Challenges for Automatic Home Supply Replenishment in e-Retailing

George Roussos[1], Panos Kourouthanasis[2],
George Lekakos[2] and George Doukidis[2]
[1]*Pouliadis Associates Corporation, 142 Syngrou Avenue, 17671 Athens, Greece, email: g.roussos@acm.org,*
[2] *Athens University of Economics and Business, 47A Evelpidon Str., Athens, Greece, email:* pkour@aueb.gr

Abstract. Recently, there has been significant interest by both business and academia in wireless product identification and related technologies. Such technologies offer the opportunity to provide total supply chain management across organisations and represent a major step towards the realisation of the aims of the Efficient Consumer Response (ECR) initiative. A major experiment of these concepts in e-retailing and after-sales using standards compliant radio frequency identification (RFID) and wireless networking infrastructures is the MyGrocer project. Building on the experience gained through MyGrocer we identify the major obstacles for the efficient and effective adoption of such technologies in retailing as well as barriers in customer perceptions that must be overcome for a successful deployment of relevant services to the end consumer.

1. Introduction

In its quest to offer value-added services to current business practice, eCommerce expands into services increasingly cost efficient and consumer-oriented. At the same time the retail sector attempts to expand efficiency levels with Internet based collaborative, cross-organisational supply chain models [3] that provide a direct, shared and cost efficient channel from the supplier all the way to the customer. This interaction brings a novel kind of service, which is on demand, ubiquitous and personal. This paper reports on the experience gained through the EU funded MyGrocer project (IST 2000-26239) which aims to provide the service of automatic replenishment of home supplies (a service also known as vendor managed inventory or VMI) through monitoring of radio frequency identifiable consumer goods.

Indeed, the main objective of MyGrocer [5] is to introduce advanced B2C e-services over intelligent mobile access devices, to enable full interactivity, personalization and automation of the replenishment process of home supplies. The project focuses initially on products in the grocery sector but it is designed to facilitate future extensions to the retail sector in general. To this end, it develops the necessary infrastructure for the products, the supermarkets and the ”smart” homes, as well as a supportive mediation platform to act as the gateway between retailers and consumers, providing personalized services to consumers and advanced marketing facilities to retailers.

However, a global deployment of MyGrocer faces several challenges both technological and societal. This paper will focus on the required supporting infrastructure to MyGrocer before it enters the mainstream. In particular, the focus of this paper is on the need for standardization in identification product codes and

electronic product catalogues and electronic business processes. Successfully resolving issues relating to consumer trust and protection of user rights will also be addressed.

2. The efficiencies of electronic inventory management

The use of RFID technologies for e-retailing [1, 2, 4] focuses on its ability to provide faster inventory counts based on shelf content as well as significant reductions in point of sale (POS) costs. In particular, it has been estimated [2] that in a typical supermarket out of stock conditions cause up to 3 percent loss of revenue due to the loss of sales.

According to a study by Andersen Consulting, in 53 percent out of stock conditions are due to store replenishment inefficiencies. Even worse, a further 8 percent of on the floor out of stock conditions occur despite the fact that the necessary supplies are in storage on site. A possible solution [2, 6] to this problem is to distance the store from the ordering process, that is to establish ordering on the basis of consumption. A goods receipt system that automatically and accurately adds incoming material to inventory book-keeping combined with point of sales (POS) demand information, enables new, possibly order-less, replenishment solutions between distribution centres and supermarkets. It is expected that this approach would reduce significantly out of self-stock conditions.

For an automatic goods receipt the identification of products would not have to be item level, transport package or pallet level identification would already be sufficient. For after sales, wireless product identification technologies also make new customer service models possible. Especially in the business-to-business situation new solutions based on wireless product identification can create notable after sales benefits to the customer.

For example, RFID technology could be used as the basis for new after sales solutions by constructing a portable maintenance database that may be updated with each service transaction. In the case of a grocery product, when the customer exhausts her inventory and discards packaging, the tag is read, the database is updated and a consumption alert generated and delivered to the customer most probably through her mobile device (Gould, 2000).

3. Technology standardisation for interoperability

In order to fully exploit the MyGrocer business opportunity it is necessary that all IT systems from the manufacturer all the way down to the consumer must be compatible, in the sense that they must be able to exchange data in a meaningful way. Although in theory it is conceivable that this may result through peer-to-peer agreements the complexity of this task becomes unmanageable in the long run. Thus the need for standards. Indeed, the requirement for interoperable supply chains has been recognised by both vendors and regulators and thus several standards bodies are currently working on different aspects of collaborative commerce.

Standardization efforts relevant to MyGrocer are in the areas of product identification and intelligent tagging, business processes and data sharing and exchange. Central in this respect are the efforts of the Global Commerce Initiative (GCI). GCI is not a standards body but rather a coalition of user groups and initiatives. Its work is expected to result to standards through traditional bodies in this filed, for example EAN International and the Uniform Code Council, Inc. (UCC). Although the technical details that underlie these requirements are beyond the scope of this paper, in this section we will discuss briefly the missing components before a successful global deployment of MyGrocer type services.

The first MyGrocer requirement is for the uniform identification of products and automated data capture along the supply chain. The current situation is that there exists a range of complementary standards and implementation guidelines, a fact that leads to confusion for users in most cases. On the other hand, GCI aims to create a set of clear implementation guidelines for a global recommended standard for identification of products and evaluate its costs and benefits, thus defining a clear migration path for users.

