever and started a study of why joho-ka development has been so slow. An economist's answer is simple and obvious: it did not pay for firms to enthusiastically engage in joho-ka development. Nobody, however, will be satisfied with this answer, and asks to walk further steps. Before the discussion, note that we observe successful cases in joho-ka which we mention in Section 5, therefore, the question is not to ask why any firm or any group of firms did not construct an effective EDI system. Not a few other firms could have succeeded if the following difficulties had not existed.

The basic view is as follows. With the development of inter-firm EDI system, firms collect and exchange new kinds of data both on trade partners and their transactions. From these data they can draw profitable information, whose value, however, totally depends on how to use it. This value, depending again on the intra- and inter-firm EDI environment of individual firms, determines their individual demand price for the EDI system. So, a firm with a well organized intra-firm system tends to have a high demand price, and a less developed firm a low price. Moreover, each firm's construction of intra-firm system has an external effect, which makes inter-firm system development still harder. (i) A development of intra-firm system within a firm has positive effect on the other firm's demand price both of their intra-firm systems and of inter-firm system. (ii) Construction cost of an inter-firm system, like that of a bridge within a community, consists of a large fixed cost and rather small variable costs, which, like public good provision, distorts correct revelation of related party's demand price. (iii) The design and function of inter-firm system

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[36] I discuss further neither how to use the collected and exchanged data nor how the joho-ka development would influence the industrial organization in the distribution sector. The recent fever on strategic information system (SIS) emphasized the first point and discussed how to construct a system for collecting data effective for their strategic use. See cover stories in 'NC' 26 October 1987 and 10 October 1988, Synnott [1987], Keen [1988], and Wiseman [1988].

notably influence demand price of each individual, which arouses a battle for leadership in the coordination for its construction.[37] Thus, conflict of interests among related parties has made the joho-ka development difficult. The following five points are important as factors making the coordination difficult. Among these the fifth is the most important.

First, individual firms' demand prices for an inter-firm system vary greatly, since the value of any information drawn from collected data on the system differs among individual firms, which depends on the present state of each party's intra-firm system for information flow and decision making.

Second, the value of information drawn from the collected data also depends on business know-how accumulated within the firm and ideas based upon it for its use. Such know-how and ideas dramatically decrease their value with the number of firms in posession. The coordination process inevitably requests their disclosure and spill-over to other paticipants, which makes the coordination difficult.

Third, the first two points assume an agreement among participants on the information to be provided and, therefore, on the data to be collected. What information each firm values most and demands, however, differs decisively among participants, depending on the environment of each firm, such as technology, history, and market position. This difference causes a diversity of demands for the EDI system. Thus, in addition to that for the allocation of construction cost, coordination for the design and function of the system is necessary, which makes the conflict of interests severe.[38]

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[37] Recently those points are discussed under the title of network externality. See, for instance, Farrell and Saloner [1992] and Matutes and Regibeau [1992].

[38] The SOFT, one of the major two nationwide physical distribution networks for audio-visual software, was established jointly by Victor Company of Japan (JVC) with nine record manufacturers and 16 video-software manufacturers. The greatest difficulty in the system construction was the wide diversity of individual member's demand for its function, and accepting all of them would make the system too huge in size and complicated. Such a system, reqesting complicated operation, would arouse user's complaints, and reaching a compromise was a big task. See 'NC' 7 December 1987, p. 128.

Stern and El-Ansary [1988, p. 446, Exibit 10-1], a well-known standard textbook in marketing, identifies five steps in designing a marketing channel information system.

> Step 1: Identify Key Decision Areas in the Channel System (e.g., minimum order quantities, product assortment, prices and discounts, cooperative advertising). --> Step 2: Identify Levels (e.g., manufacturing, wholesaling) at which Each of These Decisions are to be Made. --> Step 3: Identify Information Needs to Make These Decisions. --> Step 4: Identify Who Should Provide the Information to Whom and How It Sould be Provided. --> Step 5: Identify Uncertainty Absorption Points in the Channel and Develop a Program to Supplement Current Information.

