BUILD-TO-ORDER IS NOT THAT EASY: ADDING VOLUME FLEXIBILITY TO MASS CUSTOMIZATION

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Abstract
The present paper reports preliminary observations from a longitudinal case study of the Lawn Mowers & Garden Tractors business unit of Deere & Company. This business unit is interested in analyzing the applicability of a Build-To-Order strategy for its business. By analyzing the problems related to the simultaneous pursuit of volume and mix flexibility we propose a model explaining how these two trade-offs can be simultaneously addressed. We then speculate about the compatibility of the techniques generally advocated to address either volume or mix flexibility, in this case where these two trade-offs have to be jointly reduced.

Keywords
Build-To-Order, Mix-Flexibility, Volume-Flexibility, Case Study, Theory Building

INTRODUCTION

From consumer electronics (Trommer & Robertson, 1997) to automobile (Howard et al., 2001) to apparel (Aiclmyr, 2001), firms in these and many more industries are being encouraged to adopt what the popular press has dubbed Build-to-Order (BTO) in order to efficiently and effectively manage the increasing market volume and mix uncertainties that are being levied on these firms. Building products to order, in a literal sense, means aligning the product creation and order fulfillment processes to specific customer ordering requirements, usually by adopting one or more approaches described in the Operations Management lexicon such as Assemble-to-Order, Make-to-Order, and/or Purchase-to-Order (see Kraemer et al., 2000; Svennsson & Barford, 2002).

What is driving these manufacturing firms to BTO is the real need to reduce the financial and commercial risks stemming from trying to serve uncertain consumer markets – uncertainty in terms of both market volume and mix – with finished goods inventories. As uncertainties in market volume and product mix increases, the risks that these manufacturing firms face increases tremendously. Not only do they face the costly risk of unsold finished goods inventory sitting in a warehouse and/or distribution center, but they also face the risk of missing out on commercial opportunities because one or more products offered in their mix that are selling are not available in finished goods inventory. BTO promises to reduce not only these risks but also the internal operational performance tradeoffs that manufacturing firms typically face between being flexible in terms of production volume or being flexible in terms of production mix.

Hence, for manufacturing firms transforming to BTO, this strategic imperative signals a major departure from the traditional Make-to-Stock approach, typical of mass production, where batches of various products are produced in relatively high quantity and often in advance of demand. As Holweg & Frits (2001) suggested, becoming BTO will necessitate a rethinking, in an integrated fashion, both how products are designed and offered to customers and how processes responsible for delivery of these products are designed. Undoubtedly, past research on how manufacturing firms can successfully achieve product mix flexibility (e.g., Berry & Cooper, 1999; Shanling & Tirupati, 1997) or volume flexibility (e.g., Khouja, 1997; Jack & Raturi, 2002) will be most informative in facilitating this transformation, if and only if the choice was between pursuing product mix flexibility versus volume flexibility but not both. What BTO requires is the pursuit of both product mix flexibility and production volume flexibility in order to counteract market volume and mix uncertainties. Herein lies a major gap in literature. *At present, we do not know what innovations and changes must a manufacturing firm make to the way existing products and manufacturing processes are designed in order to successfully transform to BTO.* Furthermore, since product design, process design, and supply chain design decisions have to be integrated to support one another (Fine, 1998) and since firm performances can be dramatically impacted by performances of supply chain partners, *we must also understand what innovations and changes must a manufacturing firm make in configuring its supply chain to support the transformation to BTO.*

To provide insights into the two questions raised above, we propose to engage in longitudinal case research to study the transformation and evolution of the Lawn Mowers and Garden Tractors Business Group (LMGT) of Deere & Company. This particular business group is ideal as a research setting given the corporate decision to pursue a "Build-to-Order" competitive strategy.

1. METHOD

We developed an interview protocol of open-ended questions to be answered by key personnel at the Horicon WI facility. Working with company mangers, we identified and targeted the plant manager, the accounting manager, relevant product design engineers, relevant manufacturing process engineers, relevant supply management specialists, and one critical 1st-tier supplier for interview data collection. Interviews were conducted onsite by 2 or more members of the research team and were taped (a) to avoid loss of information or distortion of meaning and (b) to allow for an assessment and verification of content validity after transcription. During interviews, supporting archival documents and records (e.g., design specifications, workforce policies, plant layouts, promotional materials, etc.) were collected for triangulation with interview data. Taped interviews were subsequently transcribed, checked for transcription integrity, and triangulated against archival data.

With the interviews concluded, we performed intra-case analyses adopting the coding techniques recommended by Strauss (1987). We first clustered interview data into large conceptual categories (open coding) and subsequently identified sub-categories (axial coding), according to an indented coding scheme (see Rubin, 1995). The purpose of these analyses is to gain a clear understanding of the different contexts embedded within the cases and to identify the main themes and/or variables relevant to the research agenda.