One of the core requirements for the success of this aim is that the developed standard [7, 8, 9] has global scope and that it includes current UCC, ECCC and all EAN Numbering Organisations. Thus, GCI aims to address Product Identification so as to remove barriers that hinder the free exchange of goods across borders. It is expected that widespread adoption of any resulting standards will be through the use of the collective involvement of GCI members to recommend improved standards and best practices. As part of this effort, GCI expects to deliverable a unified standard for the resolution of current divergent product lists as well as an integrated system to ensure current work fits with emerging technologies, primarily RFID.

A second MyGrocer requirement if for the development of a globally adaptable, flexible Product Classification system for the general merchandise and grocery business. This is particularly important as a catalyst to foster competition within the market segments, especially for own and budget shopping. The product classification should also provide methods for item set-up, maintenance, authorisation and query. A first version of the Product Classification for Food & Beverages has been developed by GCI and is available since April 2001. It is currently planned that the product classification system will be extended to cover the apparel, drug, food service, general merchandise and indirect purchasing segments.

The third requirement of MyGrocer is for the extension of Enterprise Resource Planning (ERP), Advanced Planning and Forecasting (ASP)and Supply Chain Management (SCM)systems to cater for the free information flow between and across trading partners. Indeed, ERP is internally focused and ensures that all departments within the same organisation talk the same language and ASP does for planning what ERP does for execution. Last but not least, SCM succeeds in facilitating the synchronization of information between organisations. Alas, ERP, ASP and SCM although they have undergone significant evolution have at their basis a fundamental focus on transactions.

On the other hand, the commerce over the Internet has opened up new channels but it does not imply that simply putting activities over the Internet immediately changes

the nature of the relationship between trading partners. Internet-based Collaborative planning is that consumer behavior could be communicated ”live” within multiple levels of the value chain (or trading partners) so as to make public the interpretation of the change in pattern. Instead of focusing on individual transactions which most frequently disguise the true nature of demand, the wholesaler and manufacturer could collaborate on the interpretation of change. If they collectively agreed that the demand change was real, they would collectively accelerate product push through the supply chain without any locally harmful effects. To this end the VICS CPFR and the ebXML efforts have produced specifications for process description and data exchange which bring this target closer to realisation.

Thus, a key requirement of MyGrocer is for real-time, global, secure and simultaneous communication: Real-time updates are necessary since if the information is outdated it losses its value; global is an implication of the fact that participants in a particular value chain may be from diverse geographic locations; security is paramount if trust is to be established across multiple trading partners and simultaneous since each value chain is a many-to-many relationship which is also the root of complexity of the phenomenon. Indeed, information is shared between numerous interested parties at the same time.

4. Social barriers to service adoption

Aiming at capturing user requirements MyGrocer project conducted research into consumer perception of its services. Research was carried out in Athens, Greece and there are plans to repeat it in Helsinki, Finland. Four focus groups were presented with a description of the MyGrocer services in development and were asked to discuss the implications in their everyday life.

Barriers to acceptance of the MyGrocer services referred primarily to the collection and processing of personal data as well as to the installation of RFID readers (perceived as monitoring devices) in consumer homes. A fundamental distrust in technology and technology providers in particular made the vast majority of the interviewees skeptical about MyGrocer. Especially the home scenario was treated with particularly negative remarks.

Substantial skepticism about the fair use of purchase statistics accumulated per customer was expressed by a number of respondents. A large percentage of them was particularly concerned about the use of this information: the sensitivity of this group was triggered principally by the eponymous customer identification and the idea of a preference list created by an analysis of their own purchase history.

A second barrier of acceptance lied in the fact that the suggested shopping format for some respondents seemed to imply a life-style regulated by technological means. In addition to this, the idea of a preference list based on a historical record of their purchasing habits appeared threatening and patronizing. In fact, most interviewees rejected the possibility that their behaviour could be effectively captured by any kind of information technology system since they considered their shopping activity unpredictable to anyone but themselves. The implication of close monitoring of their activities and the resulting promotions was considered as limiting to the fun of

shopping and contrary to the concept of shopping according to their mood and individual needs at any particular time. Furthermore, several respondents objected to the implications of this scenario in employment since MyGrocer services were perceived to limit working positions at supermarket stores.

The in-home scenario created strong defensive attitudes among respondents. This fact may be primarily attributed to the perceived intrusion of consumers' homes by monitoring devices which are perceived as the centerpiece of their private lives. As a direct consequence to that, respondents felt the need to defend their family environment by external factors. Individual habits were perceived as in need to be treated with the utmost discretion and thus the idea that they could be monitored and examined by experts for the benefit of retailers was strongly opposed to. Some interviewees even questioned the ability of technology providers to protect customer rights and as evidence to that they cited the currently frequent defacements of commercial web sites.

5. Conclusions

In this paper we have discussed the implications of emerging wireless product identification technologies for vendor managed home inventory. In particular, we claim that to maximise the return from the introduction of such services it is necessary to accelerate the adoption collaborative commerce processes. On the other hand, collaborative processes over the Internet depend on the adoption of open standards and provision of access to internal processes to trade partners. A significant step to this direction is the introduction of the GCI product code and categorisation as well as the e-business process specification. Furthermore, a crucial step to this direction is the development of trust relationships with end consumers. Since VMI depends on personal data sharing between vendor and consumer, the intimacy of this relationship reaches an unprecedented degree.

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