Research paper

Adoption of efficient consumer response: the issue of mutuality

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Keywords

Consumer behaviour, Response rate, Grocery, Case studies, Australia

Abstract

The adoption of efficient consumer response (ECR) has been slow in many regions, despite its many potential benefits to supply chain participants through reduction of inventory level and operating costs. There has not been any well-developed theory that can explain this slow uptake. Argues that the inherent characteristics of ECR have actually created barriers to its own adoption. As an inter-organisational system (IOS), ECR adoption requires co-operation and trust between trading partners, which are unlikely to happen unless costs, benefits and risks of ECR implementation can be mutually shared. Shows, using a case study conducted within one supply chain, that an unequal distribution of costs, benefits and risks among manufacturer, distributor and retailer is inherent in the implementation of cross-docking, which typifies the overall ECR program. The findings of this study lead to a new direction in understanding the barriers to adoption of ECR and IOS in general.

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Introduction

Efficient consumer response (ECR) has been perceived by a number of companies in many regions as a key catalyst for supply chain reform (Szymankiewicz, 1997). In its attempt to re-engineer grocery industry supply chains, ECR promotes efficiency initiatives in four areas: promotion, product development, product replenishment and store assortment. These four initiatives are facilitated by a number of programs and enabling technologies, especially electronic commerce (EC) technologies, which eventually integrate all players within a supply chain. The ultimate objective of ECR is thus to reform a supply chain in such a way that products can be brought smoothly and continuously from manufacturer to consumer, as a result of timely, accurate and paperless information flowing from consumer back to manufacturer. Since ECR is a typical EC-enabled inter-organisational system, partnerships among participants of a supply chain play a crucial role in achieving the objective of ECR (Kurt Salmon Associates, 1993; Martin, 1994).

According to the ECR vision (Kurt Salmon Associates, 1993), supply chains within the grocery industry must undergo a total transformation. Participants within a supply chain need to work together to maximise the efficiency of the whole supply chain, in order to achieve one common goal, that is to deliver better value to the consumer (Kurt Salmon Associates, 1993; Karonis, 1997; Szymankiewicz, 1997). With collaboration and integration among the players of a supply chain through the use of information technologies, the boundaries between these players will gradually disappear (Preiss *et al.*, 1996). Manufacturer, distributor and retailer within one supply chain can thus be considered as a single entity, which can be thought of as a virtual organisation, pursuing one common goal (Preiss *et al.*, 1996; Marshall *et al.*, 1999). As a result, competition will shift from company against company to supply chain against supply chain (Daugherty *et al.*, 1996; Montezemolo, 1997).

A number of studies have been conducted in the USA, Europe and Australia to examine the potential benefits obtainable from ECR (Kurt Salmon Associates, 1993; Krum, 1994; Coopers and Lybrand, 1995; Leggett, 1996; Mathews, 1996; Ross, 1996). Despite the many benefits of ECR, adoption of ECR has

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been slow in many regions (Kurt Salmon Associates, 1995, 1995/6, 1997; Coopers and Lybrand, 1998). Explaining the slow uptake of this inter-organisational reform with considerable benefits is an important theoretical problem that has not been adequately addressed in the ECR literature. In a previously published paper (Kurnia and Johnston, 1999), we have argued that the slow uptake of ECR can be attributable to the lack of cases of successful ECR implementation by organisations. We then identified a number of likely determinants of success with ECR, using survey as a research method. The findings, while providing an explanation of the slow ECR adoption rate, were limited by the necessary focus on individual organisations as the unit of analysis. Studies focusing on the entire supply chain are therefore required to gain more in-depth understanding of the complex interactions between companies, which affect adoption and implementation of inter-organisational systems, such as ECR. Such studies are still currently limited and there has been a growing interest in researching this particular area (Chan and Swatman, 1999; Gregor and Jones, 1999; Gregor and Menzies, 1999; Johnston and Gregor, 2000).

In this study, the virtual organisation literature (Grenier and Metes, 1995; Preiss *et al.*, 1996; Allen *et al.*, 1999; Marshall *et al.*, 1999; Marshall and McKay, 1999) was reviewed to provide a more detailed understanding of the complex issues involved in ECR adoption. Specifically, the model of critical success factors for virtual organisation proposed by Marshall and McKay (1999), appears to be relevant to addressing the slow adoption of ECR. They argue that due to the interdependent nature of the activities of virtual organisations, all members in such an organisation need to have a common purpose, share risk, trust each other, and have mutual benefits (Marshall and McKay, 1999). A number of other authors agree that without these four factors, the virtual organisation cannot be successfully achieved (Grenier and Metes, 1995; Hart and Saunders, 1997; Karonis, 1997; Allen *et al.*, 1999; Marshall *et al.*, 1999) and we argue this applies equally to EC-enabled inter-organisational initiatives such as ECR (Karonis, 1997). In addition to these four factors, we believe "cost sharing" should be considered alongside "benefit sharing".