Identifying key decision areas in the channel system is the first step, on which an efficient and effective system should and can be designed. "A major factor in the miscomprehension of a message is noise. An overload of detailed information is likely to be misunderstood because it will exceed the processing capacity of the recipient. The recipient is faced with the burdensome and confusing task of having to decipher the information he needs from a large volume of data. A channel member's failure to understand information prevents other members from learning the intended message, too. Thus, an overload communicaion system is a detriment to channel coordination." (Ibid., pp. 448-49)

Fourth, both intra- and inter-firm information systems are to grow or evolve with time and learning by experience, which makes the coordination difficult. Technological environment changes over time, and with accumulation of experience and business know-how new ideas come out both for better use of collected data and for the system improvement. The long experience in daily practice also improves the effectiveness of the system. With these factors a common sense view prevails that a construction and development of information system should proceed step by step, that is, an information system is to evolve with time and accumulation of experience.

Thus, the difficulty of coordination exists not only in the construction of a system at a given time as discussed in the first three points but also over a long dynamic process of evolving and changing system construction.[39]

Fifth, many, particularly firms, have had a strong interest in the joho-ka development, because they anticipated a revolutionary change, or at least its beginning, in basic technology supporting the distribution system. As discussed in Section 2, the basic function of firms in any distribution channel is information management: to transmit, gather, process various types of information, to exchange them with other trading agents, and to make their efficient and effective use. The joho-ka development, or arguments for it at least, has included a reference to a radical change in technology underlying their information management. Therefore, joho-ka development might have changed the shape of distribution channel, the structure of division of labor within a channel, the position of a firm in the market, and the distribution services provided to consumers. This change, in return, might provide a chance to some firms to improve their position both within a channel and in the market, providing also the possibility to others to deteriorate their positions, or even to be driven out of the market. Coupled with the following two factors, the grave potential impact of joho-ka development makes quite difficult both the coordination of member's interests and therefore the realization of potential gain from the change. (i) The large number of potential participants in the coordination. Coordination cost increases with the number. Moreover, any group formation among small number of firms only for an experimental development may arouse strong reaction of other firms, because of the first mover advantage in designing the system. (ii) The nonexistence of agreement on the future technological advance and therefore the potentials of joho-ka. Each firm has to and does determine the function and draw a design of desirable system, based upon its own expectation of

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[39] SABRE is the computerized reservation system of American Airlines, which I discuss in the next section as one of the most successful cases of joho-ka development. A manager, however, only recently argues that they began to move from the construction of systems to a challenge to effective use of information. See Hopper [1990, p. 121].

technological development and joho-ka potentials. Those designs differ greatly among firms, on which to reach an agreement is difficult.

## 5. Comparison with a success: the Case of Computerized Reservation Systems (CRS) in the U.S. Airline Industry

A comparison of the joho-ka development in the two sectors, daily necessities and processed food, discussed in Section 3 with a successful case highlights why the development there has been slower than was expected. Manufacturers, wholesalers, and retailers within a marketing channel were expected to become closely connected through computerized information network and exchange trade data and information drawn from them. The airline industry, particularly American one, is one of the industries where information system development has had most strong influence. The core source of influence is each airline's computerized reservation system, which airlines fiercely competed in their construction. Among those systems American Airlines' SABRE is famous as the most successful.[40]

Today, as Hopper [1990, p. 122] described, 'SABRE is neither a proprietary competitive weapon for American Airlines nor a general distribution system for the airline industry. It is an electronic travel supermarket, a computerized middleman linking suppliers of travel and related services (including Broadway shows, package tours, currency rates) to retailers like travel agents and directly to customers like corporate travel departments.' Our focus, however, is placed upon the development process rather than the present state. SABRE began as an inventory-management tool in the early 1960s, in response to American's inability to monitor inventory of available seats manually and to attach passenger names to booked seats. By the mid-1970s, its functionality expanded greatly, and its technology provided the base for generating flight plans for their aircraft, tracking spare parts, scheduling crews, and developing a range of

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[40] SABRE is regarded as one of the most successful inter-firm information systems. A list of successful cases includes, for instance, Apollo of United Airlines, American Hospital Supply's ASAP order-entry and inventory-control system, United Service Automobile Association's Automated Insurance Environment. See Hopper [1990, p. 118] and Wiseman [1988].

decision-support systems for management. Thus, SABRE and its associated systems became the control center through which American Airlines functioned. American installed its first SABRE terminal in a travel agency in 1976, inaugurating its now familiar role as a travel-industry distribution mechanism. 'SABRE now operates in more than 14,500 subscriber locations in 45 countries' (Ibid. p. 122).

