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**ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS**

**DEPARTMENT OF INFORMATICS**

**MASTERS PROGRAMME IN INFORMATION SYSTEMS**

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**“Exploring Information System’s Potential  
in the ECR Context:  
Developing CMFacts for P&G Europe”**

**MSc Dissertation**

**Katherine Pramataris**

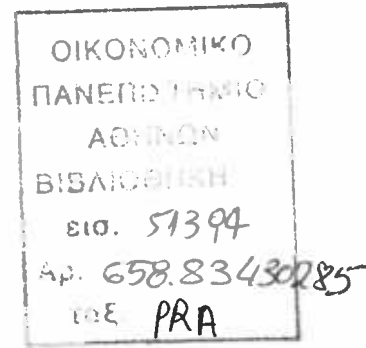
**Supervisor: Prof. G.I. Doukidis**

**SEPTEMBER 1996**



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ΚΑΤΑΛΟΓΟΣ





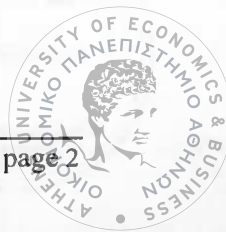
## ***Acknowledgement***

*For the conduction of this project I worked, in the form of an internship, in the Management Systems, Procter & Gamble European Technical Centre, Brussels, as a member of the ECR Category Management Group, for a period of four months, from March to June, 1996. I would like to express my acknowledgements to all the people of the company that helped me both in getting this position and during my work there. Special acknowledgements correspond to the people of the ECR Group, including the Group's Manager and my supervisor in Procter & Gamble, Mr Didier Rossi. I would also like to express my gratitude to my supervisor in the University, Prof. Georgio Doukidi, for his support and guidance during the whole of the project's period.*

*Katherine Pramataris*



ΣΗΜΕΙΩΣΗ: Από την εργασία έχει αφαιρεθεί  
εμπιστευτικό υλικό που αφορούσε το  
συγκεκριμένο Case Study.



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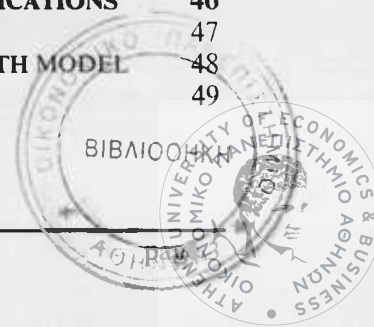
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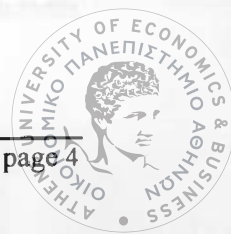
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# Chapter 1 - Introduction

*This chapter gives an initial overview of the problem area and the work conducted under the current study. Initially, the ECR (Efficient Consumer Response) strategy, which forms the contextual framework of the study, is defined. ECR is a grocery industry strategy that focuses on co-operation across the value chain, on one hand, and the efficient use of new technologies, on the other, in order to deliver better value to the grocery consumer. On this basis, the purpose of this project is presented, which includes a theoretical research effort, positioning ECR within the Information Systems research field, and the presentation of an innovative information systems application, developed within the ECR context. The case field of this development is then presented in more detail, followed by a discussion on the overall structure of the report.*

## 1.1. The concept of ECR

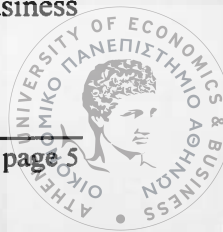
Efficient Consumer Response (ECR), a term which first made its appearance in the 1992 yearly conference of the Food Marketing Institute (FMI) in USA, is defined as 'a grocery industry strategy in which retailers, distributors and suppliers work closely together in order to deliver better value to the grocery consumer' (Kurt Salmon Associates, 1993).

ECR focuses on the efficiency of the total supply system rather than the efficiency of individual components and aims at reducing total system costs, inventories and physical assets. Emphasis is placed on the application of modern management methods and available technologies in order to achieve a responsive, consumer-driven system, in which customer satisfaction is maximised, costs are minimised, while accurate information and high-quality products flow through a paper-less system between manufacturing line and check-out counter.

ECR is not a system, but a collection of proven methods and tools applied to product categories in an integrated manner across the entire value chain. Rather than a destination, ECR is a journey of continuous improvement, as individual companies progressively implement new ECR capabilities and apply them in co-operation with an increasing number of their trading partners. It is a 'strategic initiative' intending to overcome traditional barriers between trading partners and eliminating internal barriers between functions that result in costs and time but add little or no value to consumers (Coopers & Lybrand, 1996a).

The above principles bear high resemblance to the Quick Response (QR) concept, which was introduced in the mid-80's as a strategy to improve the effectiveness of the supply chain in general merchandise, particularly in soft goods. However, the most fundamental difference between QR (which applies to the apparel industry) and ECR (which mainly refers to the grocery industry) is in the characteristics of the merchandise involved. Beyond obvious physical differences in the products, there are critical differences in the value, velocity and variety that characterise merchandise in each industry (Harding, 1995).

In addition, the term ECR was chosen in order to emphasise the fact that, under this new strategy, the consumer is considered to be in the centre of any activity and decision making process. ECR represents a major paradigm shift, but also reflects a return to earlier business practices using the latest technology.





### 1.1.1. An integrated vision of the supply chain

In the current grocery chain, there is no single co-ordinated replenishment system. Instead, there are three separate systems joined by inventory buffers at the retail store and distributor warehouse. In the typical grocery store, the consumer act of replenishing the household does not directly trigger any replenishment activity. The store replenishment activity is only triggered when the shelf stock (or back-room stock, if any) falls to a predetermined re-order point. This lag can range from a few hours to several weeks, depending on the item movement rate and the level of stock on-hand when the consumer purchase was made. This highlights one of the biggest challenges facing distributors: maintaining an optimum balance between assortment breadth and inventory turnover.

In the same way, the act of filling an order at the retail store does not trigger any replenishment activity at the distributor warehouse. The buyer monitors movement on a weekly or daily basis, focusing particularly on service levels to ensure that predetermined goals are met. When total inventory levels (turn inventory and forward buy inventory) fall to re-order levels, the buyer will decide if he or she should re-order. This decision is rarely a simple one and is mostly influenced by price opportunities than service level and turn.

Demand information available to the supplier through the current replenishment system is therefore highly distorted by many factors having nothing to do with actual consumer demand. The information is of little value for production planning decisions and suppliers have to purchase information about consumer buying from other sources such as POS data purchased from third-parties. To compensate for the lack of quality information on which to base sales forecasts and production plans, suppliers carry high levels of safety stock. This provides an acceptable level of service to their customers, but also incurs high warehousing and inventory carrying costs.

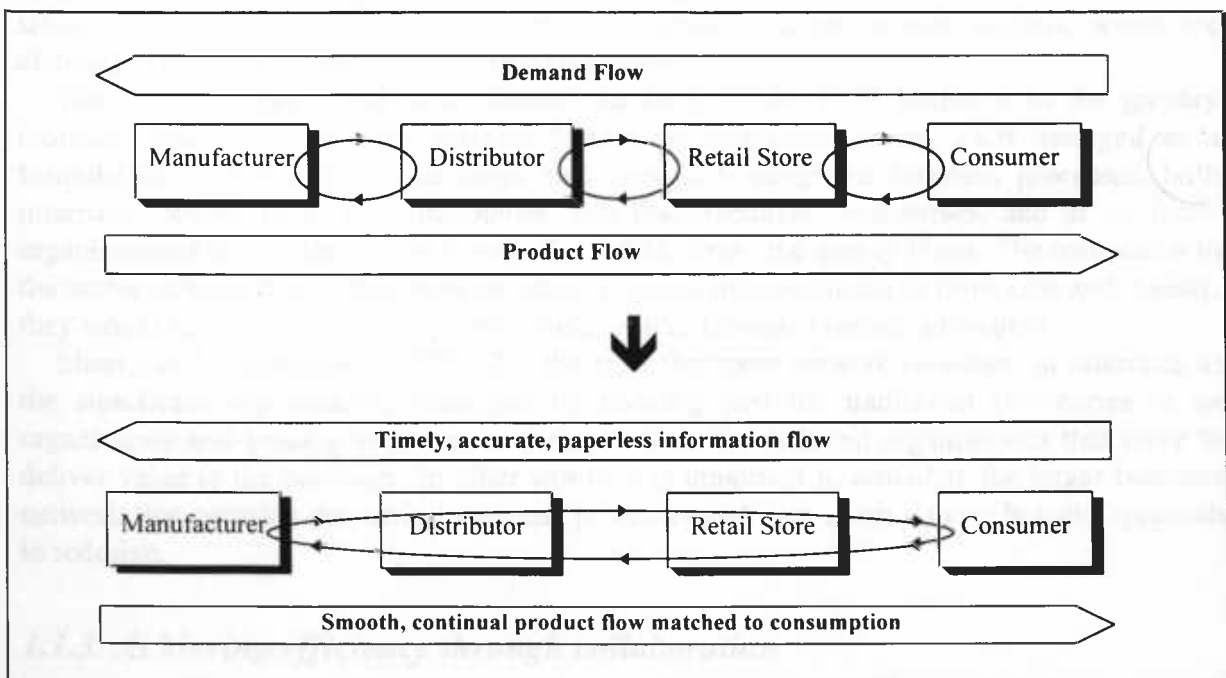


Fig. 1. Linking the Grocery Supply Chain with ECR

The ECR objective is thus a supply chain in which information and product flow quickly and reliably to where they are needed (Figure 1) (Kurt Salmon Associates, 1993). The parties involved in ECR focus on the efficiency of the total grocery supply chain rather than the improvement of the individual parts of it, while questioning every activity and business practice that adds time and cost in the process without creating consumer value. By expediting the quick and accurate flow of information up the supply chain, ECR enables manufacturers, distributors and retailers to anticipate future demand far more accurately than the current system allows. This enables safety stocks to be cut, and allows product movement to be planned without wasting time, while product is stored or staged between packing line and check-out counter.

### ***1.1.2. A sector reengineering initiative***

Taking a closer look into the time frame during which the ECR strategy made its appearance, we could deduct that ECR emerged in parallel or as a consequence of the broader concept of business process redesign or reengineering (BPR). BPR is usually referred to as a way to dramatically improve business performance. More specifically, it may be defined as 'the critical analysis and radical redesign of work flows and business processes in order to achieve dramatic improvements in important measures of performance'. Its distinctive focus is the process, a 'set of logically related tasks performed to achieve a defined business outcome' (Davenport and Short, 1990). With BPR, both physical and informational aspects of processes are considered. In fact, it is argued that information-processing work should be subsumed into the activities which produce the information (Hammer, 1990).

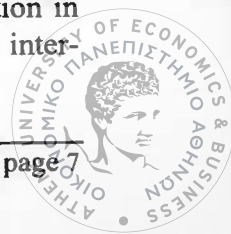
BPR assumes that business performance can increase by doing things differently (radical operational changes) as well as by doing different things (new strategies). With reengineering, the focus typically shifts from production-oriented specialisation to customer-oriented integration. The generic goal is to ensure that organisational resources, such as materials, labour and data, are transformed into product, service and information outputs, which are distinctly valued by internal and external customers.

The above concepts and ideas formed the basis of the ECR initiative in the grocery industry. Matched with other external factors, as mentioned above, ECR emerged as a formulation of the need to transform structures and reengineer business processes, both internally, within retailers', distributors' and manufacturers' enterprises, and at an inter-organisational level (Barrett and Konsynski, 1982), across the supply chain. The companies in the sector realised that if they were to achieve radical improvements in time, cost and quality, they would have to adopt total systems thinking, like Edwards Deming advocated.

Short and Venkatraman (1992) offer the term 'business network redesign' in reference to the significant opportunities attainable by thinking past the traditional boundaries of an organisation and looking to processes defined across the different organisations that serve to deliver value to the customer. In other words, it is important to articulate the larger business network that contains the critical business processes and then adopt a more holistic approach to redesign.

### ***1.1.3. Achieving efficiency through collaboration***

However, ECR is not merely the projection of the BPR paradigm on the retail sector. The transformation of business processes internally is a necessary but not sufficient condition in order to achieve total system efficiency, while the reengineering of processes at an inter-





organisational level is not feasible without the underlying assumption of extensive co-operation among involved parties.

And indeed, it is the approach of mutual acting and collaboration that constitutes an essential element of ECR. Instead of acting as adversaries, ECR proclaims that the various actors have to work closely together to better serve the consumer. Each participant has to conceive his role and position in the total process and co-operate with the rest of the system members, just as the different departments do within the same company, in order to achieve the highest possible levels of process efficiency. Collaboration and trust is a key ingredient in establishing and maintaining successful relationships and inter-organisational information systems, because of the mutual dependency of system participants and the ensuing co-ordination requirements.

ECR implementation is expected to lead to fundamental changes in relationships among different segments within the industry. Models of interaction based on a "win/lose" philosophy will be replaced by a more traditional "win/win" approach based on partnerships and trust. Improved trust and communication will be key factors in determining the acceptance and successful implementation of ECR, since the benefits of ECR won't be realised until there is widespread adoption of the practices by most companies in the industry. This, in turn, requires greater co-operation and communication, which can be built gradually through improvements in relationships between individual companies working on focused projects (Hoban, 1993).

#### ***1.1.4. ECR current status***

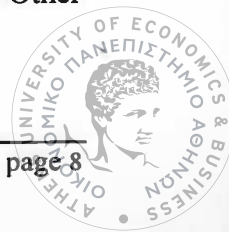
##### **1.1.4.1. Industry adoption of ECR**

In a survey conducted on behalf of the Joint Industry Project on Efficient Consumer Response in USA (Hoban, 1993), it is shown that general awareness of ECR is quite high among industry leaders. Most companies are very aware of ECR and have considerable interest in its implications. Evaluation is underway, but many companies lack the specific data they need for final, full-scale adoption decisions. Most see ECR as an inevitable and important development within the grocery industry and plan to be active participants in the process.

In a European ECR tracking study conducted by Kurt Salmon Associates and presented in the 1st Official Conference of ECR Europe, Geneva, January 1996, it is shown that the overall commitment to the principles of ECR is very high at 95 per cent for retailers and 88 per cent for manufacturers, although in practical terms retailers are well ahead at 43 per cent compared to manufacturers at 25 per cent.

##### **1.4.1.2. Barriers and incentives to ECR implementation**

The greatest incentive for adopting ECR has been the recognition of a long-standing and critical need for ECR, especially in light of increased competition from alternative formats, and consumer demand for greater value. Most envision the potential benefits from ECR (especially improved efficiency and reduced costs). Improved consumer service and greater co-operation among industry segments are also seen as incentives. On the other hand, the most fundamental barriers to successful implementation of ECR are recognised to be the social and cultural factors, especially resistance to change among people in the industry. Other barriers relate to the perceived complexity and overwhelming scope of the ECR system.



In the aforementioned survey in USA (Hoban, 1993), it is demonstrated that different industry segments express varying perceptions about ECR. Manufacturers are the most enthusiastic about ECR, retailers tend to have mixed views about ECR, while wholesalers tend to be the most cautious about it.

Regarding the different attitudes among the interested industry segments, towards what are considered to be the barriers and incentives for adopting ECR, we could observe that:

- The key barriers that have been mentioned by manufacturers include: the investment cost of equipment; the potential loss of competitive advantage; the lack of progress and standardisation among retailers.
- Key incentives for manufacturers are the documented potential for cost savings and the ability to work on more pilot projects with selected retailers and wholesalers.
- Wholesalers tend to be the most cautious group about ECR and would generally like to see the pace of implementation slowed. Elimination of certain practices (such as forward buying and diverting) would remove a major source of revenue for them. Thus the key barriers include: the need to change the training and attitudes of key employees; the potential for loss in revenues; the potential for diminished importance of their function within the industry.
- Some wholesalers see ECR as opportunity to provide new, value-adding services (such as information management services) to independent retailers. Other incentives include: the ability to participate more directly in pilot projects; the chance to see ECR proceed at a more cautious pace, and a systematic attempt to identify and minimise some of the negative impacts that they face.
- Retailers tend to have mixed views on the appropriate pace of ECR implementation and will be more likely to see the process from the consumer point of view. Many retailers tend to see ECR mainly as driven by manufacturers and express concern that the benefits to consumers have not been clearly identified and emphasised. Identified barriers to ECR adoption by retailers are: belief that ECR is not applicable for non-EDLP retailers (i.e. retailers not applying the Every Day Low Pricing strategy); perceptions that information is mainly flowing from the retailer to the manufacturer; and the need to change attitudes and skill levels of employees.
- Some of the key initiatives for ensuring successful implementation of ECR among retailers include: increased focus on the potential of ECR to add value and provide savings for the consumer; targeted assistance efforts, including results from pilots with similar firms; and assurance that flexible adoption of selected practices can occur at an appropriate pace.

#### 1.4.1.3. The establishment of ECR Committees

In Europe, industry leaders both in the retail and manufacturing sectors took the initiative to create the ECR Europe Committee, beginning of 1995, with the aim to increase awareness about ECR and co-ordinate action and pilot project implementation under the ECR umbrella at a European level. Since then, similar committees with national responsibility have been established in almost every European country. These committees are composed of members from both parts of the retail sector, manufacturers and retailers, and aim to achieve balanced implementation of the ECR strategies, on one hand, and to avoid duplication of effort at an



industry level, on the other. More specifically, the issues addressed by the ECR committees include:

- the development and dissemination of implementation guidelines and best practices,
- the definition of industry-wide standards for the sharing of information and the handling of goods,
- the definition of specifications and requirements for the use of common services,
- the identification of cost saving opportunities and cost of change/ investment,
- the agreement on principles of operation and cost/ benefit sharing,
- the conduction of pilot trials between representative partners.

The number of the companies participating in the national ECR committees across Europe, as well as in the ECR Europe committee, combined with the importance of the issues undertaken by these committees allows ECR to be considered as the single most important initiative the grocery industry tackled in the 1990s.

## 1.2. The purpose of this research project

Within ECR, Information Technology (IT) and its use within a specific application context, i.e. Information Systems (IS), seem to play a key role. On one hand, IT is a principal enabler of processes transformations and efficient running of business operations. Although it is not a necessity, its capability to surmount both time and distance constraints contributes significantly to the achievement of total supply chain efficiency.

On the other hand, the possibilities offered by information technology and its power to introduce new business paradigms need to be seriously considered during the business strategic planning, while the employment of modern IT techniques and tools may facilitate the long and short-term decision process itself.