Specifically, in this paper we examine the issue of mutuality of benefits, costs and risks between retailers, distributors and manufacturers in ECR adoption, using a case study conducted within one supply chain. The case study looks at one element of ECR which typifies the whole approach, namely cross-docking, as part of the Continuous Replenishment Program. Cross-docking is a good example to address the inter-organisational aspect of ECR, as it promises substantial cost savings, requires relatively simple technology to adopt, but requires good communication, cooperation, and trust between trading partners. We use this case study to show that certain aspects of the approach itself, while capable of producing substantial supply chain wide efficiencies, inherently give rise to an imbalance in the distribution of benefits, cost and risks amongst the participating parties, which is particularly unfavourable for manufacturers. This indicates that cross-docking, and EC-enabled inter-organisational reforms in general, imply the need for participating parties to re-negotiate trading terms if mutuality is to be achieved. We then describe the efforts taken by the manufacturer in the case study to better position itself in such negotiations using a detailed activity-based costing (ABC) study of their processes.

The analysis of this case study shows that the ideal state envisioned by ECR cannot be reached through individual self-interested activity of the participants. Given the additional plausible assumptions that parties will be unwilling to adopt reforms without a satisfactory division of benefits, costs and risks, and that such a re-distribution involving supply chain wide negotiation, cooperation, and trust will be difficult to achieve amongst separate corporate entities, we argue that ECR reforms by their very nature present barriers to their own adoption. By considering the entire supply chain, as opposed to individual organisations as a unit of analysis, this study leads to a new direction in understanding ECR adoption.

Research methodology

The case study was conducted with one leading manufacturer and one leading retailer in Australia. The manufacturer in the case study operates in approximately 80 countries,

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employing around 300,000 people, with a turnover of $58 billion per year. The participant retailer is one of the big three supermarket chains in Australia. It has 410 stores (supermarkets) throughout Australia and has been in business for 84 years. This company employs more than 52,000 workers and serves over 4.5 million customers per week, with an annual turnover of over $19 billion. The case study conducted with the participant retailer also allowed us to embrace the distribution function, since the participant company manages its own distribution to individual retail stores (supermarkets).

The unit of analysis in this study is the entire supply chain, which includes manufacturer, distributor and retailer. The case study is thus not intended to be comparative but rather to build a richer understanding of a single supply chain. As not many theories exist on the adoption of ECR over the entire supply chains, theory building, single case studies are an appropriate research method (Eisenhardt, 1989; Yin, 1989).

The data collection techniques employed were site inspection and semi-structured interviews with a number of managers and individuals involved in ECR-related projects of the participating companies. Two distribution centres of the participating retailer were deliberately chosen and inspected in this in-depth case study in order to examine the differences between the traditional "pick-and-pack" approach to handling goods and the "cross-docking" approach advocated as part of ECR.

With the retailer/distributor, four managers were interviewed. They were the Logistics Planning manager, the National Supply Chain manager, a Regional Distribution Centre manager and the National Distribution Centre manager. With the manufacturer, interviews were conducted with the Supply Chain Development manager, ECR manager and a Project Analyst who is involved in the ABC of the company. Each interview with each contact person took approximately between 60 and 90 minutes, to assess the impact of cross-docking adoption on the entire supply chain and how the mutuality issue can be resolved.

Factual data obtained from the site visits and interviews were tape recorded. As suggested by Miles and Huberman (1994), after each interview, the recorded information was directly transcribed as a written-up field note in an electronic format. All these raw data obtained from the case study were then reviewed and arranged systematically. Some excerpts were also selected. Information that has not been obtained and any ambiguity were identified. Follow-ups were then made through the phone and electronic mail for clarifications and for obtaining more information from the participants when necessary. For some confidential information, face-to-face interviews were re-organised with the participants. From all the data collected from the case study participants, similarities and differences in terms of requirements for cross-docking implementation, as well as benefits, costs and risks involved in implementing cross-docking for the participant manufacturer, distributor and retailer were identified. In addition, the distribution of costs, benefits and risks of cross-docking implementation among the case study participants was analysed. The final "write-up" of the case study was then distributed to the participants to ensure all information was correct and no confidential data were disclosed. From the data collected, the benefits, costs and risks involved in implementing cross-docking were identified and the distribution of each among the players of this supply chain was analysed.