Marketing, distributing, and managing inventory of airline tickets is a complex task. For consumers any flight has no perfect substitute, determining the basic industry character as highly differentiated and making the task complex. Demand for seats of a flight arises over a long interval, and airlines accept consumer's request for seat reservation before being sold-out, forcing airlines to face complex task of inventory-management over a long period of time. Most customers first visit travel agents, and distribution and inventory-management of flight seats is a complex task, depending upon a huge amount of detailed flow of information between an airline and many travel agents. Before the diffusion of CRS terminals, travel agents in the U.S., counting 40,000, determined customer's travel schedule with the aid of Official Airline Guide which included schedules and fares for all domestic and international flights. The agent, then, made a seat reservation with fare confirmation, and issued a ticket with hand-writing. Moreover, with airline deregulation since 1978, airlines companies developed airline networks of hub-and-spokes type, which dramatically increased the number of flights, including transit flights around the hubs. Coupled both with the increased number of flights, also by newly entered airlines, and with complicated information on discounted fares under various conditions, travel agents strongly demanded effective and efficient CRS systems in order to timely provide their customers with appropriate information. Most travel agents now have CRS terminals in their offices. 'Largely as a result of the proliferation of such systems, travel agents now account for more than 80% of all passenger tickets as compared with less than 40% in 1976' (Ibid., p. 122). Thus, SABRE and its CRS rivals truly transformed the marketing and distribution of airline services.

Comparison of this case with the two sectors discussed in Section 3, daily necessities and processed foods, suggests the reasons why computer-

ized information systems have an exceptionally definite impact on the airline ticket distribution. The following eight points are important.

First, distribution and inventory-management of airline tickets is suited for computerization. Without CRSs, airline companies could not cope with the increasing complexity of their task, which made their gain from computerization great.[41] Without extending on-line links to outside the firm, or even to other sections within the firm, for instance, to sales department or sales offices, computerized information system would have developed within the firm, particularly around the control center.

Second, the gains from developing computerized information system increase with the number of travel agents equipped with its terminals. (i) Most information management is carried out by the sales and inventory-management system in the control center, and a simplified system is enough as an agent's terminal. Thus, the marginal cost of increasing such an agent is small, and the average cost decreases with its number. (ii) A CRS terminal saves man-power inputs into agent's operation, improving its service quality. Besides its cost reduction effect, an agent has a strong incentive for its introduction as a weapon for competing with rival agents.

Third, travel agents need not provide any complex information on the content of airline flight service, since it is so standardized and well-known.[42] A terminal needs to be backed up neither by a heavy collection of samples and pamphlets nor by a well informed expert.

Fourth, even before the diffusion of CRS terminals, the airline ticket distribution was free from constraints due to the need for physical

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[41] A condition favorable for computerization is as follows. A firm has to monitor flight by flight inventory of available seats and attach passenger names to booked seats. The number of seat allocation patterns is rather small due to the type of aircrafts in use and the same pattern appears repeatedly because of the dominance of regular flight service, which makes computerized inventory-management rather easy. Every seat in each flight is already coded, requesting no additional task for computerized handling. Thus, one of the most famous computerized information systems in Japan is that for inventory-management system for the former Japan National Railways' new trunk lines (shin-kansen) tickets, MARS (see Miwa [1991a, pp. 11-2]).

[42] Hotel room reservation at a tourist resort, for instance, needs extremely complex information.

distribution, which makes the diffusion much smoother.[43] Simple terminal operation is enough to replace the formerly requested procedure, that is, telephone communication, hand-writing ticket issuing in an agent, and corresponding passenger name attaching work to each seat in the airline office.

Fifth, no serious contest for leadership in the development existed within the distribution channel. A big airline company, fully equipped with an intra-firm computerized information system, took the leadership, and many small travel agents based on manual works followed. No conflict of interests could existed in selecting a basic system and setting standards on which inter-firm information system would develop.[44]

Sixth, although many goods and services other than airline tickets are provided through travel agents, coordination of information systems with other suppliers such as hotels and rent-a-car companies caused no serious problems. For passengers a travel agent is a convenient one-stop shopping place, and this channel and its information system can be closed without loss of convenience. Systems in powerful hotels and rent-a-car companies can easily be linked with CRSs, enjoying big commercial gains.[45]

Seventh, even before the CRS terminal diffusion wholesalers played no critical role within the channel, which makes the development easier. If wholesalers had played a key role as a node within distribution channel, like in the two sectors studied in Section 3, coordination for the development of inter-firm information system would have been difficult. Ajinomoto,

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[43] Recall the crucial constraint on the development of distribution system in the two sectors discussed in Section 3 of the requests of small-lot, frequent delivery to many small retailers.