The purpose of this project is to explore the information systems' role and potential in the ECR context. That means to give answer, among others, to the following questions:

1. What are the basic requirements of the various ECR strategies and how do the needs of each party involved interrelate with each other?
2. What kind of information relate to which processes, how is this used and who is the owner of the information in each case?
3. What is the relation between IS growth models and ECR adoption?
4. Where is ECR positioned relatively to inter-organisational information systems?
5. Which are the ECR business applications supported by information systems and which are the specific systems and technologies used?

At this point, it is worth mentioning that ECR has not been examined yet under a research perspective, especially in the area of Information Systems. The above issues have only been addressed, to a limited extent, within the business environment, under a goals-achievement and guidelines-development orientation. One of the main objectives of this project is thus the positioning of ECR within the field of Information Systems and the examination of the above issues from a research standpoint.

A second objective of the project is the presentation of an innovative information systems tool, developed in order to support the category management process within ECR. This tool, called CMFacts, was developed for the Sales Organisation of the Procter & Gamble Europe





multinational company, where the author conducted an internship for a period of four months, from beginning of March, 1996 to end of June, 1996. The experience gained through this development, apart from the usefulness that the tool itself had for the company, contributed to the further enlightenment of the aforementioned research issues.

### 1.3. The Case Field

Procter & Gamble markets a broad range of laundry, cleaning, paper, beauty care, health care, food and beverage products in more than 140 countries around the world, with leading brands including Tide, Ariel, Crest, Pampers, Pantene, Always, Vicks, and Max Factor. Based in Cincinnati, Ohio, USA, Procter & Gamble has operations in 61 countries and employs 99,200 people world wide.

The Europe, Middle East, Africa & General Export Region of Procter & Gamble accounts for one-third of the people being employed at Procter & Gamble and for more than one-third of Procter & Gamble's world wide business. Although this is a large share of the total business, further growth is expected. The company's entry in new markets, in particular Eastern Europe, the Middle East and Africa, offers tremendous opportunities.

Procter & Gamble has built its European business by satisfying consumer needs through the development of superior products tailored for the European market. This strategy and the joint efforts of about 28,500 employees in the European operations make Procter & Gamble one of the leading companies in the European market. In addition to P&G's locations, the company has also several joint ventures in Europe. Across Europe, there are six major Technical Centres for applied research and product development. For perspective, world wide there are 17 P&G Technical Centres.

Management Systems department provides information systems, consulting and operations services to all divisions of the Company. The issues addressed by Management Systems, include the development of new systems meeting the continuously evolving business needs, the management of the company's hardware, software, and network infrastructure as well as the provision of consulting and operating services to all divisions of the company.

CMFacts has been developed within the Management Systems, European Sales and ECR System Design section, in Procter & Gamble European Technical Centre, Strombeek-Bever (Brussels), Belgium. More specifically, the tool has been designed and implemented by the ECR Group, under the above organisation, as a continuation to previous effort in the area of category management.

### 1.4. Overview of the report

This report consists of five chapters, which have the following structure:

1. Chapter one, as it has already been shown, gives an initial overview of the problem area and the work conducted under the current study. Initially, the ECR (Efficient Consumer Response) strategy, which forms the contextual framework of the study, is defined. On this basis, the purpose of this project is presented, which includes a theoretical research effort, positioning ECR within the Information Systems research field, and the presentation of an innovative information systems application, developed within the ECR context. The case field of this development is then presented in more detail.



2. Chapter two deals with further defining the ECR strategy and the informational requirements associated with it. The basic components of this strategy, that is Efficient Assortment, Efficient Replenishment, Efficient Promotion, and Efficient Product Introduction, are described under two main aspects: the first refers to the product replenishment process (supply side), while the second addresses the demand side or what has been called Category Management Process. This description places special emphasis on the informational requirements of the processes and the issues that call for efficient systems solutions.
3. Chapter three tries to position ECR within the Information Systems (IS) research field and explore the potential that the innovative use of information technology and systems may have for the ECR strategy. Initially, ECR is examined under two aspects of Information Systems research. The first deals with the evolutionary role of information systems in the business arena and how this is associated with the ECR principles. More specifically, the growth model defined by Venkatraman (1991), which identifies five levels of maturity regarding the use of IS, is adopted. The second aspect examines the relationship between ECR and the concept of inter-organisational information systems (IOIS). Following a different perspective, the specific ECR business application areas are then discussed and the underlying information technologies are examined. These are conceptually divided into two layers: the core information technologies, including databases, networks, etc., and the software applications, such as EDI, E-mail, Decision Support Systems, etc. The theoretical findings of the above approaches are finally summarised into a conceptual framework, offering a holistic view.
4. Chapter four deals with the presentation of CMFacts. CMFacts is a tool that has been developed as part of the current project, in order to support the Category Management process within the ECR strategy. The development of the tool took place in the European Technical Centre of the Procter&Gamble (P&G) multinational company, as part of the company's overall strategy regarding ECR. In this chapter, CMFacts is initially positioned within the Category Management process of P&G and its basic characteristics, associated with relevant user requirements, are discussed. The tool's higher level architecture, interface design and organisation are then described in more detail. Finally, the position of CMFacts within the previously discussed Information Systems framework is examined.
5. Finally, chapter five provides some concluding remarks regarding the contribution both of CMFacts and of the proposed Information Systems framework. CMFacts is assessed in comparison to the possibilities offered by related products available in the market and in terms of its acceptance by the users community. CMFacts development is also used as a first basis for evaluating the proposed Information Systems framework. Practical and theoretical issues, linked to both topics, are finally suggested for further research.





## Chapter 2 - ECR Information Needs

*Chapter two deals with further defining the ECR strategy and the informational requirements associated with it. The basic components of this strategy, that is Efficient Assortment, Efficient Replenishment, Efficient Promotion, and Efficient Product Introduction, are described under two main aspects: the first refers to the product replenishment process (supply side), while the second addresses the demand side or what has been called Category Management Process. This description places special emphasis on the informational requirements of the processes and the issues that call for efficient systems solutions.*

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### 2.1. Introduction

#### 2.1.1. The ECR Strategies

ECR information needs stem from four core-processes, which cover the whole scope of operations in the retail sector. For each of these processes, an ECR strategy has been defined as shown in Figure 2 (Kurt Salmon As., 1993):

1. *Efficient Store Assortment* addresses the optimum use of store and shelf space, the critical interface between the supply chain and the consumer. The objective is to determine the performance and role of each product within each category as well as the performance of a category as a whole and make the right decisions regarding store and shelf space allocation. Adopting an effective category management process supported by category/space management systems will significantly improve sales per square foot and the utilisation of non-selling space.
2. *Efficient Replenishment* links the consumer, retail store, distributor and supplier into a synchronised system with the aim to match the flow of products throughout the system to consumer actual demand. Accurate information flows quickly through electronic linkages between trading partners, while product flows with less handling and fewer interruptions from the supplier's packing line to the consumer basket.
3. *Efficient Promotion* refocuses supplier's promotion activities away from selling-in to the distributor and towards selling-through to the consumer. The flow of products is matched to consumer actual demand, yielding substantial improvements in manufacturing, warehousing and transportation efficiencies and with much less inventory in the system.
4. *Efficient Product Introduction* addresses the processes of developing and introducing new products that match consumer needs and requirements at a low cost. This area requires a deep insight into consumer demographics and hierarchy of needs.



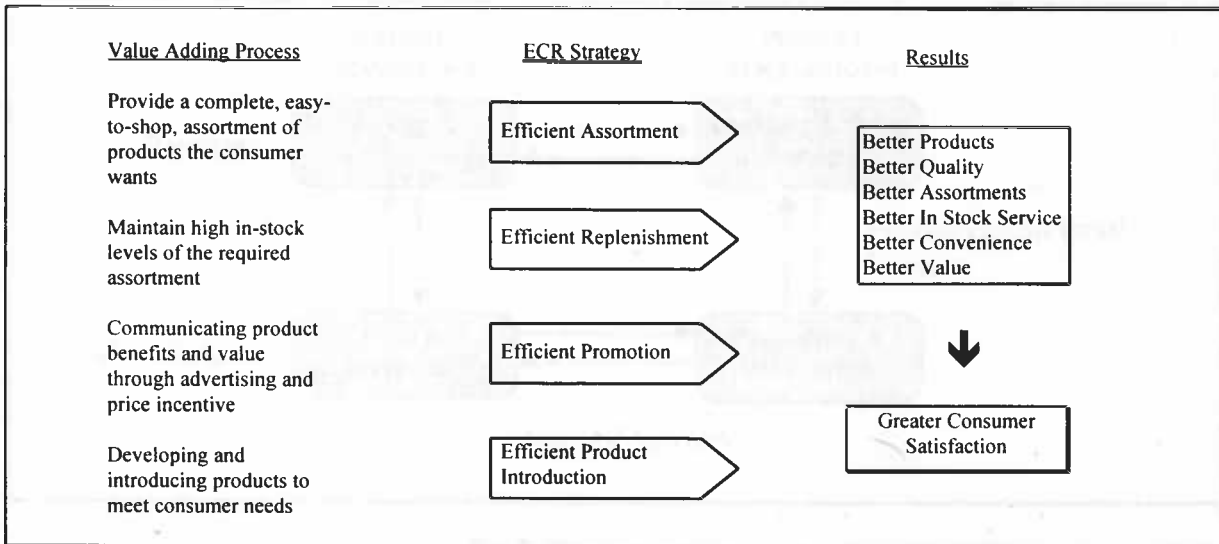


Fig. 2. Core Value-Adding Processes and ECR Strategies

### 2.1.2. ECR Focus Areas: Category Management and Product Replenishment

The strategies of Efficient Assortment, Efficient Promotion and Efficient Product Introduction lay under the umbrella of what we call Category Management. These strategies are all based on the conduction of several analyses, in the area of sales and marketing, through which the desired conclusions regarding assortment, promotions and product introductions can be drawn. Data relating to different measures, usually referring to the purchasing of goods per different store and retailer and according to consumer habits and criteria, are used as input to the analyses. The output of most of the analyses is an indication of the performance of a specific product, a product category, a specific store or retailer etc.

In order for Category Management to be effective, co-operation at an inter-organisational level, between manufacturer and retailer is necessary. Each partner occupies a different position in the process and can thus contribute with a different way: the retailer is closer to the consumer and can better perceive consumer needs and habits, while the manufacturer has a better knowledge of product properties and the degree to which these satisfy consumer needs. Internally, co-ordination between production and sales, within the manufacturers' organisations, and between merchandising and logistics, within the retailers' organisations, is also required.

The Efficient Replenishment strategy pertains to the area of production and logistics, addressing all the issues involved in the product movement from the manufacturer's line to the retailer's check-out counter. The aim is to achieve maximum efficiency in the total value chain and to best match production to consumer demand. Such an achievement presupposes the co-operation of all the actors in the supply chain (manufacturer, distributor, retailer) as well the co-operation and aligned action of all the departments within a company.

The above are visually summarised in Figure 3 below. ECR suggests the elimination of barriers both internally within a company and externally, at an inter-organisational level (Coopers & Lybrand, 1996a). That means that ECR suggests a change in the attitude of everyone towards a more co-operative approach, both within the different departments in a company and among the actors at different levels in the supply chain (e.g. between retailer, distributor and supplier).

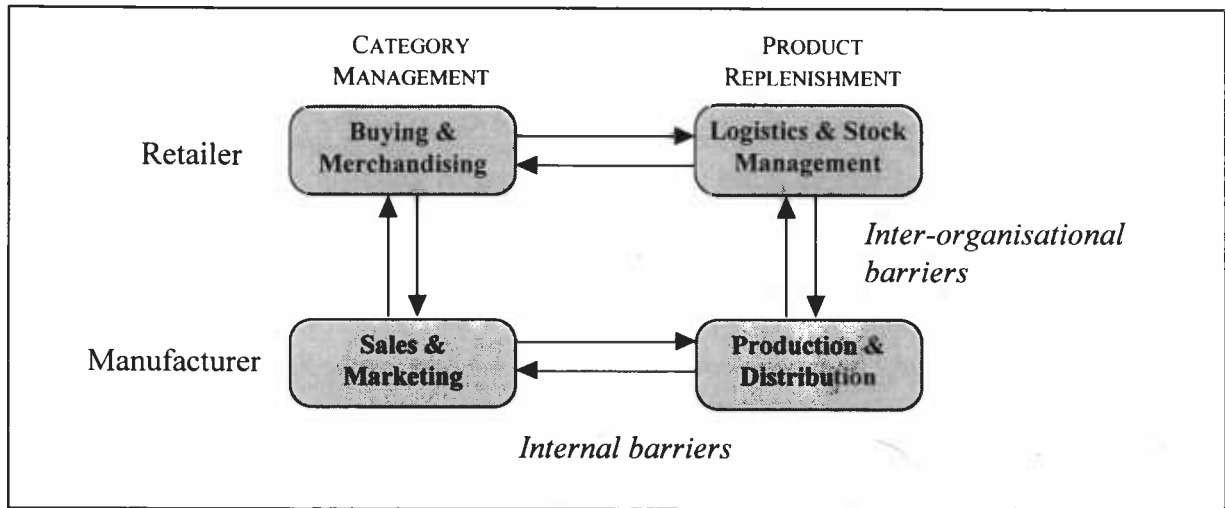


Fig. 3. Elimination of barriers

While Product Replenishment addresses the physical flow of products, Category Management is focused on the planning and communication of the variations in consumer demand that will influence the mix and volume of products flowing through each stage of the supply chain, and the efficiency of the overall replenishment process. In the following sections, a more detailed examination of the information needs of both the category management and the product replenishment process is attempted, making a distinction between manufacturer and retailer where necessary. The owners and the flow of the required information in each case are also discussed.

## 2.2. Category Management

### 2.2.1. Definition

Category Management (CM) is a term which has evolved to describe a variety of concepts (Category Management Report, 1995):

- the management of groups of complementary and interrelated products (i.e. the management of a product category), as opposed to the management of brands in isolation, supported by policies and practices designed to add value to the total category output;
- the restructuring of retailers' and distributors' organisations under the aspect of the category management process, including the merging of buying and merchandising departments into category management teams charged with integrating business plans internally and with supplier;
- the interactive business process between retailers and manufacturers of co-creation and management of consumer-focused category plans.

However, the official definition which has been adopted by the ECR Europe Committee states that 'Category Management is a *distributor/supplier* process of managing categories as *strategic* business units, producing enhanced business results by focusing on delivering *consumer value*' (Joint Industry (FMI) Report, 1994).

Included in the above definitions are all of the activities associated with understanding consumer needs, influencing consumer demands, and ensuring that the right products are in the right place at the right time and at a price that is acceptable to consumers.

Category management is not entirely new to the grocery industry. In the past, however, it has had a tactical buyer-to-seller focus. Until recently, category management evolved slowly in importance for the entire industry. This pace is changing significantly, as competitive pressure, technological innovation and better communications combine to demonstrate the business potential for category management (Category Management Report, 1995).

As has been already mentioned, Category Management addresses effectiveness and efficiency of three critical processes: New Product Introductions, Product Promotions and Management of the Assortment (Coopers & Lybrand, 1996b):

- Efficiency considerations focus on understanding and implementing a set of integrated processes that respond rapidly to shifting consumer needs, and at a cost that is consistent with the value added to these consumers.
- Effectiveness considerations define consumer and business expectations associated with product assortments, promotions and introductions, and ensures that actual results are meeting these expectation.

#### **2.2.1.1. Optimise Introductions**

Within the process of new product introductions, category management considers two very different but related issues. On one hand, efforts are focused on understanding the criteria used by all trading partners and consumers that drive the success or failure of new introductions. These criteria are then used to screen new product ideas early in the development process. At the same time, much effort is being spent to eliminate complexity and dramatically reduce the time and costs associated with new product introductions.

While companies can gain many benefits from internally focused efforts, the greatest benefits will come when trading partners work together to pursue these opportunities. However, given the current relationship between many trading partners, this will not happen easily or soon.

#### **2.2.1.2. Optimise Promotions**

The second process addressed by category management is that of promotions, including all activities and results associated with advertisement campaigns as well as consumer promotions and trade deals. Beyond improving the efficiency of the promotion management processes, ECR efforts are typically focused on increasing the effectiveness of all promotion events. This is particularly true for advertisement and consumer promotions, where poorly conceived or executed events can result in excessive costs and confused consumers. For trade deals, two issues are most often being addressed. First, reduction of the complexity of deal structures dramatically reduces administration costs. Second, decoupling of the replenishment process from financial paperwork eliminates many of the artificial 'spikes' that drive production and distribution costs (Coopers & Lybrand, 1996b).

#### **2.2.1.3. Optimise Assortments**

Work here typically begins with defining the role of a given assortment in meeting the specific strategic targets for the category and assessing how well the current and planned mix



of products fulfil these expectations. Often these efforts result in decisions to withdraw poorly performing products, or rather products not meeting actual consumer needs, and adding products that are more consistent with these needs. Introduction and promotion guidelines are then issued to facilitate this transition. Once the strategic assortment issues are understood, attention typically shifts to shelf space mix and layout. However, it is important to note that these efforts often need to address multiple product categories when considering “traffic builders” and co-marketed products. Additionally, successful assortment optimisation efforts often require the free flow of critical information between trading partners.

#### 2.2.1.4. Joint Category Management

Beyond the Category Management capabilities of individual companies, ECR promotes the joint efforts between retailers and manufacturers to draw upon the strengths of both trading partners and focus their combined capabilities on better serving consumers at lower costs.

It is important to note that joint category management does not replace traditional branded consumer marketing, retailer marketing or buyer-selling activities. Rather, it complements these activities, reduces inefficiencies and increases effectiveness by avoiding redundant, improperly focused and often counter productive efforts (Figure 4).

On the other hand, it would be wrong to view joint category management as just an add-on to current marketing and sales activities, but as something that requires fundamental changes in the way trading partners work together (Coopers & Lybrand, 1996b):

- Successful joint efforts always reflect a shared understanding of the business needs of both trading partners, as well as consumer expectations;
- Current brand and retailer marketing efforts will be impacted by moving towards more co-marketing activities;
- Information must be shared between trading partners in an environment where each has earned the right to become a trusted partner.