The case study

All alternative product replenishment approaches proposed by ECR ("cross-docking", "flow-through" and "direct-store delivery") are prevalent at the participant retailer, although at present only for limited product ranges. With cross-docking, suppliers deliver individual stores' orders to a distribution centre. Goods are then sorted into their destinations at the distribution centre and dispatched. Thus, the inventory level at the distribution centre is almost zero at any time. With flow-through, goods (specific to stores' orders) delivered by suppliers are brought to the dispatching area of a distribution centre, to be loaded to a distributor's truck, ready to be delivered to stores. There is no sortation required at the distribution centre. Direct-store delivery (DSD) employs direct delivery from suppliers to stores, by-passing distribution centre or distributor. At the moment, approximately 90 per cent of the products at the stores of the

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company under study come from its own distribution centre, while 10 per cent (perishables) are supplied directly by suppliers (DSD). Out of this 90 per cent, only slow moving items are handled by cross-docking, while very high demand items are handled by flow-through operation.

The retailer's distribution centres have recently been integrated into a new business entity. At the moment, a service fee is charged to the regional supermarket head office, not individual stores. Thus, the lower the operating costs at the distribution centres, the less the supermarket has to pay for the logistics costs to get products on the stores' shelves. The company will soon commence a new "user pays" arrangement, whereby each distribution centre will charge each customer (store) for the costs of replenishing the store, resulting in high cost transparency between distribution centres and stores. In the next sections, two distribution approaches (pick-and-pack and cross-docking) are discussed and analysed comprehensively.

Pick-and-pack operation

The distribution centre with the traditional pick-and-pack operation handles medium to fast moving items. It has been operating for ten years. This distribution centre handles 775,000 cartons per week on average, within 350,000 square feet. A warehouse management system and a computer aided ordering system known as reorder inventory system (RIS), with some basic forecasting functionality are used to manage the inventory and ordering. These two systems interface with each other. On average, the handling cost per carton at this distribution centre is broken up as 24 per cent direct labour costs and 76 per cent overhead costs, including consumable costs such as stationary, wrapping, and so on, and fixed overhead costs of insurance, electricity, building, administration and infrastructure such as main frame computers.

Figure 1 summarises the process of pick-and-pack operation at this distribution centre. The following sub-sections discuss the main business activities involved in the pick-and-pack operation.

Ordering

Stores place orders with this distribution centre everyday via file transfer over a private dedicated network. These are independent of the replenishment orders placed by the distribution centre with the suppliers. Supplier orders are larger and less frequent and are triggered by an order point/order quantity system. Each product has a pre-determined order quantity, order point and safety stock level. The computerised RIS identifies items that have reached the re-order point (arrow a in Figure 1) and generates a recommended order quantity for each item (arrow b). In the ordering area, reports generated by the RIS are printed on a daily basis. After reviewing and making necessary adjustments to the recommended orders, purchase orders are sent to suppliers, via EDI, fax, or telephone, depending on the supplier's capability.

