E-COMMERCE SUPERMARKET SYSTEM: CONCEPTS AND IMPACT

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Abstract: The key of being competitive in today's world for the manufacturers is to enrich the range of products that can be sold in a make-to-order environment, to minimize the delivery time to the client and to maximize the production in order to improve profitability. The best solution is to eliminate the retailers and to sell directly to the clients, using specialized software that groups the received orders in batches, on family of products. This article presents an original implementation of an e-commerce supermarket system – SUM. The paper briefly summarizes the software architecture of the SUM system, the concepts and impact of the software.

Keywords: e-commerce, make-to-order, management, software architecture

I. INTRODUCTION

In the last years the concept of make-to-order is more and more important as the manufacturers faced to a decrease of the volume from their main retailer customers.

This concept is at the core of the SUM system. We performed a literature investigation on this subject and the results found are summarized here.

The term make-to-order is originating from the area of production and operations management and it is often contrasted with make-to-stock. Both terms are referring to specific classic manufacturing operations strategies (Gupta and Benjaafar, 2004).

The main characteristics of make-to-stock production systems are: i) products are generally produced in batches, stocked ahead and shipped immediately as customer order is received; ii) finished good inventories for most of the items are held. The benefits are that customer delivery times are minimized and response time in fast as expense of inventory holding costs. The major drawbacks are that production to stock becomes costly and impractical when the variety of products is large and that it becomes risky when demand is highly variable and/or products life cycle is short.

To avoid this problem, the concept of make to order is more preferably. Using this strategy the production is initiated only when a customer order is received. There are a large number of configurations and that is why each item is negotiated with customers.

The main characteristics of make-to-order production systems are: i) production is not initiated until a customer order is received; ii) customer orders are backlogged and due dates for each item are negotiated with customers; iii) there is a large number of product configurations and no finished inventories are held. The benefits are that financial risks are reduced and the variety of products is large. The drawbacks are that customers experience long lead times and the work in progress level is high. It is needed the help of a retailer which would group the orders from clients in batches and then send them to manufacturer,

grouped.(Andel, 2002; Nandi and Rogers, 2003) The idea of the SUM system is to permit the manufacturer to sell directly to the clients without the help of a retailer.(Roberts, 2003)

Three project objectives have been identified in SUM: i) the development of new e-commerce software to enable manufacturers to sell their products directly to their end customers in a make-to-order environment; ii) the improvement of current business practices to enable manufacturers to make a smooth transition from selling via a retailer to selling directly; iii) the development of guidelines to help manufacturers to build more effective supply chains. The estimated benefits of the software are: to improve the profitability of manufacturing companies, to improve the stability of manufacturing industry, to improve manufacturers responsiveness in fashion change, to reduce the overall lead time of supply chains, to reduce the seasonal variations that put a strain on the supply chain and to improve the business practices of the manufacturers.(Badica *et al.*, 2004)

It will group the clients ordered products on families of products. If two products have common stages in manufacturing process it is considered to be from the same family. Even if there are small differences between products, this grouping is benefic for the manufacturer to reduce production costs. The production costs are generated by the changes that need to be made on the production line when changing the manufactured products, or only the characteristics for the same product. It is more reliable to produce, for example, 100 white t-shirts once, then 100 yellow t-shirts, than to produce 30 white t-shirts, then 50 yellow t-shirts, then 70 white t-shirts and after that 50 white t-shirts.

The availability of a high product variety or the ability to sell directly to the end-customers in a make-to order environment, while maintaining a high profitability rate, are often conflicting with the objective of quick response time. The client's order is not delivered to the manufacturer immediately, but only when the conditions of profitability are fulfilled. For most companies the system might need to accumulate significant volume of ordered products to ensure the profitability (Gupta and Benjaafar, 2003).

To avoid the case when an order waits forever to be delivered, the manufacturer has the possibility to customize those conditions so the volume of orders might be lower.

The paper is structured as follows. Section II gives an overview of the concepts underlying SUM and presents the main components. Section III the effects of the software in the manufacturer's business transactions. Section V lists some conclusions and points to further work.