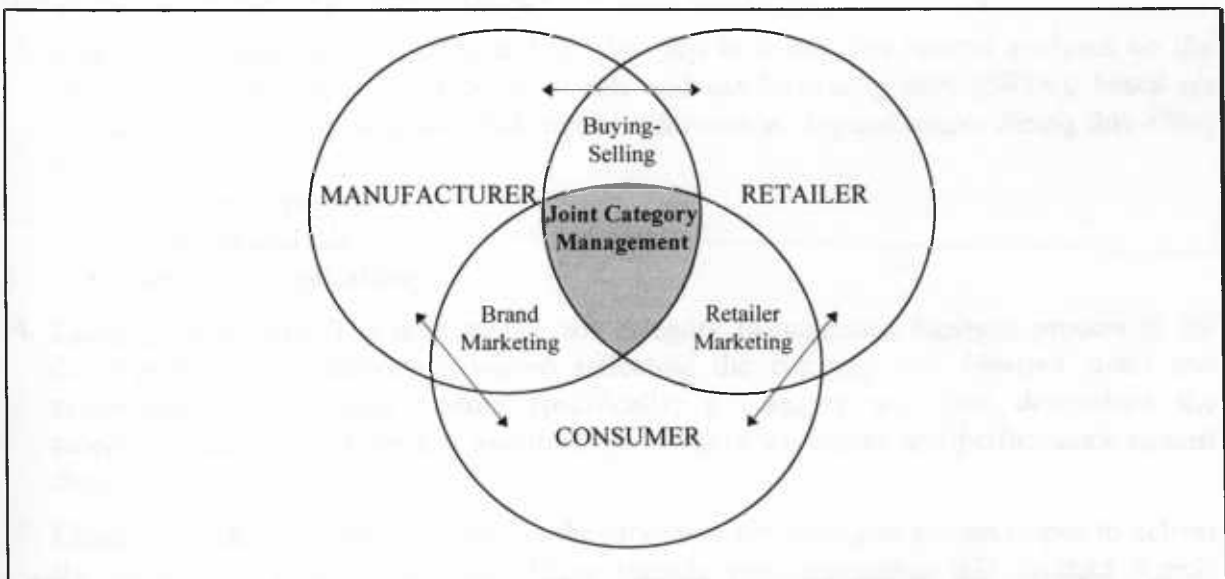


Fig. 4. Joint Category Management



### 2.2.2. The Category Management process

The category management business process is a structured, measured set of activities designed to produce a specific result: development and implementation of a category business plan. The steps followed during this process have been defined as following (Category Management Report, 1995):

1. Category Definition: The purpose of this activity is to determine the products that make up the category and its segmentation. The category definition is usually completed by the retailer with the contribution of the products' manufacturers. The manufacturer's category expertise and consumer knowledge can play a key role in developing the appropriate definition and structure of the category. Category structure is the identification of the category's key sub-categories, segments and sub-segments. This segmentation is usually based on different product characteristics, as perceived by the consumer.
2. Category Role: This step refers to the priority and importance of different categories in a retailer's overall business and the resource allocation that will reflect these choices. Possible roles that can be assigned to product categories include:
  - *Destination*: to be the primary category provider and help define the retailer as the store of choice by delivering consistent, superior target consumer value.
  - *Routine*: to be one of the preferred category providers and help develop the retailer as the store of choice by delivering consistent, competitive target consumer value.
  - *Occasional/Seasonal*: to be a major category provider and help reinforce the retailer as the store of choice by delivering frequent, competitive target consumer value.
  - *Convenience*: to be a category provider and help reinforce the retailer as the store of choice for delivering good target consumer value.

Important factors that are taken into account during the assignment of category roles include: the retailer's *target consumer*; the importance of the category to the retailer; the importance of the category to the competitors; and the outlook of the category within the retailer's marketplace. These issues are clarified by conducting a cross-category analysis, revealing the category's position relative to the other categories.
3. Category Assessment: The main task of this step is to conduct several analyses on the category's sub-categories, segments, brands and stock-keeping-units (SKUs), based on consumer, retailer, manufacturer and market information. Typical stages during this effort include:
  - Information acquisition
  - Information analysis
  - Conclusions/ implications
4. Category Scorecard: The next step in the category management business process is the development of a category scorecard reflecting the category role (desired state) and assessment (current state). More specifically, a category scorecard determines the category's target objectives and monitors the category's progress and performance against these objectives.
5. Category Strategies: This is the step in the process when strategies are developed to deliver the category role and scorecard. These include both marketing and product supply (procurement and distribution) strategies which address how an individual company plans to purchase, distribute, market and service the category. Table 1 highlights some of the



product characteristics within a category that are suitable for achieving certain marketing strategies.

Category Strategies	Product Characteristics
Traffic Building	high share, frequently purchased, high percentage of sales
Transaction Building	higher ring-up, impulse purchase
Profit Contribution	higher gross margin, higher turns
Cash Generating	higher turns, frequently purchased
Excitement Creating	impulse, lifestyle-oriented, seasonal
Image Creating	frequently purchased, highly promoted, unique terms, seasonal
Turf Defending	used by retailer/manufacturer to draw traditional customer base

Table 1: Category Strategies

6. **Category Tactics:** Category tactics, i.e., the specific actions that should be taken in order to achieve the chosen category strategies, are usually developed in the following five areas:
  - *Assortment tactics* define the product variety offered to consumers as well as the criteria for carrying and deleting the category's SKUs.
  - *Pricing tactics* define the criteria used for setting the retail prices for the category, sub-categories, segments and SKUs, based on an understanding of consumer and competitive behaviour.
  - *Promotion tactics* define the criteria used for promoting various components of the category to the consumer, including choices regarding the type of promotion, the items to be promoted, the frequency, timing and duration of the promotion, the location of the promotion as well as cross-merchandising and tie-in promotions.
  - *Shelf presentation tactics* determine the criteria used for managing category shelf space and presentation by sub-category, segment and SKU. Key elements often include: category location in store and in aisle; category shelf layout; on-shelf service level; sub-category/ segment and SKU space allocation.
  - *Product supply tactics* include actions that are taken against acquisition cost: order/ payment transaction, product handling, transportation, and inventory management at the warehouse and store level.
7. **Plan Implementation:** The key components of plan implementation are the approval process, referring to the establishment of the criteria and process for approving the category business plan, the assignment of responsibilities, involving the breaking down of the various tactics into specific tasks, and, finally, the implementation scheduling, involving the development of timelines and milestones for the tasks that are assigned.

### 2.2.3. Analyses in Category Management

The development of a category business plan is based on the conduction of several analyses, through which the desired conclusions for the category can be drawn. These analyses contribute in several steps of the above process, including the category definition, the assignment of category roles, and mainly the category assessment. Regarding the ECR strategies, the questions for the manufacturer and the retailer which these analyses provide answer to include:



	Manufacturer	Retailer
Efficient Assortment	What is the ideal assortment of the products (categories) I produce?	What is the ideal assortment of the products (per category) I sell?
Efficient Promotion	What promotion strategies should I follow?	What promotion strategies should I follow?
Efficient Product Introduction	Which products (in each category) should I introduce that best match consumer needs?	Which products (per category) should I offer that best match consumer needs?
Basis	All Customers (retailers)	All Products (manufacturers)

Table 2: Questions to be answered by Category Management

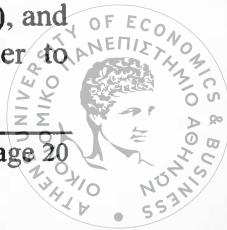
Although the objectives for both the manufacturer and the retailer are similar, the basis for running the analyses differ between the two. The manufacturer examines the performance of his categories across all his customers (retailers). The retailer conducts category management taking into account the brands from several manufacturers per category.

Going a step further in detail, we could mention, as an example, the following questions to be answered or, in other words, analyses to be conducted, within each strategy:

<b>Efficient Assortment</b>
What is the cumulative share build-up?
What are the differences in average segment/brand/manufacturer share?
Quadrant analysis
What is the average distribution level per category/manufacturer/brand?
What is the shelf space allocation compared to fair share?
What is the out of stock by brand ?
What are the out of stock evolution patterns, if any
<b>Efficient Product Introduction</b>
Where the business is coming from when launching new products?
What is the demographic profile of consumer buying a given product?
What is the demographic profile of consumer buying in a particular account?
What is the overall needs of consumers from the most important to the least important (hierarchy of needs)?
<b>Efficient Promotion</b>
How consumer differentiate products and what are the strength and weaknesses of these products (usually at brand level)?
What is the mixed usage of products indicating competition or complementary use?
What is the mixed shopping of account indicating competition or complementary use?
How likely are consumer to switch between two given products? What is the mixed usage, in terms of volume (which product is used most)?
How likely are consumer to switch between two given stores? What is the mixed usage, in terms of volume (which store is used most)?
What are the differences between categories in terms of consumer penetration, loyalty, repurchase cycle,...?
What is the consumers decision tree?

Table 3. Examples of analyses used in category management

Answer to the above questions is provided through the collection of certain data, aggregation or disaggregation of the data so that they refer to the desired level in a given hierarchy (e.g., possible levels in the product hierarchy include: SKU, segment, brand, manufacturer etc.), and finally calculation of specific measures based on those data. For example, in order to



understand the cumulative share build up within a product category, the following steps are performed:

1. Get/ calculate the data relating to the turnover and the number of consumer units sold per SKU (measures), within a certain product category and for a given retailer and period of time.
2. If possible, aggregate data at brand or manufacturer level (i.e., sum-up the corresponding values), so as to obtain an additional view of the data.
3. Calculate the share build up by consumer units and turnover. This is accomplished by sorting the SKUs in descending order of consumer units (turnover) value and computing the cumulative sum.
4. Present the results in the form of a table or a graph.

Table 4 below gives a selection of measures and possible questions/ analyses supported by them.

Analyses	Measures used
Understand what is the demographic profile of consumers buying given product	Penetration, MainConsumption, MainSpending, MainOccasion
Understand how likely consumers are to switch between two given products Understand mixed usage, in terms of volume	Penetration, MainConsumption, MainSpending, MainOccasion, AlterConsumption, AlterSpending
Understand whether an SKU is contributing in terms of traffic, turnover	VolumeCU, Turnover, AcquisitionValue, VAT, DPC
Understand what is to be expected, from a consumer buying a particular category or product, on the total basket value	MainSpending, CatSpending, TotalSpending
Understand what is the average consumption per consumer in value or purchase occasion, what is the repurchase rate, the closure rate of a product	Penetration, MainConsumption, MainSpending, MainOccasion

where:

MainSpending	Main product spending in the period by consumers handling main and alternative product in the given period of time
AlterSpending	Alternative product spending in the period by consumers handling main and alternative product in the given period of time
CatSpending	Category spending in the period by consumers purchasing main and alternative product in the given period of time
TotalSpending	Total spending across all categories in the period by consumers purchasing main and alternative product in the given period of time
MainConsumption	Consumption of main product in the period by consumer handling main and alternative product in the given period of time
AlterConsumption	Consumption of alternative product in the period by consumer handling main and alternative product in the given period of time
MainOccasion	Number of occasions with purchase of main product in the period by consumers purchasing main and alternative product in the givne period of time
Penetration	Number of consumers handling main and alternative product over period of time
VolumeCU	Number of main product consumer units sold
Turnover	Value of main product sold (including VAT)
VAT	VAT rate
AcquisitionValue	Acquisiton value used to calculate retailer profit of main product sold

Table 4. Examples of measures and analyses supported by them





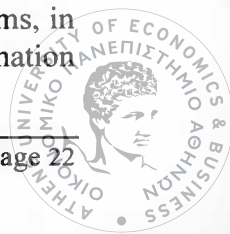
#### 2.2.4. Category Management data sources

The conduction of the aforementioned analyses is based on data coming from various data sources, including the manufacturer, retailer, distributor or external data provider. Usually, a specific set of analyses is based on a certain set of data, while particular analyses require data from more than one sources. In these cases attention should be paid to the combination of those data, since not all data measures are directly comparable. What should be compared is the information deriving from those data and not the data itself.

Typical data sources include:

- *Warehouse.* Warehouse inventory and withdrawal information by SKU is used in category management to support business decisions focusing around distribution of SKUs, warehouse stocking/ reorder levels, and forecasting of inventory requirements based on historical demand patterns. In addition, warehouse information is used to determine item selection and to make merchandising decisions.
- *Point-of-Sale (POS).* POS information is gathered through scanning of the item unique identification bar code, at the store level. The information can be used at the store level, for groups of stores or for a total manufacturer or distributor view. Major uses of this information include helping to determine efficient store product assortments, consumer demand planning, shelf management, out-of-stock identification and prevention, promotion planning, and acquiring of pricing information. The limitation of POS information is often the reliability of the data, since scanning errors at the store level may impact accuracy. Other issues include the massive amount of data available and the resources required in terms of technology and people to support the use of the data.
- *Market-level data.* Examples of market-level data include: shipment, consumption, pricing and market share information. Normally, a manufacturer is able to provide market-level shipment data for its products by various groupings, e.g., consumer segments. An alternative source of market-level data are certain data-supply companies. These organisation provide timely access to data on a broad scale at all hierarchical levels, i.e. category, sub-category and SKU levels.
- *Consumer preference information.* Several market research techniques, such as focus groups, consumer testing, controlled store tests and test markets, are used to identify consumer preferences, which can be the source of much consumer information. This information helps in determining consumer trends, buying decisions, product assortment, price points and promotion decisions.
- *Geodemographic information.* This kind of information assists in determining individual store consumer preferences, buying habits and behaviours, supporting thus decisions in areas as diverse as product assortment, price points, promotion and shelf management. Available information includes age, income, population density, ethnic groupings and other consumer patterns. Primary sources for this information are outside data suppliers.

An apparent problem, however, in the conduction of most of the analyses, is the availability of the required data, especially when more than one data sources are involved. This is mostly a problem for manufacturers than for retailers, since retailers usually have the potential to exploit an extended set of detailed data, through the establishment of appropriate POS systems. In this case, the problem is transferred to the capabilities owned by those systems, in recording information, and the degree to which they integrate with the rest of the information





systems. Also, it is worth mentioning the particular situation met in Europe, where similar data (e.g. market data) from different countries, and thus from different data sources, are not directly comparable, as they correspond to different market sizes and product characteristics, while they may not be available at the same level or even not available at all. This situation constitutes an additional barrier for the conduction of the category management analyses at a European level.

## 2.3. Product Replenishment

### 2.3.1. The Product Replenishment Process

The Product Replenishment process addresses all the stages in the grocery supply chain, from manufacturing line to check-out counter. This chain could be viewed as consisting of three independent flows: from supplier to warehouse; from warehouse to store; and from store to consumer. Information and fund flows, on the other hand, follow this process in reverse, from consumer back to supplier.

Efficient Replenishment is a fundamental supporting platform for the overall ECR strategy. Its main objective is to ‘provide the right product to the right place at the right time, in the right quantity, and in the most efficient manner possible’ (Continuous Replenishment, 1994).

This is supported by a free flow of accurate and timely information, integrated with the flow of products, throughout the grocery supply chain. An overview of the product flow and information exchange between trading partners required to support the product replenishment cycle, is schematically given in Figures 5 and 6.

The driving force of Efficient Replenishment is consumer sales data, as captured via point-of-sale (POS) scanners, which is the prevalent method of item-level auto-identification in the grocery industry. The POS-driven integration of systems and logistics aims to significantly reduce product handling, non-value adding activities, inventory, and associated carrying costs, by establishing a paper-less, inter-organisational system with the potential of reducing overall supply chain costs.

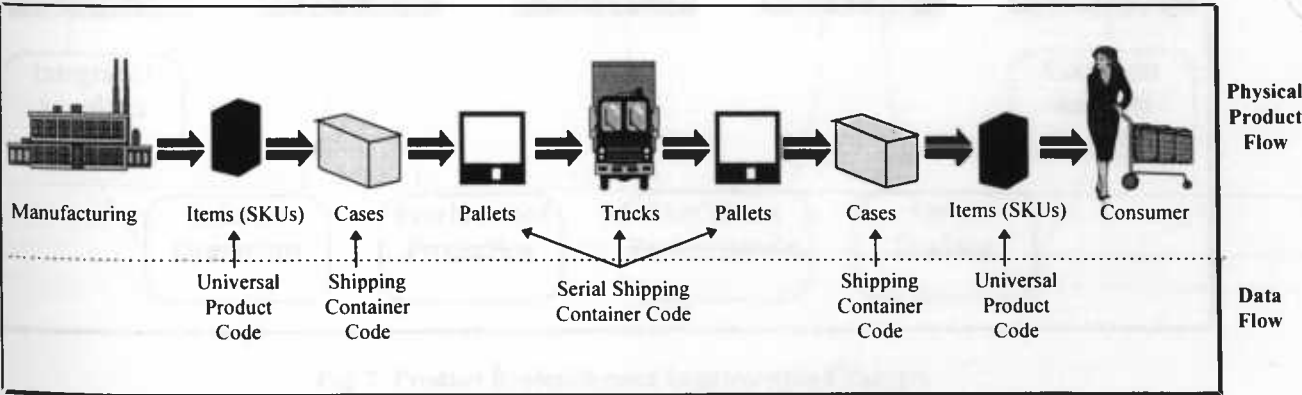


Fig. 5. Product and Identifying Data Flow





Fig. 6. Information exchange between trading partners within the product replenishment cycle

2.3.2. ECR product replenishment improvement concepts

There are six ECR product replenishment improvement concepts, which are all proven and available methods for increasing the efficiency and effectiveness of product manufacturing and distribution. Collectively, they address each stage in a typical grocery product supply chain, as shown in the following figure (Coopers & Lybrand, 1996a):

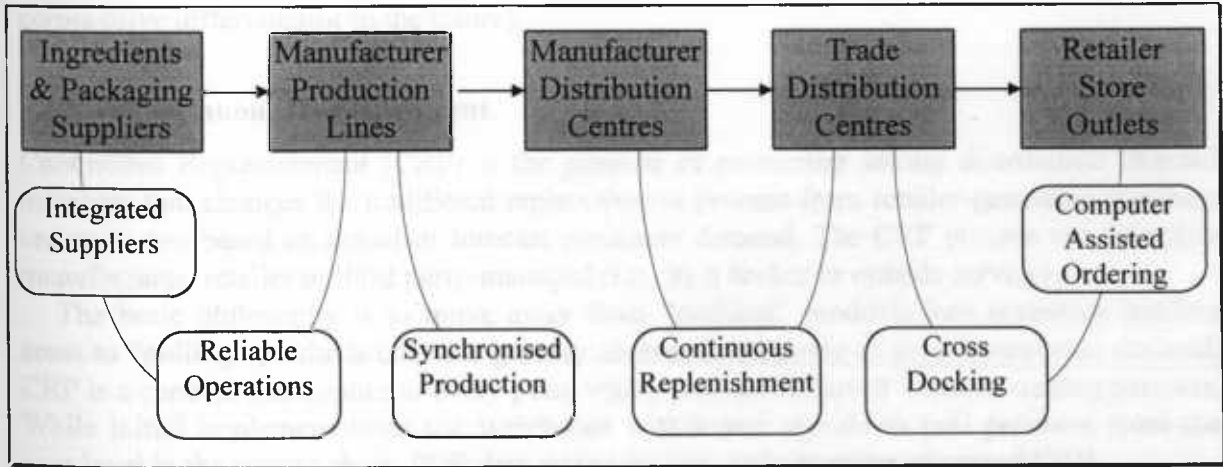


Fig. 7. Product Replenishment Improvement Concepts

There are two fundamental differences when these concepts are addressed under ECR, as compared to most efforts in the past. First, ECR addresses the use of product replenishment concepts as an integrated set, tailored to the needs of specific product categories. Second, ECR considers the impact of the concepts on all trading partners, avoiding situations appearing to benefit one link in the chain, which actually result in poorer consumer satisfaction and value.