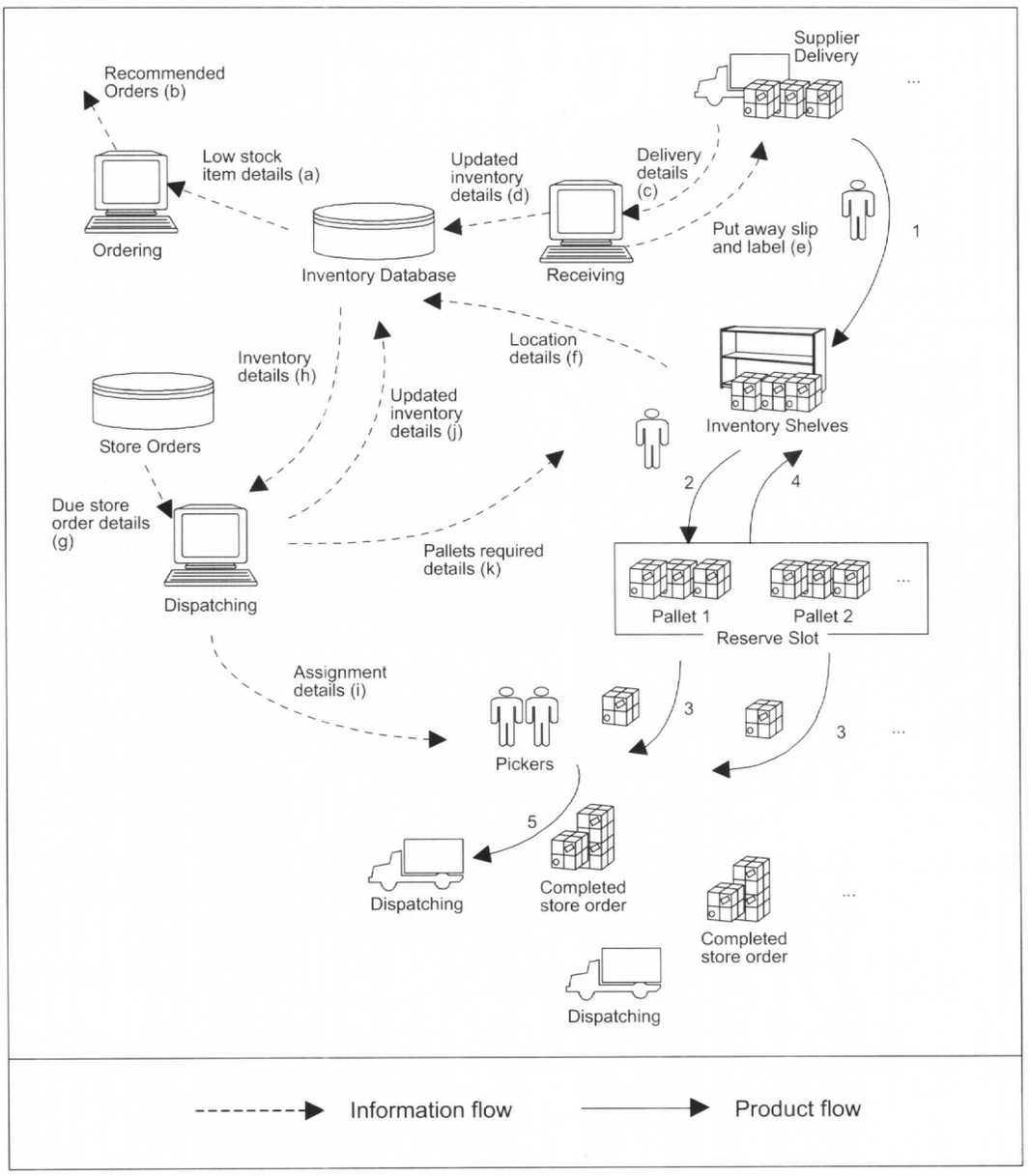
Receiving

When goods arrive from a supplier, they are accompanied by a paper-based delivery docket. Suppliers need to unload the pallets at the receiving bay and a time allocated by the distribution centre. Upon arrival, information about the delivery is entered into the warehouse management system (arrow c). The inventory database is then updated accordingly (arrow d). The warehouse management system issues a "put away" instruction slip and a bar-coded pallet label (arrow e) for each pallet. Each pallet is then taken by a forklift to its location (arrow 1). All forklifts are equipped with a radio frequency terminal that communicates with the warehouse management system. After storing the pallet on the required shelf, the bar-code on the shelf is scanned to allow the warehouse management system to keep track of the inventory location (arrow f).

Dispatching

In the dispatching area, due store order details are obtained from the warehouse management system (arrow g). After getting the details about the inventory required (arrow h), labels are generated by the warehouse system for each due store order, detailing the time required to complete the assignment (arrow i). The inventory level is then updated accordingly (arrow j). The instruction on which pallets are moved down from the inventory shelves to the reserve/picking slot is made available (arrow k). The required pallets are moved to the reserve slot by a forklift (arrow 2). Goods are picked from pallets at the reserve slot as required (arrow 3) then the pallets are moved back to the

Figure 1 Summary of pick-and-pack operation



inventory shelves (arrow 4). All items for an individual store are consolidated into one pallet, ready for dispatching (arrow 5).

Cross-docking operation

The second distribution centre studied uses the cross-docking approach. At the moment, cross-docking is only used for slow moving items (indent items), such as imported general merchandise. It has been operating for six years, with a throughput volume of 120,000-140,000 cartons per week, within 10,000 square feet. Thus, this operation handles 1/6 the throughput of the pick-and-pack operation using only 1/35 the floor area. The average handling cost is broken up as 71 per cent direct labour cost and 29 per cent overhead cost. The total of cross-docking cost is 21 per cent less than the pick-and-pack costs, as shown in Figure 2. Thus, for cross-docking, the majority of cost is salary intensive, with small overhead costs.

Figure 3 summarises the cross-docking operation. Each process is described in detail in the next sub-sections.

Ordering

Orders from each individual store are collected via the private internal network and centrally collated into a single EDI order for each manufacturer, with individual store requirement specifications. Each order is sent to the suppliers who deliver the consolidated goods to the distribution centre on the due date. Stores place their orders every four days

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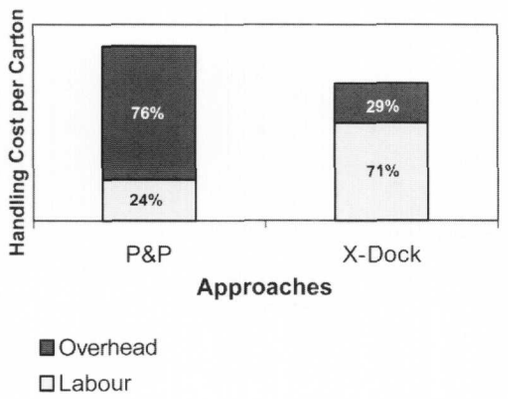
Figure 2 Handling cost per carton for pick-and-pack and cross-docking