[44] Compare this with the two sectors studied in Section 3, where powerful firms on each stage of distribution, that is, manufacturers, wholesalers, and retailers, had developed their own intra-firm information systems.

[45] Recall that, as mentioned above, wholesalers in the daily necessities wholesalers' association trade with manufacturers in 13 manufacturers' trade associations. Also note that the ratio of the daily necessities sales to the total in a big GMS is about 5 percent. Construction of an exclusive distribution system is not always an effective weapon to those problems. On this point recall a description of small home electronics retail store in footnote 24.

one of the largest food manufacturers, sells over 60 percent of their products through 400 retailers, mostly chain stores, with which they make direct trade. Detailed distribution activities, however, are carried out by wholesalers, including order entry and delivery to individual stores.[46]

Eighth, deregulation in the U.S. airline industry much increased the value of CRSs. (i) As mentioned above, with this travel agents had stronger demand for CRS terminals for providing customers timely with appropriate information on time schedule for increased number of flights and complicated fares, particularly discounted fares available under various conditions. (ii) Deregulation allowed airlines to adopt flexible business strategy. Changing pricing policy, for instance, allowing spot discount on individual flight's fare with monitoring inventory of available seats is to be effectively carried out on condition that precise information on these changes can be transmitted promptly to many travel agents, which increases the value of CRSs to airlines.[47] (iii) For each airline company CRS is an effective weapon in competing with rivals for the support of travel agents by occupying the most advantageous place on their counter, which increases the value of CRS for an airline with an increase in competition due to deregulation.[48][49]

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[46] Role of wholesalers, or the division of work load among manufacturers, wholesalers, and retailers, within a distribution channel is determined so as to minimize the costs for providing goods and services. Though varied both in countries and industries, among many basic factors underlying technology, particularly information technology, plays a critical role in their determination. This seventh point may suggest that this system can fully develop only in a simple distribution channel where there is no room for wholesalers. It may also suggest, however, that in some sectors a progress in information technology not only reduces the costs for developing computerized information system but also changes the basic environment so dramatically that conditions for wholesaler's critical role disappear.

[47] 'During routine periods, the system loads 200,000 new industry fares a day. In a "fare war" environment, that figure is closer to 1.5 million fares per day' (Hopper [1990. p. 121]). Without CRSs, the volume of relevant information could have been transmitted to travel agents only in turmoil, and such frequent new fares could not have been introduced.

[48] With the diffusion of terminals CRSs have become an infrastructure in the travel supporting industry, and American Airlines argues that they are 'entering the new era: we want to compete on the use of electronic tools, not on their exclusive ownership' (Hopper [1990, p.122]). On the process many pointed to so-called 'screen bias' as a source of marketing advantage, to which, however, Hopper [Ibid., p.122] insists to have proven groundless.

Comparison with the success of CRSs in the U.S. airline industry strongly suggests that at least in the near future joho-ka development will have no comparably notable impact on the distribution of daily necessities and processed foods in Japan. Neither many terminals of manufacturers in their exclusive use will be on the counter of retailer's head office or individual shops, nor terminals of small number of dominant wholesalers will occupy offices both of manufacturers and retailers. As discussed above, the development of computerized information system, often called 'the industry VAN', which most manufacturers, wholesalers, and retailers use as an industry infrastructure, is hard even to imagine.

Most agree, however, that the recent development of communication and information management technology has great potentials in influencing the basic function and structure of economic organizations, and many share the view that in the long run even in these distribution sectors the structure of channels and work load sharing within them will follow the same way as was observed in the U.S. airline industry. The speed of change and the path it will take totally depends on the behavior of individual agents under environmental constraints like technology and history, on whose process government policy will have some influence.