All of these concepts contribute to the ECR vision of a rapidly flowing supply chain, with replenishment generated by actual consumer demand. While point-of-sale data provides the primary inputs to drive this future vision, anticipating and planning for variations in consumer demand, such as promotions and seasonality, are critical to ensure that the right products are in the right place at the right time. This is where product replenishment interrelates with Category Management.

### 2.3.2.1. Computer Assisted Ordering

Information technology provides the key to potentially huge improvements in customer responsiveness and efficient replenishment. Linking point-of-sale scan data with the replenishment process could lead to higher product on-self performance at a lower cost and immediate feedback of product availability requirements generated by promotions. In contrast to current ordering practices, computer assisted ordering permits retailers to respond much more rapidly to shifting consumer demands, while simultaneously reducing both operating costs and inventory levels.

### 2.3.2.2. Cross Docking

Cross Docking is a distribution system in which merchandise received at the warehouse or distribution centre is not put away, but instead is immediately turned around for shipment to retail stores. By eliminating the put-away, storage and selection operations, it can significantly reduce distribution costs. Cross docking requires close synchronisation of all inbound and outbound shipment movements and can be implemented in three levels: Cross Docking of Product Pallets (already widely used for high volume products); Cross Docking of Cases (progressively becoming more widely used); and, Cross Docking of Mixed Pallets pre-sorted by the manufacturer into multi-product pallets for single Retail Store drop-offs (probable competitive differentiator in the future).

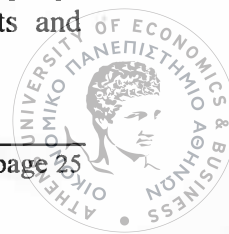
### 2.3.2.3. Continuous Replenishment

Continuous Replenishment (CRP) is the practice of partnering among distribution channel members that changes the traditional replenishment process from retailer-generated purchase orders to one based on actual or forecast consumer demand. The CRP process can be either manufacturer, retailer or third party-managed (i.e., by a broker or outside service).

The basic philosophy is to move away from “pushing” products into inventory holding areas to “pulling” products onto the grocery shelves in response to actual consumer demand. CRP is a concept that applies to every point where product is moved between trading partners. While initial implementations use warehouse withdrawal signals to pull products from the next level in the supply chain, POS data drives the entire chain under advanced CRP.

Comprehensive integrated continuous replenishment systems require the following:

- *Forward visibility.* The ability to provide a forecast of consumer demand requirements over a planning horizon of six to eight weeks for operational purposes and up to fifty two weeks for strategic planning purposes. The forward visibility must include both regular turn, seasonally influenced and promotional volume.
- *Promotion forecasts.* The ability to accurately forecast promotional response and gauge store/ item specific lift factors associated with various merchandising treatments and consumer coupon events.



- *Inventory status.* Knowledge of stock on hand and in transit at each holding point along the demand chain is essential to maximising the productivity of inventory and service.

#### 2.3.2.4. Synchronised Production

Synchronisation of production to actual consumer demand can dramatically increase responsiveness and service levels, while reducing pipeline inventory levels and costs. By moving towards shorter order lead times, manufacturers can reduce their dependency on longer range forecast data, that is frequently wrong and results in unnecessary costs and inventory. As in CRP, initial implementations are frequently driven by warehouse withdrawal data, while future versions may be driven by POS data. Of critical importance, the production scheduling system must dynamically manage run sequence and volumes taking into consideration reliability levels and capacity trade-offs.

#### 2.3.2.5. Reliable Operations

Reliability of deliveries and production are fundamental imperatives for efficient product replenishment. Delivery reliability is concerned with order fill rates and on-time deliveries, while production reliability addresses capacity losses stemming from unscheduled downtimes, suppressed run rates and first run yields. While ECR demands continuous improvement in the absolute levels of reliability, of equal or greater importance, ECR efforts are focused on measuring and minimising the variances in reliability. These efforts are often critical to permit implementation of CRP and Synchronised Production without compromising service levels.

#### 2.3.2.6. Integrated Suppliers

Since ingredients and packaging often account for thirty to fifty percent of total costs and their timely availability frequently dictates downstream service levels, ECR cannot ignore the role of these critical suppliers. In general, there are two focus areas for ECR Integrated Supplier initiatives. First, ECR encourages manufacturers to continue the process of forging 'strategic alliances' with key suppliers. Second, under these alliances, ECR places highest priority on joint efforts that address the replenishment concepts of Cross Docking, CRP and Synchronised Production at the interface between the manufacturers and their suppliers, plus Reliability of both deliveries and supplier production processes.





## Chapter 3 - A framework relating Information Systems and ECR

*This chapter tries to position ECR within the Information Systems (IS) research field and explore the potential that the innovative use of information technology and systems may have for the ECR strategy. Initially, ECR is examined under two aspects of Information Systems research. The first deals with the evolutionary role of information systems in the business arena and how this is associated with the ECR principles. More specifically, the growth model defined by Venkatraman (1991), which identifies five levels of maturity regarding the use of IS, is adopted. The second aspect examines the relationship between ECR and the concept of inter-organisational information systems (IOIS). Following a different perspective, the specific ECR business application areas are then discussed and the underlying information technologies are examined. These are conceptually divided into two layers: the core information technologies, including databases, networks, etc., and the software applications, such as EDI, E-mail, Decision Support Systems, etc. The theoretical findings of the above approaches are finally summarised into a conceptual framework, offering a holistic view.*

### 3.1. Business Transformation through IS

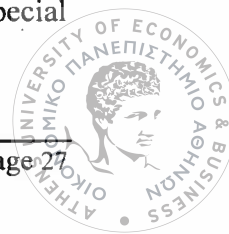
“Information technology ... is becoming increasingly the key to national economic well being, affecting virtually every industry and service. One would be hard pressed to name a business that does not depend on the effective use of information: to design products and services, to track and respond to market demands, or to make well-informed decisions. Information technology will change the world more permanently and more profoundly than any technology so far seen in history and will bring about a transformation of civilisation to match” (Diebold, 1984).

The above quotation -which is by no means unique, since similar meanings and implications can be found in the pertinent literature- highlights the emerging impact of information technology (IT) and its use within a specific application context, what constitutes an information system (IS), on the various facets of the economy.

This power of IT can be attributed to the following observations, as described by Scott Morton (1991):

#### **1. IT is enabling fundamental changes in the way work is done**

IT is an enabler for radically altering the basic structure of a wide variety of jobs, regarding production, co-ordination, and management. Physical production has been greatly affected by robotics, process control instrumentation, and intelligent sensors, while in the area of information production the use of data processing computers have completely altered the character of the standard clerical tasks such as accounts receivable, billing, and payables. In the area of co-ordination, the employment of modern IT techniques eliminates time and distance constraints, extending thus an organisation's ability to share skills by offering special





support to “group work”. Finally, IT has great potential in offering management support, both regarding the control function and the decision making process.

## **2. IT is enabling the integration of business functions at all levels within and between organisations**

The possibilities offered by IT enable the integration of business functions in several levels:

- a. within an organisation
- b. between organisations
- c. across the value chain
- d. across several sectors (leading to what has been named *electronic markets*)

These four forms of electronic integration have, to varying degrees, the net effect of removing buffers and leveraging expertise. Shrinking time and distance can have the effect of allowing the right resources to be at the right place at the right time.

## **3. IT is causing shifts in the competitive climate in many industries**

At the level of industry, IT has a unique impact on the competitive climate and on the degree of inter-relatedness of products or services with rivals. This can lead to unprecedented degrees of simultaneous competition and collaboration between firms.

## **4. IT presents new strategic opportunities for organisations that reassess their missions and operations**

Beyond the possibility to automate and informate, IT also offers opportunities of enlarging the business mission and scope (through related products and services) as well as shifting the business scope (through the substitution of traditional capabilities with IT-enabled skills).

In a recent report on socio-technical strategies for the 1990s, OECD expresses the view that we have yet to realise the true potential of IT (OECD, 1989). This failure to exploit the potential of IT is underlined by Stonehouse et al (1994). They note that ‘exceptional performance depends to a large extent on the ability of the organisation to achieve optimum configuration of its activities, and to show the necessary responsiveness and flexibility to reconfigure activities’. They conclude that the key to co-ordination and responsiveness is information and that IT is the tool which can make available the information to underpin ‘continuing superior performance’.

In ECR, information technology and systems play a central role, as they offer an obvious mechanism for innovation (Macarthur *et al*, 1994). Although IT is not a necessity, it is seen as a key enabler through the ability it has to:

- present appropriate and accurate information,
- efficiently move this information across the supply chain in a timely fashion,
- apply the information in effective support of business processes,
- utilise the information context in support of decision making.

In the following paragraphs, this role is further explored under several aspects of information systems research. Initially, the ECR position under an IS growth perspective as well as in the context of inter-organisational systems is examined. Then, the ECR business applications and the support offered to them by information systems are discussed in more detailed, accompanied by a conceptualisation framework.



## 3.2. An IS growth perspective for ECR

### 3.2.1. *The evolutionary role of IS in business*

The role that information systems play in the business arena is not static but has gradually evolved during the last decade as following (Doukidis and Avgerou, 1993):

- mid 80's: information systems are used as competitive tool,
- beginning of 90's: information systems are considered to be one of the key enablers of business process reengineering,
- mid 90's: information systems are widely perceived as the means to achieve inter-organisational linkage.

The initial trend, during the previous decade, has been the use of information systems as a key to business success, through the potential they offered for innovation, quicker response, better services and increased quality. Information systems were thus regarded by the business world as the way to either remain in a market or increase market share. The fact that this trend gradually shifted from the "competitive advantage" side (Porter and Millar, 1985) to giving emphasis to the internal reorganisation of business processes (Hammer, 1990), could be attributed to the following:

- the continuously increasing competitive pressure forced the companies to focus on new competitive strategies, such as quality, product life cycle, customer service and special needs;
- many failures regarding the employment of information technology for the achievement of competitive advantage had been recorded during the 80's;
- the pressure to reduce operational costs was such that traditional methods were inadequate;
- the cost/performance ratio of information technology had been drastically reduced.

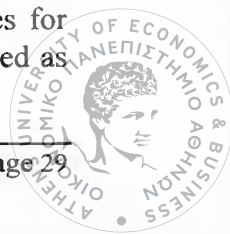
Under this new trend, the emphasis has been placed on the use of information systems as a catalyst in the reengineering of archaic business practices. In other words, we talk about a radical reorganisation of core business processes in order to achieve dramatic improvements in critical efficiency measures such as cost, quality, services and speed.

After or in parallel with the recognition of the information systems potential for internal business restructuring, the employment of information technology as an enabler of 'inter-organisational links' has emerged. This new trend may be attributed to the following, among other, factors:

- many competitive information systems require the free flow of information between trading partners;
- the reengineering of business processes often requires changes in the information flow between organisations;
- the benefits that accrue from the establishment of "strategic alliances" (Copeland, 1988) and "strategic partnerships" (Henderson, 1990) have become apparent;
- the possibilities offered by IT for electronic communication and information exchange have significantly increased during the last years.

The shifting role of IS in organisations has also been commented by Venkatraman (1991), who makes the distinction between the traditional supportive role and the emerging strategic role of IT.

- *The traditional supportive role.* In this perspective, the IS function has been typically viewed as a support activity concerned with the efficient utilisation of its resources for providing the required level of information support for management. IT is thus viewed as



the supporting infrastructure for the implementation of “higher-level” strategies. The allocation of resources is based on “administrative expenses” considerations rather than on business investments that could potentially reshape the organisation’s strategic thrusts.

- *The emerging strategic role.* This role refers to the IT’s capability to redefine the boundaries of markets and structural characteristics, alter the fundamental rules and basis of competition, redefine business scope, and provide a new set of competitive weapons.

The emerging redefinition of the IT role within organisations can be best understood as the result of convergence between two concurrent forces: technology push and competitive pull. The term *technology push* is used to describe the following phenomena:

- significant improvements in the price-performance ratio of IT (rapid advances in the various components of information technology have resulted in continuous improvements in the sophistication and price-performance ratio of these technologies);
- increased connectivity capabilities over time, possible to develop sophisticated forms of linkage, involving multiple types of hardware, software and communication systems;
- significant implications for enhancing productivity at different levels: a) individuals (e.g., better informational and decision support for structured and unstructured tasks); b) task groups (e.g., increased co-ordination and group support); c) across organisations (i.e., electronic integration enabled by the acceleration of electronic data interchange and the consequent changes in business processes).

The term *competitive pull* addresses the level of competitive intensity in the various markets. IT offers the best potential to provide new and powerful sources of obtaining distinctive advantages in the market-place. Thus, the key issue for competitive pull is not the mere deployment of new systems and applications but leveraging them to obtain firm-specific differential benefits in the marketplace.

The following framework (Venkatraman, 1991) gives a more analytical perspective of the emerging role of IT in organisations.



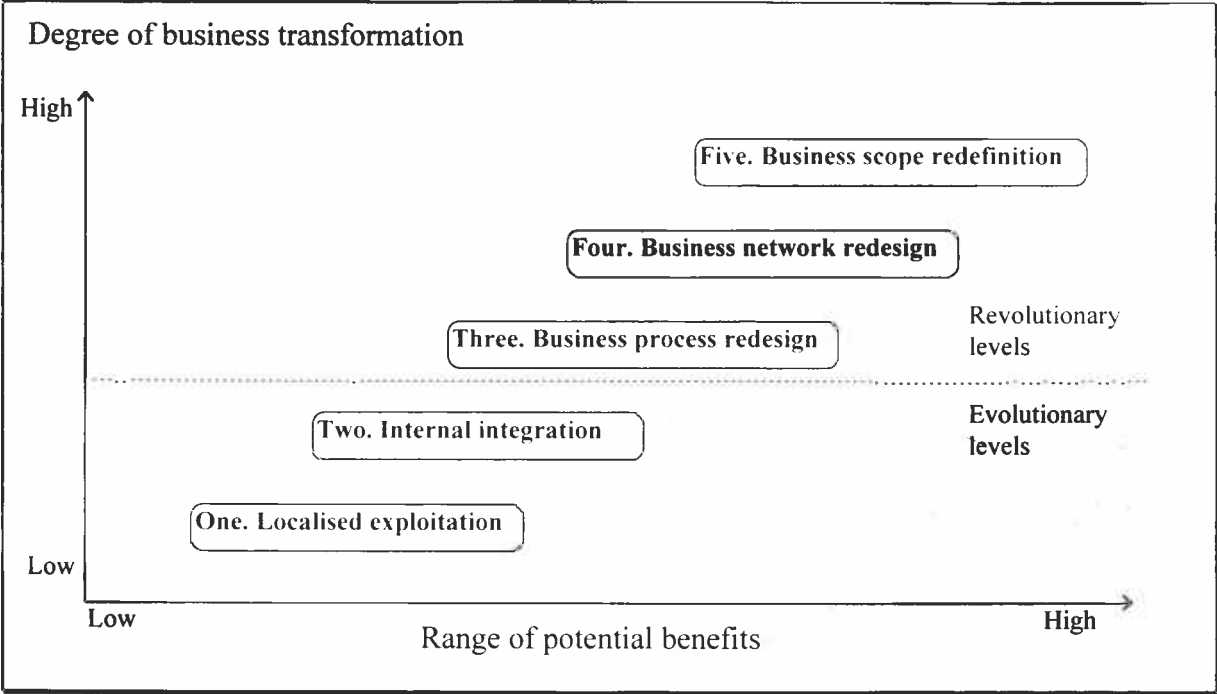


Fig. 8. Five levels of IT-induced reconfiguration

This framework (Figure 8) identifies five evolutionary levels of IT employment by organisations:

- Level one is *localised exploitation*, concerned with the exploitation of IT within business functions, such as manufacturing or marketing, or even isolated business activities within specific functions. This involves the deployment of IT applications in order to improve task efficiency of operations. Thus, applications achieve some function-specific goals (i.e., localised) without necessarily influencing related areas of operations.
- Level two is *internal integration*, which is a logical extension of the first in the sense that IT capabilities are exploited in all the possible activities within the business process. Two types of integration are critical here: technical integration, namely the integration of the different systems and applications using a common IT platform; and the organisational integration of different roles and responsibilities, which exploits the technical integration capabilities. In other words, the deployment of a common IT platform serves to integrate the organisation's business processes, potentially enhancing efficiency and effectiveness.

These two levels are viewed as evolutionary, requiring relatively incremental changes in the existing organisational processes. In contrast, the other three levels are conceptualised as revolutionary, requiring fundamental changes in the nature of business processes, as discussed below.

- Level three is *business process redesign*, involving the reconfiguration of the business using IT as a central lever. Instead of treating existing business processes as a constraint in the design of an optimum IT infrastructure, the business process itself is redesigned to maximally exploit the available IT capabilities. This reflects conscious efforts to create an alignment between the IT infrastructure and the business process, rather than simply superimpose the technology platform on the existing business processes.





- Level four is *business network redesign*, concerned with the reconfiguration of the scope and tasks of the business network involved in the creation and delivery of products and services. This includes the business tasks both within and outside the formal boundaries of an organisation and the consequent redesign of this 'virtual business network' through IT capabilities. Thus, electronic integration across key partners in the changed business network becomes the dominant strategic management challenge.
- Level 5 is *business scope redefinition*, concerned with the *raison d'etre* of a corporation, pertaining to the possibilities of enlarging the business mission and scope (through related products and services) as well as shifting the business scope (through the substitution of traditional capabilities with IT-enabled skills).

Perhaps the most significant challenge from IT lies in the redesign of business networks to create new capabilities and skills as well as favourable asymmetries in the marketplace, what is usually called *electronic integration*. This needs to be distinguished from terms such as electronic data interchange (EDI), which refers to a communications technology, involving important issues of standards for information exchange. In contrast, strategies for electronic integration address business issues involving the relative authority and responsibilities of the different participants and the consequent implications for obtaining differential benefits in the marketplace.