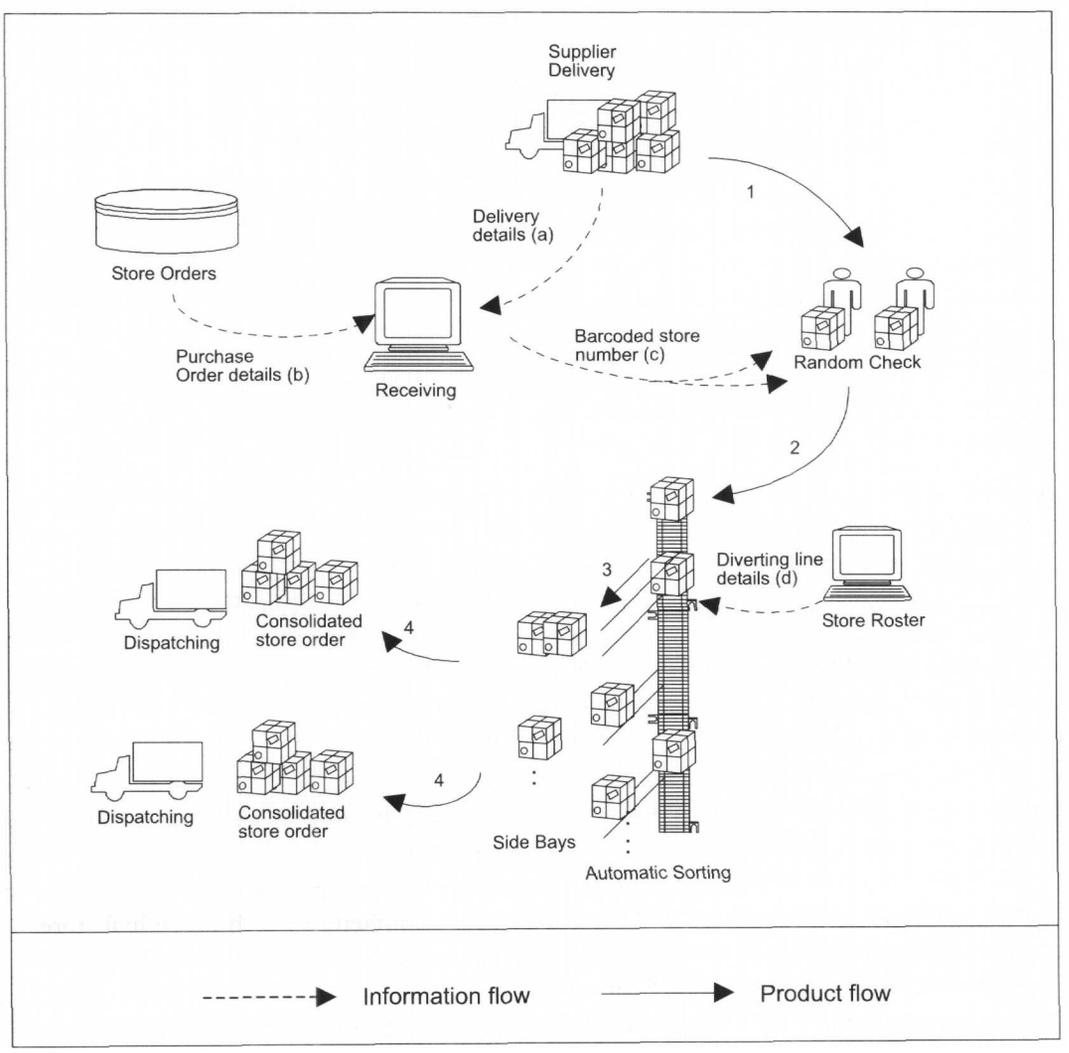


according to a roster. The lead-time for products replenished, using the cross-docking operation, is four days. This lead-time is to be reduced to two days through a better informational coordination between the retailer and its suppliers.

Receiving

In the cross-docking operation, all deliveries come through one receiving area from approximately 330 suppliers, of which 30 are seasonal and 300 daily. Each pallet delivered has 80 to 90 store orders, which are packed in cartons. One carton is for one store and it may contain multiple items. Delivery dockets (arrow a in Figure 3) are checked against a computer printed store purchase order, available from the company's internal network (arrow b). At the moment, 25 per cent of suppliers have the ability to produce bar-coded labels for the carton, indicating the destination store. Upon receiving cartons from non-bar-code compliant suppliers, proprietary bar-code labels are created at this distribution centre, to indicate the store location (arrow c). Random manual checks are still performed on 10 per cent of a particular supplier's deliveries, to ensure that the supplier meets the actual orders (arrow 1).