## 6. Concluding remarks: role of the government policy

Debate on the government policy for joho-ka development or on its role in telecommunication and information management almost always begins with stating that 'as telecommunication network and computerized information systems are social infrastructure'. With this, many argue that the government should play an important role in standardizing various aspects in business activities, which is likened to public goods supply. Typically

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[49] CRSs have not played such a critical role in the Japanese airline industry due to the lack of factors from 5 to 8 discussed in the text. Due to the size of the country people travel mainly by train and car rather than by airlines, and travel agents are structured and organized for travels by train, and airline tickets are rather new comers. Computerized information system has proven effective and changed entirely the distribution of event tickets, such as theaters an concerts, of which Ticket-Pia and Ticket-Saison are the representative. On these points, see Miwa [1991b, pp.18-9].

they argue that the government should support or even lead the standardization of various economic activities for joho-ka development, from intra-firm information management system to inter-firm communication protocols and product codes, through promoting it within an office, within a firm, and between firms by reducing the costs both for system construction and for communication and information management. They argue, for instance, as follows: (i) Free market mechanism does not result in good performance in such standardization, for which the government should play a catalytic role. (ii) As social rate of return does not coincide with private returns in such standardization activities, the government should lead private agents to the social optimum. (iii) The government should better show the direction toward the social optimum at the very beginning of standardization, rather than coordinating the interests of private agents upon the achievement of the market process of standardization based totally on private incentives.

It is a hard task to develop an integrated system over many independently developed computerized information systems. The cost was thought to be prohibitively larger when attempted independently on many spots, which would delay the development of inter-firm information system. Many instead expected development of inter-firm systems, often called industry VANs, regional VANs, and more widely expanded 'general VANs', which would function as an infrastructure. Thus, backed by a wide public support, the government strongly promoted them as a basic policy weapon for developing 'Hi-Information Society'.[50]

The benefits and costs of such government intervention, however, depends on various factors, and whether the net gain can be positive, therefore whether it is a desirable policy, deserves close examination.

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[50] That notorious jurisdictional disputes between Japanese ministries appeared in this case as 'the battle for VAN' between the Ministry of Post and Telecommunication and the Ministry of International Trade and Industry. See Shiono [1984]. A rough image of developing process including a target state underlying those policies is presented in MITI [1985, p. 106]. Nevertheless, as mentioned above in footnote 17, daily necessities wholesalers discussed for its development. (i) Such discussion has never been held before. (ii) Corresponding discussion, however, neither among manufacturers nor manufacturers' associations was observed. (iii) No discussion among three relevant parties, that is, among manufacturers, wholesalers, and retailers, has occurred. Here appears a call for a government's role as a coordinator.

Here I introduce a part of my interview with a large food product wholesaler manager. Emphasizing the actual cost and potential risk of government intervention for standardization, he argued for no role of the government. After a decade of ineffective policies, it deserves wide attention. (i) Almost always more than one ministries intervene without coordination even in policies for standardization.[51] (ii) Usually a government policy puts higher priority on equity than on efficiency, which reduces the value of policy to individual participants even to be ignored.[52] (iii) Expecting government intervention, each firm tends to postpone its system development or even decision making for its start. Thus, government policies function as a noisy environmental obstacle for all, and discouraging burden are levied particularly on front runners. Even when one finds a chance for enjoying a first mover advantage, an expectation of such a government intervention as to deprive him of the advantage discourages his decision.

Besides actual costs and potential risk of government intervention, we have to pay much attention to a wide variety of related firm's demand for the system under discussion, which as discussed in Section 4 results in the big difference in its demand price, based on individual firm's amount and quality of accumulated know-how, its holding business ideas, level of R&D effort for its effective use, and its development stage of intra-firm information system. These determining factors are produced by individual firm's entrepreneurship, which by asking related firms for their cooperative reaction promotes as well an inter-firm information system

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[51] A wholesaler dealing both foods and liquor has to anticipate intervention from at least three ministries with their jurisdictions: Ministry of Finance on liquor, MITI on distribution, and Ministry of Agriculture and Fishery on food manufacturing. All of them, without coordination, support construction of industry wide information system by each trade association.