### 3.2.2. The implications for ECR

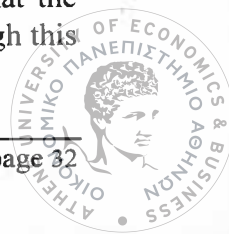
The employment of information systems in the retail sector does not form an exception to the previously discussed growth model. The IS role is considered to follow again an evolutionary course from supporting specific business functions to emerging as a strategic business element.

IT was initially employed at a local level, for the support of specific business functions, such as accounting, warehouse inventory, payroll etc. However, it was apparent from the beginning that this localised exploitation of IT could not reach the full potential offered by IT. In order to achieve this, ECR advocated that two basic principles should be followed.

The first principle relates to the use of IT not merely as a means to automate ineffective existing business functions, but in association with a thorough review and restructuring of internal business processes. Under this perspective, IT is not confined to offering support to local applications but forms a crucial mechanism for achieving integration among the various business functions. As described in chapter 2 of this document, the core business processes that have been identified by the ECR working teams include the areas of product replenishment, assortment, promotion and introduction.

The second principle focuses on the use of IT for establishing inter-organisational links between the companies in the sector. This role cannot be proved beneficial, unless a critical mass of companies involved in the electronic exchange of information is reached. It is only then that the total system can be assigned the characterisation of an electronic market. ECR's objective as an industry initiative is to increase awareness about the benefits deriving from the establishment of a critical mass and to promote the idea of co-operation and co-ordination at an industry level.

Thus, according to the five level evolution framework (Venkatraman, 1991), ECR addresses the revolutionary part, giving special emphasis to the redesign of business processes at an inter-organisational level. This business network redesign partly presupposes that the three previous levels of maturity have been reached by the network participant's, although this



is not a necessity for everyone, in order to achieve industry wide results. That means that it is expected, especially during the first stages of ECR adoption by the industry, that not all companies are found at the same level, regarding the internal integration of business functions and IT systems, as well as the efficiency of internal business processes. However, the pioneering companies in the sector are expected to act as an example for the rest in reaching the desired maturity level. These companies are also expected to reach first the fifth level of the growth model, that is start redefining their business scope by exploring new business opportunities offered by IS.

On the other hand, one of the main roles of the ECR committees across Europe and USA is the distribution of best practices and implementation guidelines. The objective behind this is to promote and speed up the ECR adoption by the industry, or in terms of the aforementioned framework, to promptly achieve the network redesign that will increase the total supply chain efficiency to the greatest benefit of the final consumer.

### 3.3. ECR from an inter-organisational systems perspective

#### 3.3.1. *Inter-organisational information systems considerations*

Another perspective under which the ECR initiative should be examined is that of the inter-organisational information systems. An "Inter-Organisational Information System (IOIS) is an integrated data processing/ data communication system utilised by two or more separate participant firms" (Barret, 1987). Implicit in this definition is "the inter-penetration of organisational boundaries" (Heide and John, 1990), which implies more than just the analysis of internal business processes conducted within a single organisation. The rationale for such cross-organisational communication links includes process efficiencies, performance increases, and competitive benefits (Konsynski, 1992).

This definition may be paralleled with level four, business network redesign, of the aforementioned evolution framework (Venkatraman, 1991), which involves the innovative use of IT at an inter-organisational level. Actually, what is implicit in both definitions is the adoption of an integrated approach that includes focusing on groups external to the organisation, such as distributors, customers and suppliers, in order to use information systems technologies effectively to reduce cycle time and achieve total system efficiency. This fact typically suggests moving away from vertical integration toward more inter-organisational arrangements (Bensaou, 1993). These emerging inter-organisational arrangements take the form of complex co-operative relationships - that have been variously described as inter-organisational information systems (Barret and Konsynski, 1982; Cash and Konsynski, 1985), "information partnerships" (Konsynski and McFarlan, 1990) and "electronic integration" (Venkatraman and Kambil, 1991) within a broader spectrum of electronic markets and electronic hierarchies (Malone *et al*, 1987).

The opportunities offered by networks that transcend organisational boundaries (Cash & Konsynski, 1985) depend on the scope of electronic integration that may be achieved, given the underlying network role. We can name four possible network roles (Venkatraman, 1991):

- *Transactions.* The network serves to exchange structured data between organisations using a pre-specified, mutually accepted format. Transactions rooted in data transfer across organisations are conducted using computers and communication systems, without any routine human interventions.
- *Inventory.* The network is designed to make inventory “available and visible” from one party to another without excessive time delay. The critical distinction is that in addition to streamlined exchange of transaction data, it is possible to ascertain the “status” of inventory and trigger the “movement of goods”.
- *Process.* A specific set of organisations integrate their business processes through electronic links (using a mutually acceptable format) for enhancing common benefits. This extends beyond the previous role to include other arrangements, such as multiparty integrated manufacturing systems. The distinctive feature is that a specific business network is created such that the relevant information is appropriately shared across various parts of the network to exploit both efficiency and effectiveness. This can be viewed as integration across distinct formal organisations for the creation of a virtual business network.
- *Expertise.* Specialised skills and expertise are shared using an appropriately designed business network. This role is characterised by unstructured information sharing and reflects the creation of a virtual intellectual network across physical and organisational boundaries.

The impact that IOIS may have depend also on two other considerations (Venkatraman, 1991):

1. *Strategies for business governance.* This is the approach adopted to develop relationships with key participants in the marketplace. This is conceptualised along a continuum from loosely coupled (standard relationship like the classic market transactions with relatively low cost to switch from one participant to another) to tightly coupled (unique, specialised relationships with high cost to switch from one to another).
2. *Strategies for IT governance.* This is the approach adopted to govern the IT network across the multiple participants. This is conceptualised along a continuum ranging from a common role (i.e., the position occupied by any given player is no different from the position occupied by other players in the network, as in the case of the adoption of a common EDI standard) to a unique role (i.e., the positions occupied by the different players are different because of either their use of a dedicated, proprietary network or their offering of specialised, value added services on the standard communications infrastructure). Figure 9 represents these two dimensions in a grid that highlights the four key strategic positions involving the integration of business governance thrusts and IT governance thrusts.



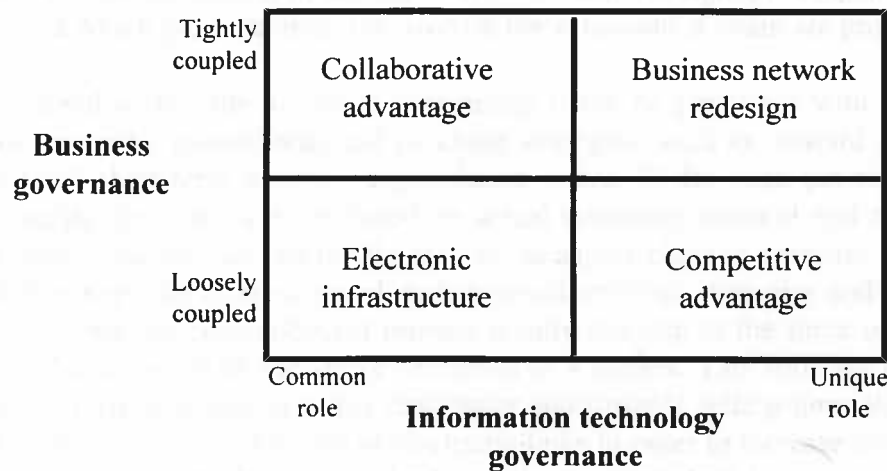


Fig. 9. Strategic options for inter-organisational information systems

The strategic implications for each position in the grid include:

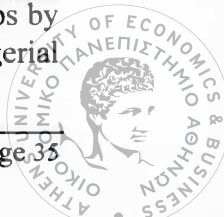
- *Electronic infrastructure*: in this position, there is no particular strategic advantage to any firm since none has distinctive capabilities through its position in the IT governance, and the business relationships are loosely coupled with low costs of switching.
- *Competitive advantage*: in this position, those that occupy the unique position in the IT governance structure are able to attain competitive advantage (albeit only for the short term).
- *Collaborative advantage*: in this position, the opportunities exist for mutual collaborative advantage between participants. The IT network serves to improve the efficiency levels of the interconnected participants with minimal opportunity for any given player to realise differential advantage, in view of the criticality of the business relationship.
- *Business network redesign*: the position offers opportunities for creatively exploiting IT capabilities to strengthen and modify the nature of the relationships with the key players in the marketplace.

3.3.2. Positioning ECR in the IOIS context

The above definitions bear high resemblance to the ECR principles presented in the previous chapters, such as the integrated vision of the supply chain supported by a timely, accurate, paper-less flow of information, or the establishment of co-operative ‘win-win’ relationships between participants, with the aim to better serve the consumer. In a broader sense, ECR is inclusive of the above descriptions of “information partnerships” and “electronic integration”, while it could be argued that it supports more the concept of an electronic market than that of an electronic hierarchy.

According to Malone *et al* (1987), markets co-ordinate the flow through supply and demand forces and external transactions between different individuals and firms. Market forces determine the design, price, quantity, and target delivery schedule for a given product that will serve as input into another process: the buyer of the good or service compares the many possible sources and makes a choice based on the best combination of these attributes.

Hierarchies, on the other hand, co-ordinate the flow of materials through adjacent steps by controlling and directing them at a higher level in the managerial hierarchy. Managerial





decisions, not the interaction of market forces, determine design, price, quantity, and delivery schedules at which products from one step on the value-added chain are procured for the next step.

In the retail sector, the notion of a hierarchy could be paralleled with that of inefficient practices driven by promotional and purchase strategies, such as forward buying, aiming to achieve local short-term benefits, e.g. reduced prices. Under such practices, purchase and manufacturing decisions are not based on actual consumer demand and taste, leading as a consequence to higher cost and inefficiency of the supply chain as a whole.

ECR promotes the elimination of such external artificial strategies and non-value adding practices, so that the replenishment process is only obeying to the force of actual consumer demand, what agrees with the above definition of a market. This shift has been described as moving away from selling-in to the distributor and towards selling-through to the consumer (Kurt Salmon As., 1993). The use of electronic links in order to increase the efficiency of the supply chain, results in what we could call an 'electronic market'.

Regarding the roles that the ECR inter-organisational systems are called to play, these initially refer to the roles of 'transactions' and 'inventory' (see section 3.3.1). The first deals with the exchange of order, invoice and payment information based on EDI links. The second extends the use of EDI links to accommodate the exchange of inventory information as well. This forms, for example, the basis of an ECR specific inter-organisational system, that of Continuous Replenishment (CRP), which suggests the modification of the classical ordering practices based on the exchange of stock-level data. More specifically, in the most common form of the CRP environment, what the customer transmits to the supplier is not an order but the level of the stock on a daily basis. The supplier or a third-party service provider is then responsible to determine the required order quantity, using additional information such as seasonal demand etc. The main advantage of such a practice is that the manufacturer can schedule production in advance, leading to much more normal flows across the total supply chain.

The other two roles of 'process' and 'expertise' require the adoption of greatest levels of co-operation, which is not certain to be attained, given the high competitive horizontal relationships (i.e., among manufacturers or among retailers) of the retail sector. However, the adoption of a star configuration, such as the sharing of data or expertise between a certain manufacturer and a number of retailers or a retailer and many manufacturers is quite possible to happen, since it may deliver significant benefits to all. The sharing of Category Management data and expertise could be referred to as an example. The party that first takes the initiative to act as a hub (centre of a star configuration), whether a manufacturer or retailer, is expected to have the greatest benefits, since such a party gains from all the relationships. The rest of the parties share among them role, which they can variably use in order to gain the maximum benefits.

Regarding the strategic position that a company involved in ECR practices may take on the aforementioned grid (Figure 9), this may vary from the 'competitive advantage' position to that of 'business network redesign' following a clockwise direction. This depends, as has been previously discussed, on the role assumed by IT (unique or common) and on the type of the relationship among the IOIS members (loosely or tightly coupled). However, ECR most focuses on the two upper strategic positions, i.e., the achievement of collaborative advantage and the business network redesign, which both require the establishment of strategic alliances between partners. The difference between the two lies in the use of information systems, which may be common (in order to achieve collaborative advantage) or unique (for business



network redesign). This last strategic position is the most difficult to achieve but also the one delivering the best results.

### 3.4. Information systems support to ECR

Information systems find extensive application in many areas of the business environment, through the support they offer to the collection and storage of data, the transformation of data for decision-making purposes, the direct access and exchange of information. In the case of the retail sector, the following selective areas of applications could be referred to as an example (Dawson, 1991):

- Elements of the finance function, such as financial accounting, treasury, internal audit and management accounting procedures.
- Personnel and labour function, including the management of personnel records and the payroll function.
- Allocation of resources and project management.
- Physical distribution and logistics management, including stock monitoring and replenishment.
- Conduction of market analyses and development of integrated marketing and trading strategies.
- Accurate measurement of product movement and monitoring of sales.
- Assessment of several business units performance and evaluation of alternative investments.

The above are examples of a localised use of information technology in order to support specific business functions. However, the full IS potential is not exploited unless these local applications are integrated, both internally and at an inter-organisational level, under the scope of specific core business processes.

In the following section, such an integrated IS support to ECR business applications is presented. The underlying enabling technologies are further reviewed in a conceptual framework.

#### 3.4.1. IS support to business applications

Figure 10 illustrates the key business applications and the associated information flow in an ECR environment (ECR Technology Guide, 1995). In this figure, integration of the various applications is assumed, both internally within each company and at an inter-organisational level. As such, the total figure could be thought of as representing the vision of an overall ECR IOIS.

The applications and information flow extend across three distinctive member roles: the retailer, the distributor and the manufacturer. Some of the applications transcend organisational boundaries (such as Continuous Replenishment and Physical Distribution), others are executed in parallel by more than one participants, although some form of information exchange is required (e.g. Category Management), while others are specific to a certain member (such as Computer Assisted Ordering).

In the following paragraphs, each of these applications is discussed in more detail.

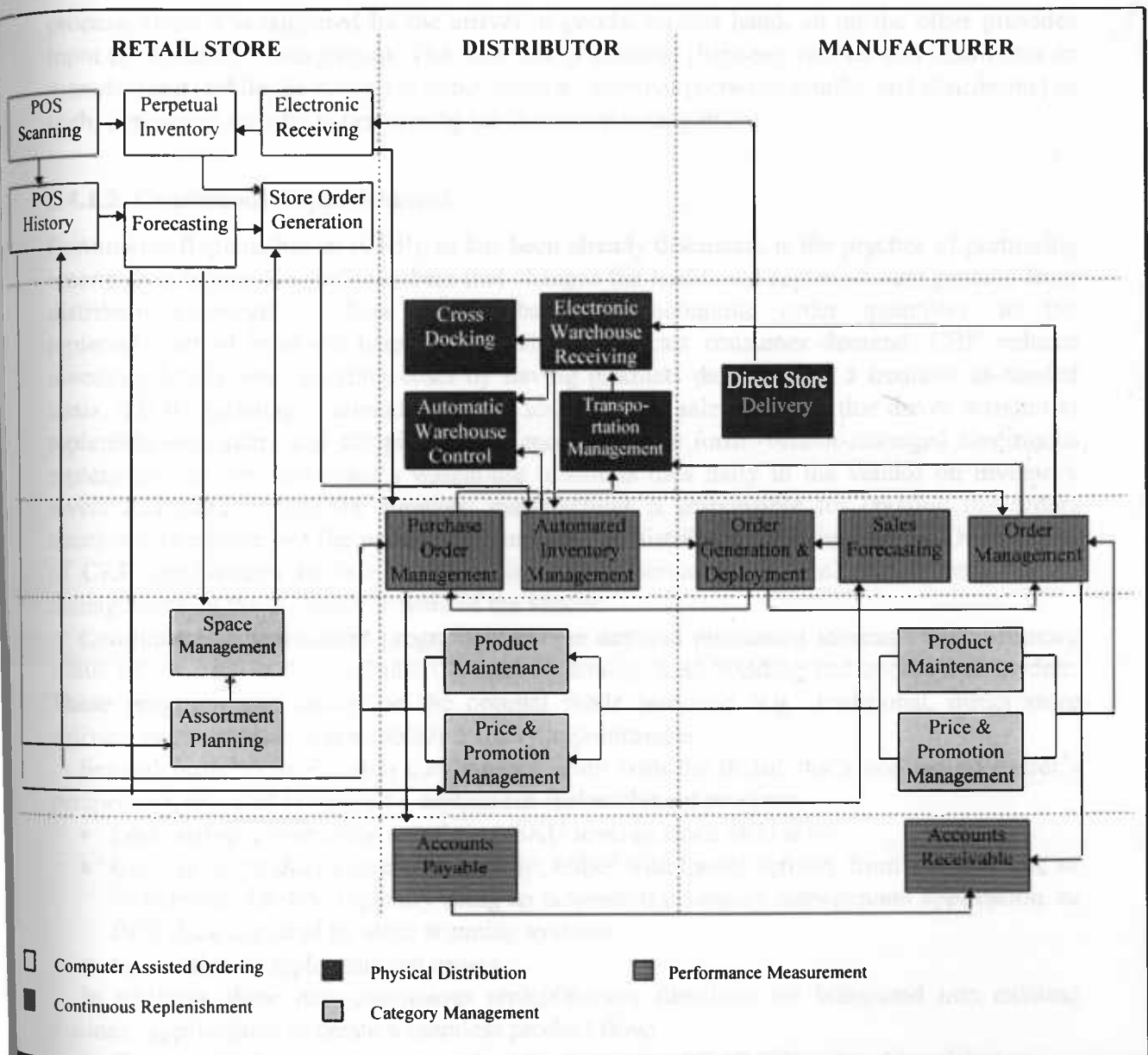


Fig. 10. ECR Business Applications

### 3.4.1.1 Computer Assisted Ordering

Computer assisted ordering (CAO) is a retail-based system that automatically generates replenishment orders when the shelf inventory drops below a pre-determined level. The computer system tracks the inventory of all items in the store, adjusting for receipts and sales. In contrast to current ordering practices, computer assisted ordering permits retailers to respond much more rapidly to shifting consumer demands, while simultaneously reducing both operating costs and inventory levels.

CAO is based on complete store-level inventories, accurate point-of-sale scan data and item forecasts. The store/ item forecast is used to establish inventory targets and is often based on historical scan data, planned promotional events and seasonal smoothing.

This application is specific to the retailer and can be considered as an autonomous system. However, it can also be considered as the retailer's internal link of the product replenishment



process, since it is triggered by the arrival of goods, on one hand, and on the other provides input to inventory management. The first link is external (between retailer and distributor or manufacturer) while the second is either internal, external (between retailer and distributor) or both, depending on who is performing the inventory management.