Figure 3 Summary of cross-docking operation



Bar-coding for non-compliant suppliers and inspection of goods is the most labour intensive part of the operation.

Sorting and dispatching

After each carton has been bar-coded to indicate the store number and randomly checked, it is sorted according to its destinations using a re-configurable automatic sorting line. Each carton is loaded onto a conveyor belt (arrow 2) along which a scanner reads the bar-code on the carton and diverts it to the assigned side bay (arrow 3). The assignment of side-bays to stores is determined from the store delivery roster displayed on a computer (arrow d). Only a limited number of stores can be handled per day using the current sortation function at the distribution centre and, therefore, the stores must be put on a four-day roster, thus limiting the applicability of cross-docking for slow-moving merchandise lines. At the end of the line, all cartons with the same destination are consolidated into one pallet, shrink-wrapped for security during the trip, and loaded into a container (arrow 4). One container is allocated for each state.

Case analysis and discussion

Pick-and-pack operation

The above description of the pick-and-pack approach indicates that, since suppliers impose a minimum acceptable re-order quantity for the items they supply, this operation deals with infrequent, large deliveries from suppliers. In addition, the existence of buffer stock, with an average holding stock of 12 days, leads to a need for an IT infrastructure and sophisticated warehouse management systems to manage the entire operation.

The consequences of having such an operation differ for manufacturers, distributors and retailers. For manufacturers, the pick-and-pack approach involves low electronic commerce infrastructure requirements for information sharing, since there is no critical timing between the incoming and outgoing goods. Buffer stocks at the distribution centre are used as a substitute for informational coordination of manufacturer and retailer activity. In addition, this operation allows manufacturers to have high production efficiency through shipping large orders. The drawback for manufacturers is that there is no visibility of individual store demand patterns, because amalgamated orders are placed by distribution centres or distributors, without specifying individual store requirements. As a result, manufacturers have no access to the information required for advertising and target marketing.

For distributors, this operation involves high costs: it is labour intensive and inefficient. There is multiple double handling of goods, from receiving and storing to dispatching, as shown in Figure 1. It also requires high investment in sophisticated IT infrastructure due to the need to manage the large buffer stock within the constraint of finite capacity. Problems with space may arise due to inaccurate forecasting for seasonality, which may lead to high inventory levels, threatening to overload the capacity of the warehouse.

For retailers, this operation is highly reliable. Since the replenishment of goods can almost be guaranteed by the existence of a buffer stock at the distribution centre, the problem of being out of stock on the shelves can be avoided. The inefficiency of this operation at the distribution centre or distributor side, however, causes retailers to pay a high cost for product replenishment. In addition, having buffer stock at the distribution centre reduces the shelf life of perishable products.

Cross-docking operation

Table I summarises the differences between pick-and-pack and cross-docking operations identified from the case study. Unlike pick-and-pack, the cross-docking operation is characterised by small, frequent deliveries from suppliers and to individual stores. With this approach, manufacturers have the visibility of the individual store requirements. The need for buffer stock at the distribution centre is eliminated by the high degree of informational coordination between manufacturer deliveries and retailer requirements. The fundamental emphasis of this operation is on the sortation of store orders at the distribution centre which requires only modest levels of technology investment and thus eliminates the need for sophisticated IT infrastructure. It is more dependent on EC compliance of trading partners, as well as partnership and trust. The

Table I Summary of the differences between pick-and-pack and cross-docking

	Pick-and-pack	Cross-docking
Suppliers' delivery size	Large	Small
Buffer stock level	High	Nil
Systems requirement at distribution centre	Sophisticated	Simple
Role of distribution centre	As a warehouse	As a sorting centre
Efficiency of operation	Low	High
Efficiency per square feet	Low	High
Overhead costs	High	Low
Store demand transparency for suppliers	Low	High
Suppliers' reliability requirement	Medium	High
Suppliers' electronic commerce requirement	Low	High
Trust and partnership requirement	Low	High

efficiency of this operation is high since there is no double handling of goods.

The consequences of cross-docking for the various supply chain parties are as follows. Cross-docking allows manufacturers to have high visibility of individual store demands, since they get the individual store requirement specifications from retailers. This allows them to have more stable production planning, lower inventory level, reduced damage and to perform more efficient promotion in each retail store. Dealing with individual store orders, however, may cause extra costs for manufacturers due reducing the quantity of batch production. In addition, implementing cross-docking requires manufacturers to have electronic commerce infrastructure to enable information sharing with distributor and retailer, allowing accurate replenishment to be done in a timely manner. Manufacturers need to be capable of receiving purchase orders in EDI format and producing advance shipping notices (ASN) based on purchase orders received to ensure data integrity. Data integrity is very important in cross-docking due to the fast pace of the operation. Any mistake in supplier deliveries may result in out-of-stock situation at the store level. Moreover, manufacturers need to be able to produce a bar coded serial shipping container code (SSCC) to identify shipments, which is essential for an optimal use of ASN. Furthermore, manufacturers need to possess more complex order processing infrastructure to deal efficiently with small individual store orders. Finally, manufacturers need to forgo the traditional economies of scale, which may lead to higher labour and transportation costs due to smaller and more frequent deliveries and introduce the need for more specialising packing which is directly usable by retailers (stores). Thus, manufacturers appear to gain little benefits from cross-docking implementation while require high implementation costs with a medium risk level.