II. CONCEPTUAL ARCHITECTURE

The system has three main modules: administration module, batching module and database module.

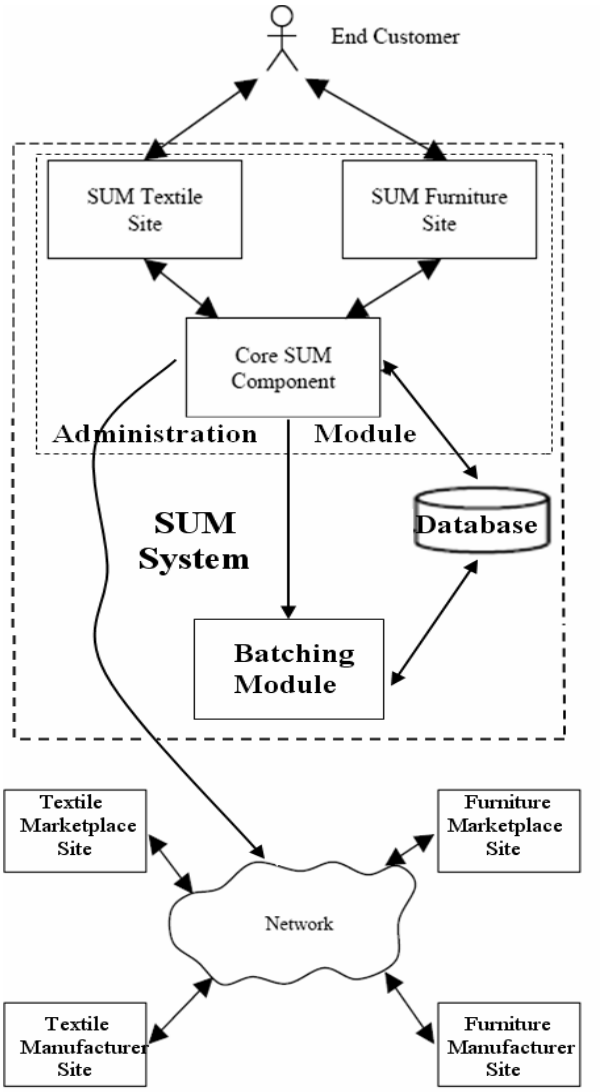

Fig 1. SUM system architecture

As can be seen in the system diagram shown in figure 1 there is a core component (administration module) that is responsible with the batching function of customer orders and the interface with the manufacturers' sites. In order to fulfill its function the administration module has three sub-modules: textile module, furniture module and the core component. It communicates directly with the client to get orders, database, batching module and manufacturer.

It receives the order from the client, adds it in the database, sends its identification to the batching module for processing and sends the results to the manufacturer.

The batching module communicates only with the administration module from which it receives orders and with the database.

When a client adds an order, the order is received by the administration module and then added to the database. The administration module sends the id of the received order for processing by the batching module. The batching module: receives the id, reads the order details from the database and starts processing.

The batching module communicates directly only with the administration module from which it gets the order id.

III. EFFECTS OF THE SOFTWARE

The effects of the software can be broken down into the following categories:

- Cultural
- Dynamics
- Manufacturing
- Supply Chain

We will discuss the cultural impact first of all. The concept of selling direct to the end consumer requires a radically different approach to that used via a retailer. The manufacturer in effect becomes the retailer and he has to carry out the prime functions of a retailer. This means he has to brand his products, a concept which is completely alien to many manufacturers.

This in turn requires a strengthening in marketing and sales skills within the manufacturing. None of this particularly difficult provided that the desire and approach are correct. Next we will turn to dynamics.

In a conventional make to order environment the manufacturer relies upon the retailer for the order. He cannot be certain of quantity, price or delivery.