#### 3.4.1.2. Continuous Replenishment

Continuous Replenishment (CRP), as has been already discussed, is the practice of partnering among distribution channel members that changes the traditional replenishment process from distributor-generated purchase orders, based on economic order quantities, to the replenishment of products based on actual and forecast consumer demand. CRP reduces inventory levels and operating costs by having products delivered on a frequent as-needed basis. It is the consumer demand, based on scan data and sales forecast, that drives warehouse replenishment orders and shipping. In the most common form -vendor-managed continuous replenishment- the distributor's warehouse transmits data daily to the vendor on inventory levels and store orders; the supplier/ manufacturer is responsible for creating the orders necessary to ensure that the warehouse can meet the distributor's product needs. Other forms of CRP employment include the provision of the service by a third party/ broker or its management by the customer instead of the vendor.

Continuous replenishment programs combine demand promotion forecasts and inventory status information with distribution resource planning, load building and operational models. These programs can determine the optimal mode selection, e.g., traditional, direct store delivery or cross dock, and establish delivery appointments.

Several business application components, from both the distributor's and manufacturer's perspective, are used to support a continuous replenishment program:

- Forecasting, either at the warehouse/SKU level or store/SKU level.
- Capture of product movement activity, either withdrawal activity from a warehouse or distribution facility, typically using an automated inventory management application, or POS data, captured by store scanning systems.
- Generation of replenishment orders.

In addition, these new continuous replenishment functions are integrated into existing business applications to create a seamless product flow:

- The supplier's order management application is used for fulfilment and invoicing.
- The distributor's purchase order management application is used for order tracking and matching at time of actual receipt.

Leading edge applications of continuous replenishment programs are beginning to fully integrate space allocation and management, logistics planning, price modelling, promotional planning and executive decision support.

Thus, CRP constitutes a classical IOIS application, extending beyond organisational boundaries and requiring integration at several levels.

#### 3.4.1.3. Physical Distribution

Physical distribution applications support the basic functions of picking and preparing orders, scheduling transportation, preparing shipping information, and, finally, transporting products to customers.



The applications and technological facilities supporting the physical distribution of goods are mostly found in a distribution centre. These support the following, among other, distribution techniques:

- *Cross docking* is a distribution system in which merchandise received at the warehouse or distribution centre is not put away, but instead is readied for shipment to retail stores. In pallet-level cross-docking, entire pallets are received from the vendor and moved directly to the outbound trucks without further handling. In case-level cross docking, cases are transferred into a conveyor system, if one is available, which routes them to the appropriate outbound staging area for delivery to the store.
- *Direct store delivery* is a form of distribution whereby merchandise is delivered directly to the stores by a supplier or vendor, without the involvement of a distributor.
- *Multidrop-multipick* is the logistics flow that includes a high number of drops (pick-ups respectively) during the same trip for delivery to retailers (from producers), co-ordinated according to time and quantity.

Implementation of the above and other distribution techniques requires the use of sophisticated warehouse control, transportation management and electronic warehouse receiving applications, integrated both in between and with the manufacturer's and retailer's information systems. Within an ECR environment, physical distribution applications are likely to be more:

- Seamlessly integrated with the rest of the replenishment applications in order to streamline and reduce the efforts associated with receiving, handling and shipping activities.
- Dynamic and flexible, supporting varying logistics strategies based on product packaging, handling and timing of store allocation.
- Tightly integrated with transportation functions, such as routing and scheduling, particularly with the increase in cross docking and flow-through distribution techniques.

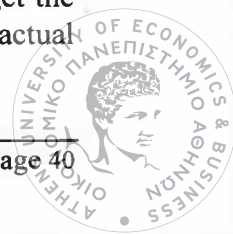
#### 3.4.1.4. Category Management Applications

The applications supporting the category management process can be grouped into three areas:

- i. *Information acquisition*, referring to the collection of consumer, market and process data, mainly captured from POS scanning and activity-based costing systems.
- ii. *Decision support systems*, allowing analysis and presentation of the consumer, market and process information, in order to support decisions on assortment definition, shelf-space allocation, promotions and buying.
- iii. *Integration with transaction process systems*, which perform product procurement, fulfilment and distribution functions.

Category management applications are helpful for all participants: the manufacturer, the distributor and the retailer. The two first gain support in their decisions regarding the product maintenance and the development of price and promotion strategies. These decisions are mostly based on the measurement of product performance according to specific criteria, as discussed in section 2.2. The retailer mostly focuses on applications regarding space management and assortment planning.

Category management applications can be executed on a local base, provided they get the required data as input. However, if efficiency is to be achieved, integration with the actual



data sources is required. This is relatively easily accomplished for the retailer, since one of the main sources of data are the POS systems. For the distributor and the manufacturer, this fact requires the establishment of inter-organisational links for the exchange of data.

#### **3.4.1.5. Performance Measurement**

An important task within ECR is the performance evaluation of existing practices, the identification of inefficiencies and areas of potential process improvements, the suggestion of possible solutions, and finally the assessment of achieved results.

Activity Based Costing (ABC) is a critical performance measurement mechanism in an ECR environment. ABC is an accounting method that enables a business to better understand how and where it makes a profit. In activity based costing, all major activities within a cost centre are identified and the costs of performing each are calculated -including costs that cross functional boundaries. The resulting costs are then charged to the product, product line, customer or supplier that caused the activity to be performed. ABC provides a more complete picture than traditional accounting methods of the profits and costs of doing business, fine-tuned to a particular product category, vendor or item. It also includes those costs that add or delete value to the customer.

ABC is supported by accounts receivable and accounts payable applications, which are extended from their classical character to accommodate electronically exchanged information such as invoices, payment advices and credit/ debit memos between manufacturer and retailer.

#### **3.4.2. IS support to decisions**

The quality, relevance and speed of data collection and analysis through technology-based information systems have allowed the development and application of many new analytical techniques and tools providing support to management control and decision making. It is not, however, the technology itself, but rather the information which these systems provide that has enhanced the management decision process.

The previous discussion on IS business applications was mostly focused on the area of operations. Most of these applications can be viewed under a decision support aspect as well. For example, Category Management applications offer support to decisions regarding the assortment definition and the development of pricing and promotion strategies. The need to support decisions is also involved in the areas of order management, inventory management, warehouse control etc.

Apart from the above supportive role to decisions, information systems are to be increasingly viewed from a general management (or strategic management) perspective as well (Venkatraman, 1991). Effective exploitation of the power and capabilities offered by IT could involve significant changes in organisational strategy, management structure, systems, and processes. It is the dynamic co-alignment between the organisation's strategic context and its IT infrastructure that contributes to increased efficiency and effectiveness.

The principal dimensions of management work that can be most affected are those of direction and control (Dawson, 1991). Direction, as used here, is concerned with sensing changes in the external environment and determining the organisation's response to those changes. Relevant, timely information can be crucial input to the organisation's direction-setting process. This is as true for a sophisticated strategic planning system as for an informal executive support system or customer feedback system.



The control dimension of management work has two key aspects. The first is the measurement task, that is measuring the organisation's performance along whatever set of critical success factors has been defined as relevant. Computer simulation has already been proved a quite useful tool for the modelling of business processes before and after reengineering in order to measure the impact of the changes (Macarthur *et al*, 1994).

The second aspect is to interpret such measures against the plan and determine what actions to take. Effective control is a critical dimension of organisational learning as it feeds back to future direction setting, and both of these can be fundamentally changed by the increasing availability of IT.

Another management consideration is linked with the new business opportunities offered by the innovative use of new technologies and information systems. Information systems have enabled changes to occur in several areas of retail management. While some changes are likely to have occurred without improvements in information technology, technology has undoubtedly increased the rate of change and made many changes more effective. The reasons for this include (Dawson, 1991):

1. The desire for improved information and control systems leading to cost savings, stricter management control over operations, strategy, and the distribution channel as a whole.
2. The potential of technologies to enable companies to take advantage of new commercial opportunities. For example, the growth potential of non-store retailing has focused attention on certain tele-shopping technologies.
3. Hard cost-reducing benefits of the control allowed by information technology as well as soft benefits accruing from the improved position in the market.

James Morehouse (1995) predicts that the supermarkets of 2005 will use a strategic mix of technology and innovative merchandising of fresh and prepared products, having a very good knowledge of their consumers' lifestyles and buying patterns. He also foresees an extended use of home shopping services, offered through telecommunication networks and combined with home delivery. Restaurants will play an integral role in the home replenishment process as well. The implication is that the alternative ways for the consumer to replenish the home will have changed the dynamics of the grocery supply chain dramatically from what exists in the mid-1990s.

### 3.4.3. *Enabling technologies*

One could view the information technologies that enable the implementation of the aforementioned ECR business applications as being in two layers. The bottom layer consists of the core information and communication technologies, which form the basis for almost any information system. The top layer rests upon the possibilities offered by the core technologies in order to provide enhanced capabilities through specialised software applications. On top of this second layer, the ECR business applications are implemented, usually based on integration of the technologies below, either within the same or across different organisations. This is schematically presented in Figure 11.

The technology components employed in an ECR environment focus on the following requirements:

- presence of appropriate and accurate information,
- ability to efficiently move this information across the supply chain in a timely fashion,



- capability to readily use the information in effective support of supply chain business processes .
- The core information technologies and enabling software applications are further discussed in the following sections, under an ECR perspective.

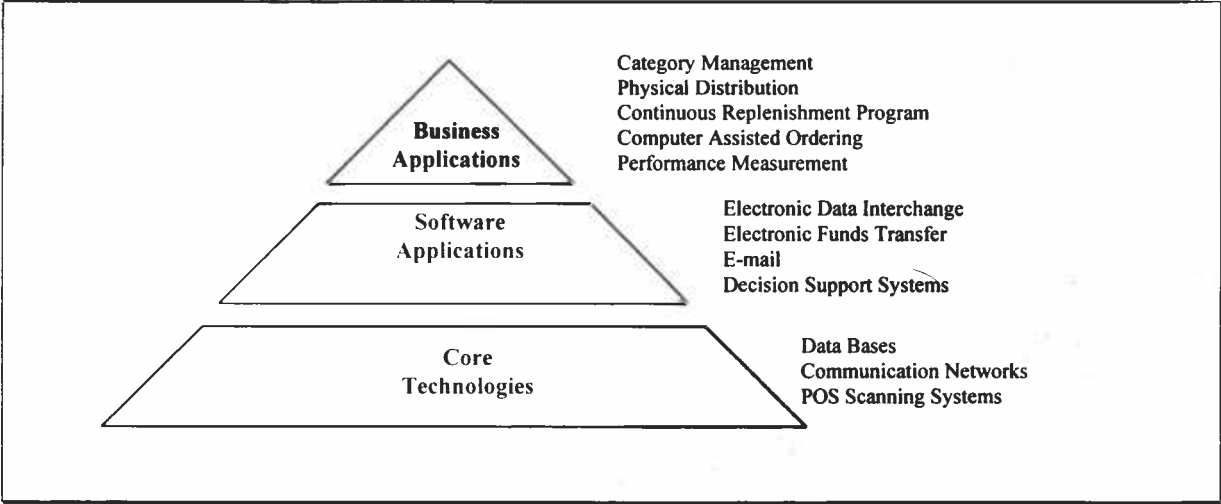


Fig. 11: Information Technology support of ECR

3.4.3.1. Core information technologies

a. Data bases

Data architecture provides a framework for managing, storing and manipulating the data that is used in business functions. The database management system comprises the largest component of the data architecture. Other components include tools for data administration, data distribution and monitoring data integrity and performance.

One key success factor in implementing many ECR strategies is the ability to have accurate and efficient access to common information. This ability enables the integration of business functions within a process, as well as the implementation of an integrated process involving many trading partners. The establishment of a central data repository within each company is the approach mostly used to satisfy this requirement. The automatic linkage of the central data repositories among trading partners, involving the exchange of various types of information, is then achieved through the adoption of advanced software applications and security mechanisms.

In an ECR environment, an organisation’s data architecture will likely need to address two factors: managing the increase in the volume of data to be maintained and managing the synchronisation of common data. The latter would mostly include item pricing and promotional information across trading partners, supporting many of the ECR strategies.

b. Communication Networks

Communication networks form the fundamental infrastructure for the intra and inter-company exchange of information, either at the level of communicating computer applications or at the interpersonnal communication level.

In an ECR environment, exchange of information between trading partners takes on special importance, as it forms the basis for implementation of any ECR strategy. This fact places



great demand on the communications architecture, regarding the transaction volume as well as the quality and type of provided services. For example, reliability and speed of delivery are major considerations as time-sensitive functions (e.g., efficient replenishment) are integrated between trading partners. Network security services become even more critical as sensitive item pricing and promotional information are exchanged between manufactures and retailers.

Organisations may consider several key factors when making decisions on an inter-corporate communication approach, such as cost, quality of service, interoperability. Regarding the exchange of EDI messages, a Value Added Network (VAN) alternative should also be taken into account. A VAN is a service company providing communication links between EDI trading partners. In its simplest form, a value added network provides the communications hardware, software and support systems to move EDI data from one point to another. Additional services offered include: mailbox services, security, event-driven services (i.e., automatic delivery of data to the receiver), customer support, control reports, in-network translation of EDI messages, alternative media delivery, broadcast services, installation assistance, set-up trading partner relationships, etc.

### c. Item Coding & POS Scanning Systems

The installation of scanning technology at the point of sale is one particular technological adoption in which standardisation has undoubtedly played a key role. The data collected at the point of sale through scanning technology provides a wide variety of information relating to consumer buying and shopping habits.

For the majority of retailers, it was in terms of stock control and reduced paperwork and administration costs that benefits for POS systems were acknowledged. More efficient stock control improves logistics, by reducing the number of out-of-stock situations. In the non-food sectors, the ability of organisations to recognise and react to changes in consumer fashions have also been enhanced by such information systems. Other hard benefits refer to the reduction of costs incurred in pricing individual items and the diminishing of errors at the checkout.

Less tangible and longer-term soft benefits pertaining to these systems include:

- development of target marketing strategies,
- free store management and staff time, allowing them to concentrate on shop floor activities and customer relations,
- accurate and detailed collection and analysis of data.

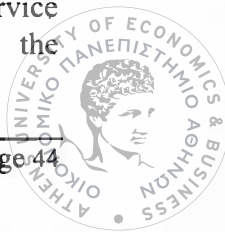
Data and information alone will not improve the performance of the business. If the full benefits of the more detailed data made available through these systems are to be realised, integration with the rest of an informational infrastructure components is required.

### 3.4.3.2. Enabling Software Applications

#### a. Electronic Data Interchange (EDI)

Electronic Data Interchange supports the exchange of business information from one trading partner to another using a public standard format. EDI is commonly defined as the electronic transmission of standard business documents in a predefined format from one company's computer application to its partner's computer application (DG XIII, 1989).

Interchange of documents usually takes place across telecommunication networks provided by public or private telecommunication organisations or value added network service providers. Standard documents must be converted into a *predefined format* (e.g., the



EDIFACT standard of the United Nations) so that they can be understood by different computer applications. In a functional sense, EDI is the application-to-application exchange of data, not just the computer-to-computer exchange of data (Wigand, 1993).

Several techniques -including traditional batching, real-time/ event-driven or interactive EDI- can be used to address various speed-of-delivery requirements. Cycle time, which is the total elapsed time required to complete all activities related to a business event, is influenced by processing techniques, the communication architecture and the overall integration of EDI with the business processes and applications.

The mechanism to manage the information flow between the EDI utility and the business applications can be as critical as identifying the appropriate processing technique. In addition to the industry standards used to communicate information between trading partners, organisationally defined standards can be applied to interface between the EDI translation software and the business applications using it.

Standardisation in article numbering and the format of trading messages play a key role in electronic trading as they:

- reduce complexity of the distribution chain
- reduce costs involved in devising individual coding systems for all the different product groups and different companies in the channel
- improve efficiency and reduce error
- allow information to be collated at any point in the distribution channel
- facilitate integration
- offer potential for intra and inter-organisational communications.

#### b. Electronic Funds Transfer (EFT)

These systems allow for the automated payment of goods and data collection at the store checkout through plastic cards (incorporating magnetic stripes storing a PIN or smart cards with microchip memory). This further involves the electronic exchange of money related information between retail store and financial institution. This practice is extended to support financial transactions across all interfaces in the supply chain, e.g., between retailer-distributor, distributor-manufacturer, retailer-manufacturer. In this latter case, EFT takes place through EDI messages exchanged between the trading partners and an involved financial institution.

Apart from the EDI-related benefits, discussed above, the application of EFT at the check-out counter results in the following improvements:

- accounting procedures are simplified
- paperwork with the associated administration costs is reduced
- security is increased as less cash is retained in the store
- accuracy of transactions increases as the scope for checkout error is reduced.

More specific benefits associated with the use of plastic cards for payment include:

- if operated through the retailer, EFT cards may effectively act as loyalty cards
- provide very specific information concerning the shopping activity of individual customers
- support identification of consumer groups and the targeting of trading strategies to these groups
- banks primarily benefit through fraud reduction and lower handling costs as paperwork is reduced
- the need for customers to carry money is removed.



### c. Electronic mail (E-mail)

Electronic mail (e-mail) supports the electronic exchange of unstructured information between individuals, simulating the regular mail service. An e-mail message, apart from unstructured text information, may have as attachment information in several other forms, e.g., formatted documents, pictures, etc.

In a business environment, e-mail provides a practical and fast means for inter-personal communication, both internally within a company and between organisations. Such a practice, although is not necessary for the implementation of any of the ECR-related applications, may facilitate a lot the communication procedures between organisations, while contributing to the co-ordination of tasks and the sharing of information and expertise.

### d. Decision Support Systems (DSS)

A Decision Support System (DSS) is a computer-based information system designed to assist both managers and analysts in the process of decision-making, through the use of sophisticated software technologies, operations research and management science models (Doukidis, 1988).

Operations research/ management science models provide the theoretical foundation for the construction of a decision support system. There are three major approaches regarding modelling: optimisation, heuristics, and simulation (Moynihan, 1995). Optimisation via such mathematical programming techniques as linear, non-linear, integer and mixed integer programming should be employed whenever possible since they guarantee the best feasible solution. Heuristics reduce the search space of a problem to a manageable number of alternatives which can then be analysed by one of the other approaches. Ballou (1985) defines simulation as a 'mathematical description of a decision problem, usually in significant detail'. This type of mathematical modelling is intended to replicate the dynamics of an existing or planned system rather than attempting to find a feasible solution.