For distributors, the cross-docking operation is very efficient, since it does not require a large distribution centre area, complex computer systems, and reduces non-value added handling activities. Thus, it involves low overhead costs in handling cartons, low IT infrastructure requirements and reduced risk of overloading warehouse capacity. The current cross-docking total cost per carton is 21 per cent less than the pick-and-pack cost. According to the National Distribution Centre manager of the participant retailer, this cost could be further increased to a 49 per cent differential if suppliers were fully bar-code compliant. If the average volume of 775,000 cartons per week handled by pick-and-pack operation were to be handled by cross-docking operation, there would be significant cost savings that can be obtained.

Other cost savings can be attained from reduced damaged products as a result of reduced double handling and reduced expired products since warehousing is eliminated. In addition, with 100 per cent compliance to ASN using SSCCs and scan-packing by suppliers, random checking would be simplified and thus costs could be further reduced. Random checking could be practically eliminated with increased trust between the distribution centre and supplier. Cross-docking, therefore, offers many benefits to distributors and requires minimal implementation costs and negligible risks.

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For retailers, since products are not stored in the warehouse, stocks have a longer shelf life and better quality. They experience lower logistics costs as a result of higher efficiency operation at the distribution centre, which, in turn, allows them to offer lower prices to consumers. Lower logistics costs, however, can be obtained only if cost savings obtained by the distributor or distribution centre are passed on to the retailer (individual stores) through reduced service charges for delivering products to the stores.

Satisfactory distribution of cost savings may require complex negotiations between trading partners. In the present case, this kind of redistribution is relatively easy to negotiate because the distributor and retailer have corporate links. A more effective cross-docking implementation may require retailers to have a new IT infrastructure to automate the replenishment process, through the implementation of computer-aided ordering and EDI for sending purchase orders. The risk of cross-docking for retailers is that if manufacturers fail to deliver on time, stock-outs may occur. Thus, for retailers, cross-docking appear to offer medium benefits, requires medium costs, but involves high risks. The distribution of benefit, cost and risk of implementing cross-docking for manufacturer, distributor and retailer relative to each other as discussed above, is summarised in Table II. It should be noted that we were not in a position to quantify the additional costs and benefits incurred at the manufacturer's and the retailer's side.

Towards achieving mutual distribution of benefits, costs and risks

The above analysis demonstrates that cross-docking implementation inherently gives rise to an imbalance in distribution of costs, benefits and risks among the participants of a supply chain. Manufacturers, in particular, appear to receive the least benefits and incur the greatest costs in implementing cross-docking within a supply chain. As argued earlier, cross-docking requires cooperation and trust between trading partners and these are unlikely to happen unless costs and risks are shared and benefits are mutual. Thus, unless every party experiences mutual benefit, cost and risk, it is less likely that cross-docking will replace the traditional pick-and-pack operation. The savings obtained by distributor and retailer cannot be passed on to the consumer, if high costs are incurred at the manufacturer's side. This inherent problem of mutuality is likely to arise in implementing other elements of ECR and inter-organisational systems in general.

Table II The distribution of benefits, costs and risks

	Manufacturers	Distributors	Retailers
Benefits	Low	High	Medium
Costs	High	Low	Medium
Risks	Medium	Low	High

As part of the effort to ensure equal distribution of benefits, costs and risks of implementing ECR, the participant manufacturer is conducting an ABC study, to examine the potential changes to the cost structure of the company which would result from the implementation of elements of ECR. The company is seeking high cost transparency, allowing them to be well prepared in re-negotiation of trading terms with the customers (retailers), as more retailers are shifting towards continuous replenishment, with different methods of distribution operations as introduced by ECR. With greater understanding of the cost structure, the company will be able to make better decisions in negotiating trading terms with retailers, to ensure that costs, benefits and risks will be mutually shared.

This is further revealed in the following interview excerpt:

> There has been a power shift between retailers and manufacturers in the last decade. Retailers are now in a better position compared to manufacturers. With the position they have, they know they are winning, and therefore, are not particularly interested in conducting ABC study (Business Analyst).