The removal of the retailer changes the calculations under which the manufacturer operates. He has more confidence about quantity since he can see a the end user demand level which is likely to be flatter and more constant than the high peaks and troughs he receives via a retailer. He sets the price so pricing confidence will be higher. He will also set the delivery date. However in this respect pressure on delivery dates will increase rather than decrease because there is no cushion between him and the end consumer.

Given these factors we expect to see a production shift from make to order to make to stock. Increased confidence in quantity and price will make it viable for the manufacturer to shift some production from make to order to make to stock. When this transition has been made the manufacturer retains all the benefits of quantity and price whilst removing much of the pressure on delivery dates. This combination of factors can be expected to make a significant contribution to a radically improved industry.

We will now discuss manufacturing. To maximize profitability, a much greater emphasis is placed on end product flexibility. Production costs can be kept to a minimum when many products use the same or similar processes. We foresee the reaction to this increased emphasis to occur in the three stages.

The first stage is product planning where the manufacturer plans how he can use his existing techniques and machinery to be able to sell more flexible ranges of products.

The second phase we expect to be that of improving the techniques to increase the flexibility.

The last stage we can foresee is modifications to machinery to provide additional levels of flexibility. The extent to which this occurs will depend upon the scale of the transition to the use of e-commerce across industry as a whole.

Lastly we will discuss the supply chain. For companies who do not manufacture the end product, the ability to sell make-to-order products directly to the end-consumer may seem of little relevance. However this is not so.

The new software will allow a company to sell products it does not have in stock.

If a company already has a discipline of controlling sub-contractor processes (eg. a weaver using an outside company for the dyeing and finishing processes) then new variations on existing supply chains become possible.

Via the new software it is possible for a weaver who manufacturers fabric for garments to sell the end product by treating the manufacture of the garment as an outside process. The same is true of a weaver who manufacturers fabric for furniture.
This opens up the following possibilities:

- Increased innovation throughout the supply chain. For example, if a weaver manufacturers a new fabric then he should be able to control its sale through to the end consumer more effectively.
- Improved profitability. For companies who wish to control the sale of the end product, greater profits can be expected since they will have control of the end-selling price.
- Improved partnership. The ability of any company within the supply chain to sell the

end product should create an equal supply chain resulting in a greater degree of full partnership.

To put this another way, selling directly from the manufacturer to the end consumer creates a control vacuum which will be filled. This will be filled by producer of the end product in the majority of cases, However, it provides the opportunity for an innovative producer who is not the manufacturer of the end product to take control by the sale of products which feature heavily his component.

IV. CONCLUSIONS AND FUTURE WORK

In this paper we presented the work that has been done so far to develop an e-commerce supermarket system based on the concept of make-to-order.

We presented the basic ideas of the implemented software. This software is a prototype and does not provide all the required functionalities, which are the topic of further project work

REFERENCES

Andel T. (2002) From Common to Custom: The Case for Make-to-Order. A Penton Publication: Material Handling Management, November 2002.

Badica C., D. Burdescu, G. Vladut, C. Comsa, R. Mitrica, M. Roberts and L. Carter (2004). Make-to-Order E-Commerce Supermarket System. Concepts and Software Architecture. Scientific Bulletin of "Politehnica" University of Timisoara, Transactions on Automatic Control and Computer Science, vol.49(63), no.3, Timisoara, Romania, pp.123-126

Fisher M, G. Hamilton and R. Cattell (1999). JDBC Database Access with Java: A Tutorial and Annotated Reference, vol. 2

Gupta G and S. Benjaafar (2004) Make-to-Order, Make-to-Stock, or Delay Product Differentiation? - A Common Framework for Modeling and Analysis. IIE Transactions, vol.36, no.6, pp.529-546, June 2004

Nandi A. and P. Rogers (2003). Behavior of an Order Release Mechanism in a Make-to-Order Manufacturing System with Selected Order Acceptance. Proc. of the 2003 Winter Simulation Conference (S.Chick, P.J. Sanchez, D. Ferrin, D.J. Morris, eds), pp.1251-1259

Roberts M. (2003) E-Commerce Supermarket System. Eureka SUM Project Proposal, August 2003.