The properties owned by Decision Support Systems are especially important for dealing with imprecise concepts and non-well defined problem areas, as for example the incalculable aspects of consumer needs in the area of category management.

In the context of the current study, the term DSS is used in its broader sense to include analytical and forecasting methods as well. As such, a DSS finds application in almost all of the aforementioned ECR business application areas, from category management and performance measurement, to logistics planning and replenishment problems, such as routing, scheduling and demand forecasting.

## **3.5. A summary of the proposed framework and its practical implications**

The following tables summarise the previous discussion by presenting three illustrative issues respectively:

- the relation between ECR business applications and enabling technologies;
- the positioning of ECR business applications within the IS growth model presented in section 3.2;
- the association of ECR business applications with the IOIS roles presented in section 3.3.



What should be noted here is that the following tables are not, in any case, inclusive of all possible ECR business applications and enabling technologies. The purpose of this section is to give an overview of the above issues, in order to increase the perception of information systems potential in the ECR context. The following grids could also be used as research frameworks supporting studies such as the examination of the industry status and maturity level regarding ECR adoption.

3.5.1. ECR business applications and enabling technologies

Table 5 illustrates the relationship between ECR business applications and enabling technologies, including core information technologies (databases, communication networks and POS systems) and software applications (such as EDI, EFT, E-mail and DSS).

- Two levels of correlation are considered:
- R (Required) indicates that the relevant core technology or software application is a necessary element for the implementation of the corresponding ECR business applications.
  - H (Helpful) indicates that although this technology is not required it would be nice to have, since it is expected to increase the efficiency of the corresponding ECR application.

ECR Application Areas	Enabling Technologies						
	Core Technologies			Software Applications			
	Databases	Networks	POS	EDI	EFT	E-mail	DSS
Continuous Replenishment	R	R	H	H	H	H	R
Physical Distribution	R	R	-	R	-	H	H
Computer Assisted Ordering	R	R	R	R	H	H	H
Category Management	R	H	R	-	-	H	R
Performance Measurement	R	H	R	-	-	H	R

Table 5. Relation between ECR business applications and enabling technologies  
(R: Required, H: Helpful, -: not applicable)

On this table we could observe the following:

- Databases are required for the implementation of all ECR applications, while networks and POS systems are also used in almost every application. POS data may be required at the lower product level (e.g. SKU) or may be aggregated at a higher level (e.g. brand).
- Electronic Data Interchange (EDI) is a necessary element of all the applications that extend past the borders of one organisation and involve communication with the outside world in a predefined format (CAO, CRP and Physical Distribution). However, in many of these cases, where communication is limited to a small number of trading partners, e-mail could also serve the same purpose.
- Electronic Funds Transfer (EFT) would be helpful if integrated with the Computer Assisted Ordering, the Continuous Replenishment and the Accountancy systems, so that together with the exchange of order and invoice information, the financial transactions would also be completed.
- E-mail plays a supportive role to all applications, through the possibility it offers for exchange of unstructured information and person-to-person communication.





- Decision Support Systems (DSS) are used here in the broader sense including analytical tools, expert systems, prediction models etc. In that sense, they are used by all the applications, either as a necessary element or in a complementary way.

The above grid constitutes a first basis for determining the IT requirements of an investment in a specific ECR business application area. Although not detailed, such a view can provide an initial estimation of the effort and resources required to undertake the investment.

On the other hand, by further expanding and filling in such a grid, one can explore complementary or totally new ways of IS support to the specified as well as to other ECR applications.

3.5.2. Positioning ECR business applications within the IS growth model

Table 5 above gives a first indication of the position each ECR business application occupies in relation to an organisation’s boundaries. This indication is implicitly provided by the degree of importance that technologies supporting inter-organisational links, such as telecommunication networks, EDI, EFT, etc., have for the corresponding business application.

Table 6 enlightens this aspect further, by positioning the ECR business applications within the information systems evolution model developed by Venkatraman (1991). Three characterisations are given to the maturity levels of IS adoption, regarding the implementation of the examined ECR business applications:

- M (Main level) indicates the basic level at which implementation of the corresponding business application takes place.
- P (Prerequisite) characterises all those levels that must have been reached, before implementation of the corresponding business application is possible.
- E (possible Evolution) suggests that full implementation or enhancement of the corresponding business application may position it to the indicated level.

ECR Application Areas	Levels of IS Adoption				
	Localised Exploitation	Internal Integration	Business Process Redesign	Business Network Redesign	Business Scope Redefinition
Continuous Replenishment	P	P	P	M	E
Physical Distribution	P	P	P	M	E
Computer Assisted Ordering	P	P	M	E	-
Category Management	P	P	M	E	E
Performance Measurement	P	P	M	E	-

Table 6. Positioning ECR business applications within the IS growth model  
(M: Main level, P: Prerequisite, E: possible Evolution, -: not applicable)

Some general comments regarding the above grid include:

- The levels of localised exploitation and internal integration are prerequisite for the implementation of any of the examined ECR business applications.
- The applications that transcend organisational boundaries (continuous replenishment and physical distribution) are mainly positioned at level 4, business network redesign, while all the rest are found at level 3, business process redesign. This fact demonstrates the revolutionary, according to Venkatraman (1991), role of ECR.



- A possible evolution of the Continuous Replenishment application, placing it at the fifth level of business scope redefinition, could be the involvement of a third-party service provider facilitating the replenishment process. Such an event may thoroughly change the relationships among the parties involved in the process and the role of the service provider.
- The same fact, combined with the electronic exchange of required information and expertise, applies to the Category Management application as well.
- Regarding the physical distribution, the redefinition of the business scope lies in possibilities such as direct home delivery and other innovative replenishment practices.

Apart from its theoretical perspective, the above grid could also be used for:

- a. Determining the maturity level, regarding the adoption of ECR, for a company, group of co-operating companies, or sector.
- b. Defining the requirements of an ECR business applications, based on the level it is introduced and the prerequisite levels.
- c. Obtaining a vision of the possible evolution of a business application and the potential of information technology and systems in supporting such an evolutionary movement.

3.5.3. ECR business applications and IOIS roles

An important observation supported by the previous grid is that all of the aforementioned business applications have an inter-organisational character, either in their current form or after potential enhancements. In that sense, an inter-organisational system is defined for each of these applications. The role of these underlying inter-organisational systems, as defined in section 3.3.1, is illustrated by the following table.

Three different roles are considered:

- M (Main) indicates the main role played by the actual or implied inter-organisational system related to the corresponding application area. More than one main roles are allowed.
- C (Complementary) indicates a complementary role, whenever this is possible.
- P (Potential) is assigned to those roles that cannot be characterised as main or complementary under current practice but could become so after potential enhancements.

ECR Application Areas	IOIS Roles			
	Transaction	Inventory	Process	Expertise
Continuous Replenishment	M	M	P	P
Physical Distribution	C	M	P	P
Computer Assisted Ordering	M	C	P	-
Category Management	-	-	-	P
Performance Measurement	-	-	-	P

Table 7. ECR business applications and IOIS roles  
(M: Main role, C: Complementary role, P: Potential role, -: not applicable)

The correlations presented on this table suggest that, under current practice, the main use of inter-organisational systems within the ECR context supports the classical business transactions and inventory management. However, there is great potential in all application



areas to expand the use of IOIS in order to support extensive information and expertise sharing.

- Some of the practical implications of this discussion include:
- a. Offering better understanding to the nature of each ECR business application and its possible requirements, in terms of organisational and information systems structure.
  - b. Determining the possibilities offered by the underlying infrastructure, based on the identified IOIS roles for each of the applications.
  - c. Suggesting complementary or totally new IOIS roles, which may deliver important strategic benefits and competitive advantage.

A visual representation of the previous discussion is given in Figure 12.

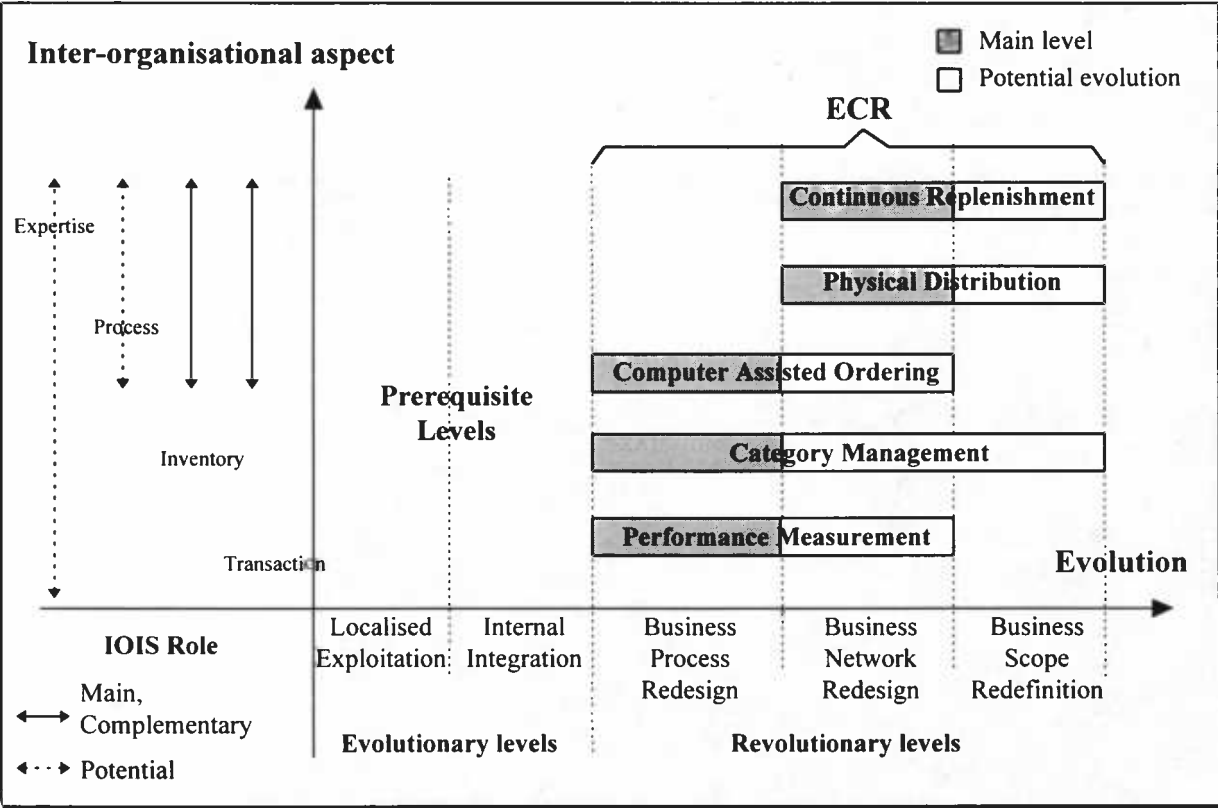
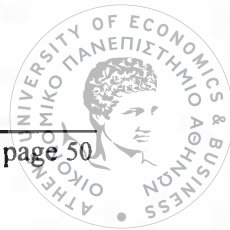


Fig. 12. ECR from an IS perspective



## Chapter 4 - CMFacts: A Category Management Analyses Tool

*CMFacts is a tool that has been developed as part of the current project, in order to support the Category Management process within the ECR strategy. The development of the tool took place in the European Technical Centre of the Procter&Gamble (P&G) multinational company, as part of the company's overall strategy regarding ECR. In the following sections, CMFacts is initially positioned within the Category Management process of P&G and its basic characteristics, associated with relevant user requirements, are discussed. The tool's higher level architecture, interface design and organisation are then described in more detail. Finally, the position of CMFacts within the previously discussed Information Systems framework is examined.*

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### 4.1. Positioning CMFacts within the Category Management process of P&G

Procter & Gamble Worldwide is one of the largest manufacturers supplying grocery retailers and wholesalers and a leader in designing how branded consumer-goods manufacturers go to market. P&G's process innovations are driven by its focus on improving consumer value by eliminating nonvalue-added processes in the channel. Changes at P&G in organisation, systems, procedures, and policies affect both the company and the entire channel. These changes are governed by the recognition that manufacturers, distributors, and retailers have to co-operate in creating industry-wide approaches to drive inefficiency out of the grocery distribution system.

Many changes leading to organisational and channel transformation were initially viewed as information systems innovations (e.g., developing systems to automate existing practices). Breakthrough change came with the realisation that the success of P&G brands depended on eliminating all processes that didn't deliver value to brand-loyal consumers (Clark and McKenney, 1995). The promotional frenzy of the late 1970s and 1980s that characterised the retail industry had produced a backlash among brand-loyal consumers, who felt they weren't getting fair value day-in, day-out. P&G studies showed that less than half of their promotional dollars were passing through to the consumer and that swings in price were creating variability and massive inefficiency, not only in P&G's manufacturing and distribution systems but throughout the entire grocery supply chain.

That led P&G to take a leadership role in working with the grocery industry to significantly accelerate the adoption of more efficient systems, policies, and practices in the grocery channel. At the same time, P&G started questioning internal processes and looking for efficiency improvements in several domains. In the area of Category Management, P&G developed a Current Best Approach (CBA) to conduct joint category management with key customers.

It is in that context that development of the CMFacts tool took place. CMFacts' objective is to help users conduct Category Management for a given product category. More





specifically, CMFacts is an analysis tool supporting decisions incurring during several steps in the category management process, as for example decisions regarding a category's definition and assessment (see section 2.2.2). Within P&G, CMFacts is initially intended to support the five-step process for efficient assortment that the company has designed internally. This process was developed at P&G by a multifunctional group of managers, including a team dedicated to efficient assortment. The dedicated team has also responsibilities for integrating software for efficient assortment into P&G's category management software and for keeping abreast of industry direction on efficient assortment (GMA ECR Strategies Newsletter).

## 4.2. CMFacts' basic characteristics

CMFacts can be characterised as a decision support tool allowing the execution of certain analyses in the area of Category Management. The analyses supported by the tool are divided into three areas: Efficient Assortment, Efficient Promotions, and Efficient Product Introductions. In the first version of the tool, which has been the subject of this project, only the efficient assortment analyses are implemented. This version is running on a Microsoft Windows PC based environment, either on a local installation or a LAN.

CMFacts is intended to be used mainly by people in the middle to higher level in the sales organisation hierarchy, who are in the position to correctly interpret the results of the conducted analyses. Other potential users of the tool are the marketing people, nevertheless, its final user group has not been defined yet.

Before going into a more detailed presentation of the tool's architecture and functionality, it's worth referring to the basic principles and requirements that guided its implementation. These include the following:

### a. User-friendliness

A basic requirement for the tool has been its simplicity and ease of use, especially since its users are not expected to have great familiarity with computers. The tool's simplicity and user-friendliness refer to several features:

- clear and understandable possibilities offered by the tool and purpose of being used,
- minimisation of the effort required to exploit the tool's functionalities,
- guidance through the process of conducting an analysis, the tool's basic functionality,
- quick presentation of results and immediate response to the interactive alteration of parameter values.

### b. Expandability-flexibility

Within P&G, the scope of the tool and the context of its use have not been finalised yet. This fact means that development of the tool needed to be in the form of a prototype, which would be flexible enough to accommodate future changes and additional requirements. On the other hand, the tool was conceived as a means which, through its use, would help to better define the process of category management and the analyses supporting it.

In terms of the tool's implementation, the satisfaction of the flexibility and expandability requirements took place on two levels:

1. The system architecture and database design were developed in such a way that the effort of accommodating future changes in basic functionalities (translated into alterations in the code etc.) is minimised.

2. The user is given the possibility to incorporate new analyses in the tool, following a default structure, or modify existing ones, regarding the presentation of the analysis' output, without the need to change the program code.

c. Output quality

The execution of an analysis refers to the calculation of specific measures, which answer certain category management questions (see, for example, tables 3 and 4 in section 2.2.3). These measures are presented to the user in the form of a graph, table or both. The quality of the output needs to be of a high standard, given the fact that the results are usually used in presentations to or in co-operation with the customers. Quality in this case refers to the attained visual effect but mainly to the clarity and comprehensiveness of the results. The user is also able to perform 'what-if' analyses, by interactively changing the parameter values and immediately seeing the variation in the results.

d. Levels of expertise

The extended functionalities offered by the tool, as the one mentioned before regarding the possibility to define new analyses, combined with the fact that the users of the tool are not expected to be all experts in computers and category management, made it necessary to introduce levels of expertise. That means that there is a differentiation in the functionalities presented to the user, depending on the user's expertise level, and this differentiation refers to the following:

- the non-expert user is not able to conduct (nor see) all the analyses supported by the system,
- the non-expert user is only able to make simple changes in the presentation of an analysis' output, as, for example, to change the title of a graph or table, while the expert user has the possibility to define totally new analyses.

e. Integration capability

The tool is expected to integrate with a number of other systems and various data sources. Integration is required both at the input and at the output level. In the first case, the tool is, for the moment, able to read data both from a text file and from Microsoft Excel application. This capability will be extended in the next versions of the tool to include automatic input from other data sources, such as other windows applications, the master P&G product database etc. Regarding the tool's output, table or graph, this can be directly exported to Excel or can be copied into any other Windows application (e.g. Microsoft Word, Powerpoint). This first feature of automatic table extraction to Excel is quite helpful for the users, since they can use techniques in Excel, which they are familiar with, to extend the tool's functionality.

### 4.3. High Level Architecture

A schematic representation of CMFacts' high level architecture is given in Figure 13.

The tool is organised in *projects*. A project database contains all the data required to run the analyses, usually relating to a certain product category and a certain retailer. This data is coming from various data sources, e.g., consumer panel data, trade panel data, POS data, the company's central database. The two first types of data (consumer and trade panel data) are usually provided by external data suppliers, either in hard-copy format tables or together with certain software applications. The owner of POS data may be a certain retailer or a third party

data provider, who has purchased the data from the former. The last type refers to the data found in the company's central database, relating to all the company's products.

All or part of the above data need to be imported into the system (into a project database, more specifically) before the user can run the analyses. For the current version of the tool, import is taking place via reading the data from a text file, the format of which may be defined by the user, or from a Microsoft Excel table.

A configuration database describes, in a generic form, all the analyses supported by the system. The use of this database provides the user with the required flexibility to modify existing analyses or define new ones, according to specific needs stemming from the manipulated data.