[52] Government policy for an industry almost always adopts as the basic principle an equal treatment of industry members, therefore, is indiscriminate. Reflecting the interests of weaker members, for instance, those being late in developing intra-firm computerized information system, the policy sets the target speed of industry-wide system development at rather a slow level, and sometimes requests front runners to slow down the pace. On such indiscriminate character of Japanese government policies for industries, see Part III, particularly Chapter 8, of Miwa [1995]. The government often intervenes when a leader asks other members within a channel for active reaction, condemning it as an abuse of power.

construction and its effective use. Therefore, the only desirable government policy must be along supporting entrepreneurs active in joho-ka development, by, for instance, rewarding higher returns to successful joho-ka firms rather than by selecting firms for policy support. The government has no capability of beating the market in selecting firms with potential success.[53]

Thus, it should be the basic discipline of desirable policy toward the joho-ka development to accept an interplay of market forces and in case of necessity to promote market competition. Up to the present both proposed and actually adopted policies have placed too much emphasis upon the government's role, which is a major reason why it has not been so effective as was expected. Government role in joho-ka development must be more limited than before, and in discussing its limited role note the following two points. First, it is the process of realizing fruits of technological innovation which has a possibility to fundamentally restructure both traditional industry orders and industry borders. Most policies already proposed and adopted, taking traditional 'industry' borders for granted, discourages this restructuring and therefore joho-ka development. Instead, policy should support successful entrepreneur's activity, including such restructuring of industry orders and borders. Second, in most cases where standardization is strongly demanded, both the target, even a temporary one, and the direction to follow is neither obvious nor widely agreed upon. We had better let many agents compete in selecting the process to follow rather than depending much on the government who has no capability of beating the market. By providing incentives for better ideas, we can expect better performance.

Emphasizing the role of the market, however, another type of policies has been proposed. Among government institutions Fair Trade Commission (FTC) took the key position in these policies, and the report referred in Section 1 (FTC [1989]) is an output of the study group for these policies. This type of policies is classified into two groups. First, investigation of the impact of joho-ka on market competition and strengthening of anti-

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[53] For a similar view, see Beesley and Littlechild [1989, pp. 466-8].

monopoly policies, if necessary. FTC carefully examined the possibility of bad impact on competition at the manufacturing stage and its importance, through, for instance, excluding rivals by launching powerful manufacturer's own computer terminal to wholesalers. They also examined whether joho-ka development would make easier resale price maintenance, now per se illegal, through collecting more detailed information on retailer's behavior. Second, policies, as part of anti-monopoly policies, against oshitsuke (burden-shifting) or an abuse of power which may appear on the process of joho-ka development. FTC constantly watched who bore the cost of introducing computer terminals, for example, a manufacturer's terminal to wholesalers, and examined whether a manufacturer forced its introduction by tying it with maintaining trade relationship.[54] As mentioned above, FTC study group concluded that throughout the 1980s joho-ka's impact had not notably realized in the distribution sector, and FTC had taken no clear policy action of this type.[55]

'Whether particular institutions or agencies assume leadership roles in specific marketing flows within distribution channels, communication in one form or another provides the means by which the work of channels is coordinated. Poor or ineffective communications can prove to be a major roadblock to coordinative efforts' (Stern and El-Ansary [1988, p. 445]). Expecting big potentials in improving the effectiveness of communication within channels, debate over and movement for joho-ka development gathered

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[54] What is and should be prohibited by the Anti-monopoly Act has long been seriously debated (see Miwa [1982, Part II, particularly Chapter 4]). I do not discuss this type of policies further, since FTC has taken no clear policy action of this type despite of heated discussion and many proposal. Some argued even to prohibit making difference of trade conditions related to an introduction of own terminal, selecting or shifting trade to wholesalers with its own terminal from others, or bypassing secondary dealers. They insist that FTC has to carefully watch in the same manner an introduction of penalty on failure in scheduled delivery. Here 'cost' includes, besides the direct cost of terminal, that for adoption and management of product- and shop code, that for coordinating form of bills and document, physical distribution system such as delivery frequency, use of distribution centers, and inspection.

[55] The next comment by Uni-Charm's manager is worth attention: 'Joining PLANET made our huge asset accumulated in the past totally useless. Before that we were one of the first movers, however, we felt that the first mover disadvantage was much greater than advantage. The follower's advantage is great, since we develop computerized information system over standardized format.'

much energy and wide public attention. It might be too early to judge the future potentials of joho-ka development in restructuring distribution channels in Japan, improving the communication effectiveness. The history of the past decade or more suggests that first most overestimated its potentials and underestimated the relevant costs and second many placed too much emphasis upon the role of government policies.

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