Given that there has been this power shift and that manufacturers appear to be the potential losers in ECR program as demonstrated in this case study, it will be difficult for manufacturers to re-negotiate trading terms with retailers to ensure mutual sharing of costs, benefits and risks. Manufacturers therefore need concrete evidence to support them in trading term re-negotiation. One approach in obtaining the evidence is by understanding the actual impact of ECR program on the current cost structure through ABC studies. Therefore, the manufacturing company involved in this case study is actively engaged in an ABC study as a key driver of their ECR projects.

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From this case study, we can see that complex business modeling and negotiations are required to ensure equal distribution of costs, benefits and risks of ECR. The ABC project, as an action taken by the manufacturer in this case study to enable effective re-negotiation of trading terms, however, can only provide a partial solution to the mutuality problem, since this company has access to data for part of the total supply chain only. This type of study of the cost structure needs to be extended beyond individual company's boundary, to provide a global solution to the problem of mutuality. This means that other parties within the supply chain (distributor and retailer) need to cooperate in conducting ABC studies and work together to ensure equal distribution of costs, benefits and risks of ECR. Other independent, external bodies within the industry such as trade associations and standard bodies may also be required to assist companies in achieving the mutuality.

Conclusions and future research

The case study demonstrates how efficiencies can be improved and cost savings can be gained from the implementation of cross-docking, as one of the initiatives proposed by the ECR. Ideally, all participants of the supply chain will gain benefits from cross-docking. Manufacturers/suppliers, for instance, will get more transparent individual store demands, and hence, they will have more stable and flexible production, less inventory level, and better planning for promotion and production. For distributors, it will:

- lower the operation costs of replenishment;
- reduce warehouse space requirements;
- reduce the inventory level;
- leading to reduced handling and damage; and
- increase the efficiency of distribution centre per square feet.

With reduced operating costs at the distributor side, stores will enjoy lower costs and hence are able to minimise the price inflation of grocery products charged to the consumer leading to higher sales, better quality (less damage) products, and longer shelf life.

However, the study further reveals that the benefits, costs and risks involved in implementing cross-docking are not equally distributed among the players, which leads to complex negotiations between trading partners in adopting ECR. While manufacturers experience some benefits from cross-docking, higher costs and risks will be incurred as they need to deal with individual store orders, rather than large, consolidated orders from retailers' distribution centres. These increased costs are inherent to the cross-docking approach which requires the use of smaller orders and electronic communication among participants to achieve its efficiencies. These additional costs and risks need to be shared among the participants of the supply chain, so that the mutuality of benefits obtained from cross-docking can be realised by all parties. However, since there has been a power shift between manufacturers and retailers, manufacturers need to look for concrete evidence to re-negotiate better trading terms with their customers, to ensure mutual sharing of benefits, costs and risks of getting involved in ECR. Therefore, manufacturers are more proactive in conducting ABC studies. Global solutions, however, requires the scope of the ABC studies to be extended to the entire supply chain which requires the involvement of distributors and retailers to conduct similar studies or assistance from external bodies in re-distributing costs, benefits and risks of ECR.

This study suggests a proposition, which requires further theoretical analysis and empirical testing, that the very approach of EC enabled inter-organisational systems, such as cross-docking and other components of ECR, creates a barrier to their implementation. By emphasising the use of electronic communication between parties and the use of smaller, more frequent replenishment quantities in order to increase efficiency and control uncertainty through the coordination of activities across organisational boundaries, these systems necessitate a re-negotiation of product cost/price arrangements between parties if the distribution benefits, costs and risks is to be acceptable to all parties. This means that the supply chain wide coordinated activity envisioned in these inter-organisational systems cannot be reached simply by individual self-interested activity on the part

of participants but rather requires them to engage in a form of explicitly negotiated activity involving trust and cooperation which is not particularly easy to firms coming from a *laissez-faire*, free-market, competitive environment. The difficulty in adopting this new *modus operandi*, even where a common goal is agreed among parties, can be a major barrier to the adoption of ECR.

By studying specific elements of ECR within one supply chain, the results of this study provide a more in-depth understanding of how ECR can improve the business procedures of the Australian grocery industry and the complexity involved in its adoption. This study thus enriches previous studies in assessing ECR benefits which mostly focused on individual organisations as the unit of analysis (Krum, 1994; Mathews, 1996; Ross, 1996; Reese, 1997) and in particular, explains the observations of our previous survey study (Kurnia and Johnston, 2001), that Australian retailers are more advanced than manufacturers in adoption of supply chain reforms, while manufacturers have been more proactive in conducting ABC studies. This study also suggests that more empirical and theoretical attention should be given to the question of how an industry as a whole can achieve mutuality of benefits, costs and risks among the participants in ECR. Thus, a further study to assess the mutuality issue at the industry-wide level would be required to complement this study that only focused on a single triadic relationship (Kurnia and Johnston, 2000). Such a study would be also useful in examining the influence of trade associations and standard bodies that could help manufacturers, distributors and retailers within the industry share costs, benefits and risks and assist them in negotiations.

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