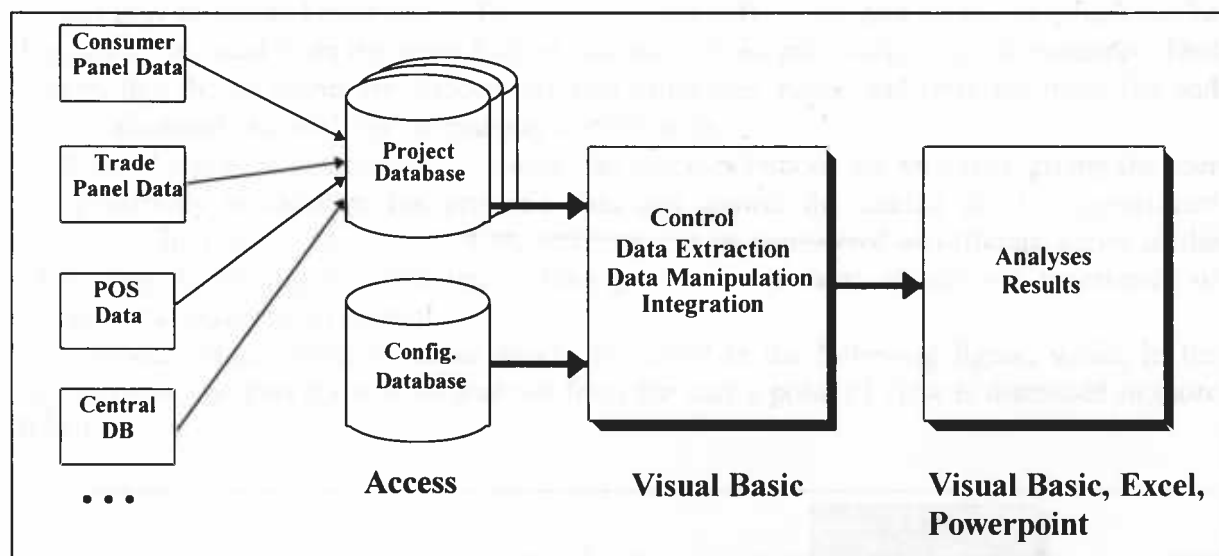


Fig. 13. CMFacts' high level architecture

The development of the configuration and the project databases has taken place on top of the Microsoft Access 2.0 software platform. A software module, developed in Visual Basic 3.0, acts as the central co-ordinator of the system. This module:

- has the overall control of the system,
- communicates with the project databases for data import and extraction,
- reads the analyses information from the configuration database,
- performs all computations required by the analyses.

Presentation of the analyses results takes place again through a Visual Basic 3.0 module. The results are presented either in the form of a table, graph or both. Automatic export of the results to Microsoft Excel is available, while their copy into any Windows Application is also possible.

#### 4.4. User Interface

One of the main concerns regarding CMFacts' development has been the friendliness of the user interface. This issue addresses many different aspects, such as the tool's clear mission and results, simplicity and ease of use, output quality etc. These issues are further discussed in the following paragraphs.

4.4.1. CMFacts' organisation

CMFacts' main screen is divided into three parts. The first part refers to the manipulation of data, i.e., the import of data from a text file or Excel table and the view of the imported (raw) data. The second part contains all those functionalities relating to the tool's customisation issues, i.e. definition of input file used for data import, definition of measures used in calculations and definition of the analyses' output. The last part consists of the analyses that the user can execute regarding a category management project.

Before being able to use any of these functionalities, the user has to open an existing project or create a new one. When creating a new project, the next step is to import data into the project database. For this purpose a default import table format may be used or the table format may be defined by the user. The user may also define new data measures, which can be imported (i.e., read from the input file) or calculated from previously defined measures. That means, that the measures are divided into two categories: those read from the input file and those calculated. An analysis' output may contain both.

When the project database is not empty, the analyses buttons are activated, giving the user the possibility to examine the project's data and answer the related efficient assortment questions. In a sense, the output of the analyses can be considered as different views of the same data, facilitating the decision making process in the area of efficient assortment or category management in general.

CMFacts' organisation is schematically presented in the following figure, while, in the next section, the execution of an analysis from the user's point of view is discussed in more detail.

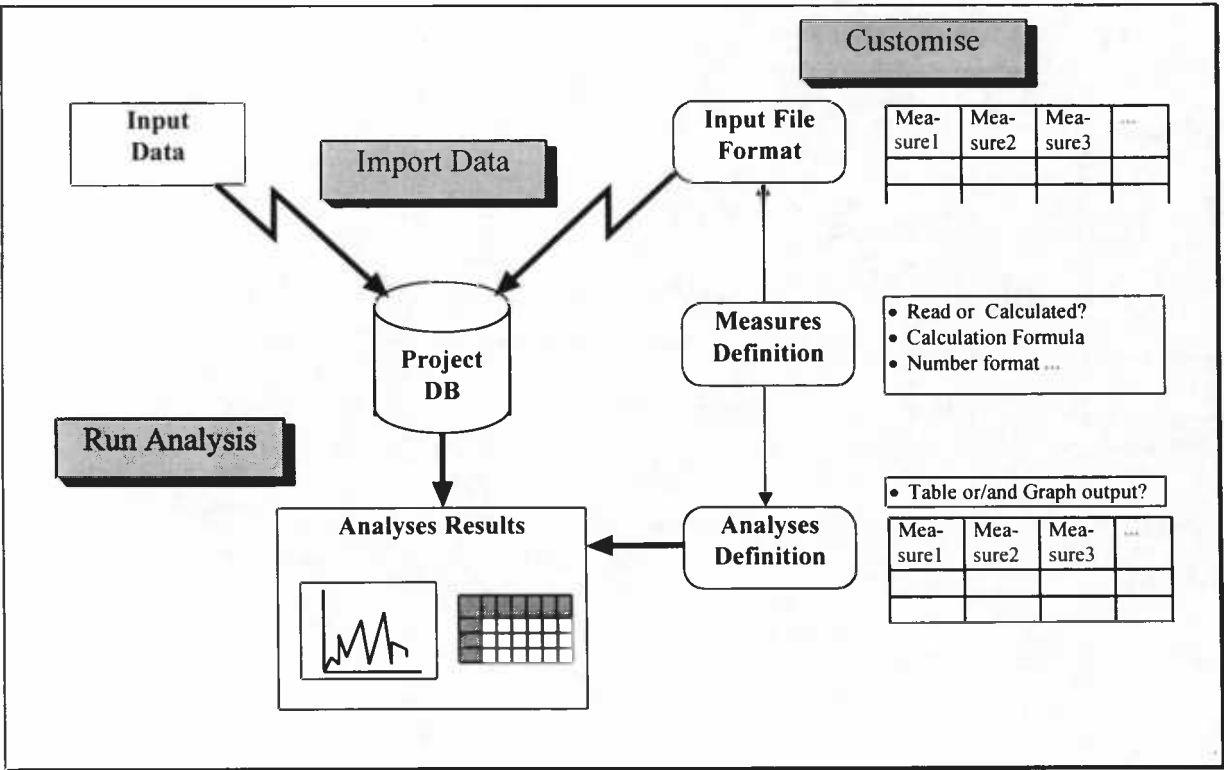
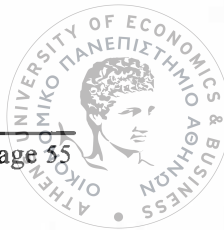


Fig. 14. CMFacts' organisation





#### 4.4.2. Analysis execution

Execution of an analysis is as simple as the click of a button. Analyses buttons are placed in ascending order of importance they have for the efficient assortment decision making process. In this way, the user is guided through the process, from the simpler analyses to the most sophisticated ones.

Some of the analyses require that the user specify some parameter values, while others require no user input. In the first case, guidance is again offered to the user in the form of a “wizard”, i.e. a window that explicitly asks the user to specify the required parameter values one by one.

As has already been mentioned, the results of each analysis are presented in the form of a table or graph or both. In the latter case, the user can switch between the table and the graph view by selecting the appropriate option in the *View* menu.

In the case of the table output, what is presented to the user is a standard table format, where each table row corresponds to a different item (SKU, brand, manufacturer, etc.) and each non-fixed (i.e. white) column corresponds to a measure. Different columns are defined for the presentation of the same measure in different forms (e.g. actual and percentage values). Each cell contains the column measure value for the row item. The first item row usually contains the aggregated values for all the items in the table (*Summary Line*).

On top of each output screen, the level of aggregation and the current item selection, according to the applied filtering, are indicated. The term *aggregation level* refers to the level in a given item hierarchy, where the items presented on the table belong to. For example, in the product hierarchy, the aggregation level may be SKU, segment, brand, manufacturer, etc. The user can interactively change the aggregation level and switch, for example, from the SKU measure values to the brand measure values.

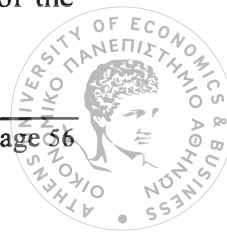
The items presented on the table may be filtered according to a certain value. For example, when the aggregation level is set to ‘SKU’, i.e., SKU information is presented on the table, the *Filter On* field is set to ‘Manufacturer’ and the *Filter Value* is set to ‘P&G’, then only the SKUs belonging to manufacturer P&G are presented on the table. This selection is indicated by the *Selection Line* information.

Apart from the aggregation level and filtering information, which appear on top of any analysis’ results, in many cases, the user may also change the values of certain parameters and immediately see the corresponding result changes, in the same way that a ‘what-if’ analysis is executed. In the above example, the parameters that can be interactively altered by the user is the number of best performers (items) that appear on the table and the measure according to which these are selected. The *Summary Line* is updated each time to depict the changes in the table values.

In the case of a graphical output, there is no differentiation regarding the aggregation level and the filtering information. Each time the user sets different values in these fields, the graph is redrawn so as to include only the points that correspond to the selected items. The type of the graph is dependent on the analysis running as well as whether and which parameters may be changed interactively.

#### 4.5. Positioning CMFacts within the proposed framework

CMFacts is a decision support system designed to support the Category Management process, through the analyses of data, coming from various data sources. However, the scope of the



tool's first version is confined to the area of Efficient Assortment, while integration with data sources is achieved to a limited extent.

The first phase of the CMFacts role-out plan within P&G has taken place. This has dealt with a) the training of the users, both regarding the new Category Management process and regarding the use of CMFacts; and b) the installation of the tool on their PCs. At this stage, people from the P&G Sales Organisation across Europe have been selected as users of the tool. These are entitled to use the tool, identify existing errors and potential improvements, determine the extent to which the new tool satisfies their requirements and supports the Category Management process, and, finally, make their suggestions. The user feedback will be taken into account during the development of the second version of the tool.

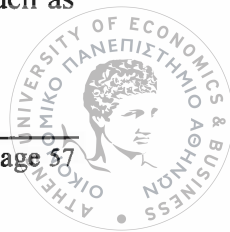
The data used to run the analyses will initially come from within P&G, as well as from external data providers. Such a use can help the company measure the performance of all its products with the purpose to identify the best ones, according to certain criteria, as well as those that are potential candidates for de-listing. This process corresponds to the task of an internal assortment definition.

However, the aim is to use CMFacts in co-operation with the company's customers (i.e., retailers across Europe) in joint-Category Management projects. Such projects have been proved especially beneficial for both parts:

- The sharing of data allows the achievement of high quality results from running the CMFacts analyses, since the principle of 'garbage-in, garbage-out' and the opposite applies in this case as well. Unless the two parts (manufacturer and retailer) co-operate, as ECR proposes, and share information and data, they cannot reach the best quality decisions they could achieve in the opposite case.
- The manufacturer has an in-depth knowledge of the product characteristics and the degree to which these satisfy consumer needs, while the retailer owns the information of purchasing habits on an everyday basis. Both pieces of information are proved especially valuable in supporting the category management decisions or for running, in the specific case, the CMFacts' analyses.
- The analyses results that are the product of co-operation, contribute greatly to the manufacturer's understanding of each product's position not only within the company's assortment but within the total market. On the other hand, the retailer may take into account more parameters, such as the consumers hierarchy of needs and decision tree, well known by the manufacturer, while defining each category's assortment, in order to increase effectiveness of decisions.
- The two parts may gain not only from the sharing of information but also from the sharing of expertise. It is worth mentioning that P&G is dedicating extensive resources for software development and research in category management, a fact that contributes to the company's being an industry leader in the area.

Based on the above, we can observe the following regarding the positioning of CMFacts within the information systems framework discussed in chapter 3:

- The first version of CMFacts belongs to the first stage of the IS adoption evolution model, that of 'localised exploitation'.
- This fact is expected to change with the development of the tool's second version, which will attempt to integrate CMFacts input with the company's internal data sources, such as the central items database.



- The next stage will address the use of CMFacts in joint category management projects with customers, involving the share of data and expertise. If appropriate, electronic links with the actual customer data sources can be established.

This last stage can be paralleled with an ‘expertise’ role (see section 3.3.1) of CMFacts, supporting the exchange of data and expertise between P&G and each of the customers it co-operates with.

The position of CMFacts within the proposed framework is summarised in the following table:

Enabling Technologies						
Core Technologies			Software Applications			
Databases	Networks	POS	EDI	EFT	E-mail	DSS
R	H	R	-	-	-	R
Levels of IS Adoption						
Localised Exploitation	Internal Integration	Business Process Redesign	Business Network Redesign	Business Scope Redefinition		
M	E	E	-	-		
IOIS Roles						
Transaction	Inventory	Process		Expertise		
-	-	P		P		

Table 8. CMFacts position in the proposed IS framework  
(R: Required technology, H: Helpful technology  
M: Main level, E: possible Evolution,  
P: Potential role, -: not applicable)

This table suggests an alternative way of using the proposed framework. That is in order to assess a specific information systems application, in terms of required technological base, position in the IS evolution spectrum, and potential role and contribution to the overall organisational structure and strategy.

Regarding CMFacts, we can observe that the extent to which it uses systems capabilities is limited and is thus positioned in the first stage of IS evolution. However, its potential to evolve to higher levels in the IS growth model and be used in an extended IOIS context should be seriously taken into account in relation to the organisation’s strategy.



## Chapter 5 - Conclusions

*This final chapter provides some concluding remarks regarding the contribution both of CMFacts and of the proposed Information Systems framework. CMFacts is assessed in comparison to the possibilities offered by related products available in the market and in terms of its acceptance rate by the users community. CMFacts development is also used as a first basis for evaluating the proposed Information Systems framework. Practical and theoretical issues, linked to both topics, are finally suggested for further research.*

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### 5.1. An internal assessment of CMFacts

Although CMFacts can be considered simple in technological terms, the characteristics it incorporates are not found in any of the category management software tools found in the market. Most of these tools are provided by external data suppliers and as such, operate only with specific data sets. The fact that all of them have been developed in USA reveals an additional inefficiency: the individual issues dealt with the fragmented and diverse European market are not taken into account. It is worth mentioning that the first European versions of these tools will not be made available in the market before the end of '96, beginning of '97; a fact that significantly increases the importance of CMFacts given the time-frame of its development.

CMFacts has thus been developed in order to meet the company's needs related to the conduction of category management projects, both within each country across Europe and at a European level. The tool's user-friendliness and overall quality has contributed a lot to its being accepted by the users (company members, mostly from the sales organisation) from the first moment. The initial roll-out phase of the tool has been completed successfully, and feedback from the users is now expected in order to improve the tool's features and further define the category management process within P&G.

Apart from being a valuable tool in the hands of P&G category management teams, CMFacts greatest contribution lies in the fact that it can effectively support joint category management projects with the customers. The possibility it offers for interactively conducting various important analyses facilitates the decision making process for both P&G and its customers, while renders P&G an expert in the area of category management. This last fact places the company in an advantageous positions compared to other manufacturing companies in the sector.

### 5.2. The contribution of this project

One of the major issues of this project was to position ECR within the Information Systems research field and explore the information systems potential in the ECR context. This was achieved by:

1. Defining the problem area and the specific informational requirements asking for efficient information systems solutions.





2. Determining certain application areas, as proposed by the various ECR principles, and exploring their requirements in terms of underlying information systems infrastructure and software applications.
3. Examining both the operational and the decision support aspect of IS employment within the various ECR specific applications.
4. Showing the relation between ECR and IS evolution models.
5. Relating ECR to the concept of inter-organisational information systems?
6. Relating all the above in a generic conceptual model with practical implications. These refer, for example, to:
  - Determining the maturity level, regarding the adoption of ECR, for a company, group of co-operating companies, or sector.
  - Defining the requirements of an ECR business applications, based on the level it is introduced and the prerequisite levels.
  - Obtaining a vision of the possible evolution of a business application and the potential of information technology and systems in supporting such an evolutionary movement.
  - Offering better understanding to the nature of each ECR business application and its possible requirements, in terms of organisational and information systems structure.
  - Determining the possibilities offered by the underlying infrastructure, based on the identified IOIS roles for each of the applications.
  - Suggesting complementary or totally new IOIS roles, which may deliver important strategic benefits and competitive advantage.

### 5.3. Further research

The information systems framework presented in this document, on one hand, and the experience gained from the development of CMFacts tool, on the other, form a sufficient basis for extending IS research in the area of ECR.

Until now, the topic of ECR has mostly been addressed from a business point of view, while the available documentation is mainly work of consulting companies. The current work is expected to introduce the ECR concept in the information systems research field, in order to further explore the information systems potential in that context.

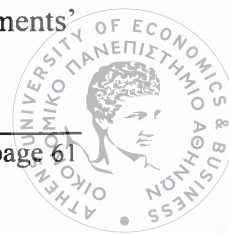
Possible topics for further research include:

- Determining the maturity level regarding the adoption of ECR at a company or sector level. The proposed information systems framework could contribute to this effort, through the relation it provides between information systems use in the ECR context and level of evolution in the adoption of IS.
- Prototype development of innovative information systems meeting the ECR requirements and informational needs.
- Estimating the impact of the ECR proposed reorganisation and restructuring of business processes, both internally and at an inter-organisational level.
- Explore further aspects of IT induced business reconfiguration and scope redefinition, such as alternative market formats and home shopping.



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## 7. Glossary

<b>ABC</b>	Activity Based Costing
<b>CM</b>	Category Management
<b>CAO</b>	Computer Assisted Ordering
<b>CRP</b>	Continuous Replenishment Program
<b>DSD</b>	Direct Store Delivery
<b>DSS</b>	Decision Support System
<b>ECR</b>	Efficient Consumer Response
<b>EDI</b>	Electronic Data Interchange
<b>EDLP</b>	Every Day Low Pricing strategy
<b>EFT</b>	Electronic Funds Transfer
<b>IOIS</b>	Inter-Organisational Information Systems
<b>IS</b>	Information Systems
<b>IT</b>	Information Technology
<b>POS</b>	Point Of Sale
<b>SKU</b>	Stock Keeping Unit
<b>VAN</b>	Value Added Network