2. THE BUSINESS UNIT AND ITS COMPETITIVE ENVIRONMENT

John Deere's Lawn Mowers and Garden Tractors Business Group operates in the Outdoor Power Equipment industry, which includes the Lawn and Garden Equipment industry. Although it exports to over 60 countries, its main market is the US. The US Lawn and Garden equipment market is a highly competitive one, for multiple reasons. First of all, it is big enough to attract strong manufacturers, as it was approximately worth $12 billion in 2002. Consequently, it cannot be considered a business populated by niche manufacturers that can enjoy relatively generous margins as small market size preempts the competition of large manufacturing corporations. Second, it has been growing very slowly from late 90s through the early 2000s, and such trend has been exacerbated by economic slowdown in 2001. Nevertheless, the Lawn and Garden Equipment market is expected to be steadily growing in the future, under the combined effect of aging baby boomers and exploding housing market. From a distribution standpoint, approximately 70% of retail is controlled by home centers (e.g. Home Depot) and discounters (e.g. Wal-Mart). Needless to say, the huge market power of these large distributors tends to shrink manufacturers' margins. Finally, from a technological standpoint, Lawn and Garden Equipment industry entry barriers are low as its main product, the lawn/garden tractor, is mature. Lawn/garden tractors, in fact, mostly incorporate well known automotive and mechanical technologies.

2.1 Seasonality

The Lawn and Garden Equipment industry is structurally affected by a severe seasonality. Most of customers sales concentrate in spring and early summer, as people either buy L&G equipment when they need it or they are likely to postpone purchase. In the specific case of the plant under analysis, gross market demand typically displays 1:7 variation, when we compare the month with lowest demand level with the peak month. Figure 1 illustrates demand variation in 2001 for a product family manufactured within such plant. Although other product families may display different variation ranges (from 1:4 up to 1:10), the demand pattern is the same, i.e. we have most of demand in spring and summer.

Unexpected weather conditions may affect the shape of the aggregated demand curve, for example shifting it forward or backwards in time. Unpredictable weather conditions, therefore, add a dimension of uncertainty to the complex task of serving a market with such drastic demand variations.

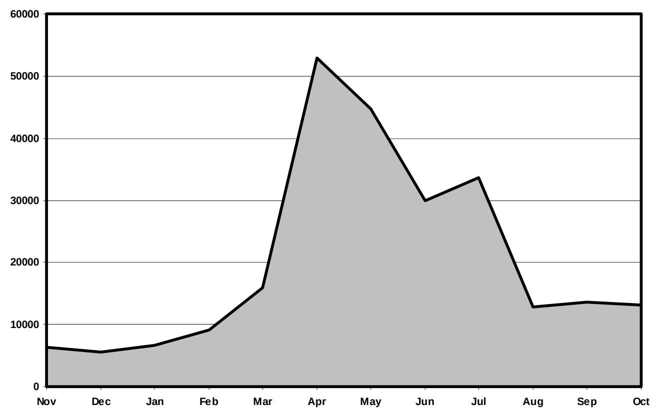

Figure 1: Aggregate monthly demand variation for one of the product families manufactured within the plant under study

2.2 Segmentation

A second source of complexity and uncertainty in serving the Lawn and Garden Equipment market is related to the heterogeneity of customer needs. A first essential distinction is that one between Lawn and Garden tractors. Lawn tractors are essentially intended as lawn mowing machines. They can be used to perform other gardening work, such as throwing snow and towing small utility carts. On the other side, garden tractors can be seen as a scaled-down version of the tractor used in agriculture, as they have a significant plowing capability, they can till relatively heavy carts, can work as front loaders, etc. besides the greater versatility and operational capabilities (e.g. see Figure 2a), these machines are more robust and more durable than lawn tractors (see Figure 2b). Needless to say, different operational capability and durability imply different price, which can roughly range from $2,000 (entry-level riders) up to $12,000 (top-of-the-line X series).

For each product family – namely riding mowers, LT-LTR, SST, LX, GT, GX300, X400, X500 – a set of product models can be selected by the customer. Typically product variants differ across a product family in terms of engine power and brand, mower deck size, mower deck engaging mechanism, tire size and other accessories such as cruise control, hour meter, etc.

Finally, once a customer has chosen a product model within a certain family can customize it with appropriate attachments, such as grass collection system, snow thrower/blower, sprayers, etc. Assortment of attachments is wider for more powerful and expensive models, while it is more limited for simpler, cheaper and less powerful models.

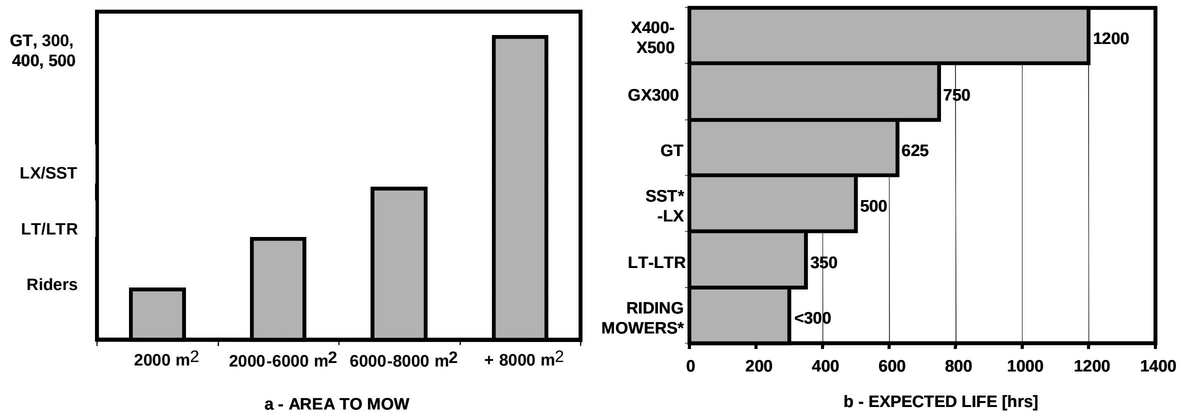

Figure 2: Product differentiation in terms of area to mow and durability

2.3 Product change

A third source of complexity is related to the fact that product families are subject to significant variation across time. As lawn/garden tractors are essentially mature products, product change can be minimally related to the incorporation of new technology. Hence, the market is the fundamental driver of product change.

In understanding how market dynamics affect product offer across time we have to discern two different factors. On the one hand product change is driven by the evolution of customer needs, meant both in terms of end customers and retailers. On the other hand, product change is the byproduct of marketing decision means to tackle on the short term actions taken by competitors.

As for the evolution of customer needs is concerned, we have to distinguish between customers and retailers. Customers may look at a lawn/garden tractor with very different eyes. Some customers may take gardening as a matter of pride and “prestige” in their neighborhood, while other see gardening as “a chore”. Such attitudes towards gardening work translate into different requirements and willingness to spend on gardening equipment. As customers become more and more aware of what they like and dislike, companies in the Lawn and Gardening Equipment industry moved toward offering more and more product variety. John Deer Lawn and Garden Business Group is no exception to such trend, as the number of product families jumped from 3 in the early 80s up to 10 in the early 2000s (see Table 1).

On the other side, the evolution of distribution channels, with the establishment of powerful retail chains and of speci alty stores further emphasized the effect of greater customer heterogeneity. Home centers and discounters concentrated on the mass market and, to some ex tent contributed to develop it. The mass market typically absorbs entry-level models and it is e xtremely price sensitive. Price sensitivity and volume justify the development of ad-hoc products and brands to serve such kind of retailers. On the other side, specialty stores and dealers focus on more up-scaled models and more demanding customers. The price premium customers are willing to pa y, as well as their ability to e ngage in comparisons with competing tractors, commanded companies competing on this segment to provide an adequate.

Finally, the very dynamics of competition across different manufacturers of Lawn and Garden Equipment led marketing organizations to further proliferate product variety in order to keep the pace with competition and to try to differentiate product offer. For example, in order to match competition J ohn Deere is offering both a 20hp a 22hp and a 21 hp Kawasaki gasoline engine. Overall, its tractor product families use a total of 16 totally different engines over 37 models! Other product chang e may require styling and product distinctiveness. F or example, to emphasiz e the 0-turning -radius capability of SST, it comes with its own spe cific steering wheel, made in two c olors unlike all the other steering wheels, which are black. The need to frequently update and revise the product offer is now reflected in a continuous product change.

		1980→85	1985→90	1990→2002
LAWN TRACTORS	**MASS MARKET**	LX	STX, LX	SCOTT SABRE LT LTR
	PREMIUM MARKET	300	GT 300	LX LX/GT 300 (GX300)
GARDEN TRACTORS	**HEAVY-DUTY MARKET**	400	400	400 500

Table 1: Evolution of product families

3. PRODUCT ARCHITECTURE

Although lawn/garden tractors may substantially differ in the components from which they are actually built, it is possible to approximately identify a typical product architecture that is mostly common across different product families. By product architecture we refer to the "way in which components are integrated and liked together into a coherent whole" (Henderson and Clark, 1990: 2).

3.1 Basic product layout

Essentially a lawn/garden tractor is built around its frame. The frame works as a "glue component" (see Ulrich and Ellison, 1998: 15) as various other components are attached to it. The essential components that are then needed to build a working tractor are engine & cooling system, transmission, axles, wheels, steering system, hydraulics, mower deck lifting-engaging system, wire harness, dashboard & console, and body parts such as hood and fender deck. In figure 3 the overall layout of a lawn tractor is illustrated, highlighting some of its key components.

3.2 Principles for generating product variants

Unlike computers, cell-phones, industrial machinery, furniture and many other products where modularity is one of the main avenues to efficiently generate product variants, this is not the case for lawn and garden tractors. Most of the fundamental functions of a tractor, in fact, cannot be specifically traced to a certain component. On other words, it is often hard to achieve different performances just by changing one component of the lawn tractor. For example, we cannot swap a large mower deck over a tractor with a small engine, as the engine does not have sufficient power to drive the large mower deck. If we change the engine we are likely to need a more powerful transmission as well. If, instead, the engine is powerful enough, we have to make sure the frame should is long enough to take a large mower deck. Many other examples could be made to illustrate the complex interdependencies across components.

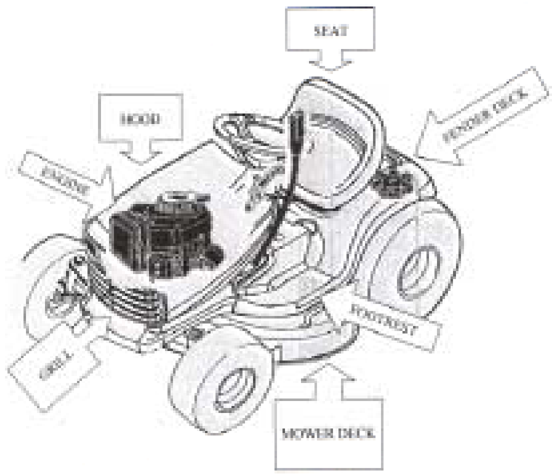

Figure 3: Lawn/garden tractor and some key components

4. SUPPLY CHAIN STRUCTURE

Schematically, we can generally depict the Lawn Mower and Garden Tractor supply chain as a three-tier system including component manufacturers, assembly plants and distribution centers/retailers. Indeed, there are two different final assembly locations, one focused on the mass market and one focused on the premium and heavy-duty markets. The plant serving the mass market is basically affected by the sole volume flexibility requirement, as product variety is very low. Accordingly, it has been structured in such a way to implement various well-known techniques to deliver volume flexibility. Our focus, instead, is on he plant serving the premium and heavy-duty markets, as these two markets face the simultaneous volume flexibility and mix flexibility challenge.

4.1 Components sourcing

Component suppliers are located in very different geographical areas and they present a wide variance in terms of bargaining power vis-à-vis the Lawn Mower and Garden Tractor business group.

The greater burden in component sourcing derives from the engine, as engine suppliers can hardly react very fast to unpredictable demand fluctuation because of technological rigidities (castings) and operational complexity (building an engine entails making and assembling a great number or parts). In particular, high-end Kawasaki engines are imported from Japan, and they have a delivery lead time that can exceed several weeks..

As for the other key component, the frame, it is entirely made by a stamping plant owned by the same Business Group, so that expediting is possible. Yet, expediting cannot be considered as a routine practice, as every time you expedite something you delay something else. As a whole, the stamping plant manages several thousand part numbers, as the tooling costs for a product family are very high: just the tooling to stamp a steel fender deck may easily cost $ 1 million. The stamping facility, which ties a lot of capital, was conceived to cut the costs of metal parts made in high volumes by means of stamping instead of welding. Later in time it appeared the option of stamped plastic parts, and part volumes shrunk because of product proliferation.

Most non-major components are sourced locally (same or nearby states) and for most of them the delivery time is within 3-5 weeks. However, if the order goes up to second tier suppliers, delivery may take up to a few months. In general, local suppliers are used to think in terms of volumes and batch sizes, and they designed an operational structure and infrastructure consistent with such logic.

4.2 Final assembly

Largely the factory shop floor was designed in the Eighties. Final assembly plant layout is product-oriented. Each product series is made on a separate focused factory with the exception of LX/GT and LT/LTR. Yields of assembly lines vary according with the specific family considered. Roughly output for high-yield lines is approximately 200 pieces per shift, while it goes down at 50 pieces per shift for the slower lines. Each line has been designed to allow for some flexibility, meaning that it can build all the variant of its product family in a day.

Automation is relatively intense in the operations preceding the assembly line. Frames, mower decks, fender decks etc. are put together by welding robots in a series of welding booths. Welded parts are then hooked to a roll bar and automatically driven to the paint shop, from which they return painted with the same system.

Given the relative complexity of the product, line workers need training and appropriate documentation in order to be able to perform their job. Such requirement is exacerbated by product proliferation, as worker have to be able to distinguish how the sequence of different product moving down the assembly line affect the operations they are performing. Parts are moved to the assembly line mainly with forklift and move across the assembly line with AGVs (Automatically Guided Vehicles).

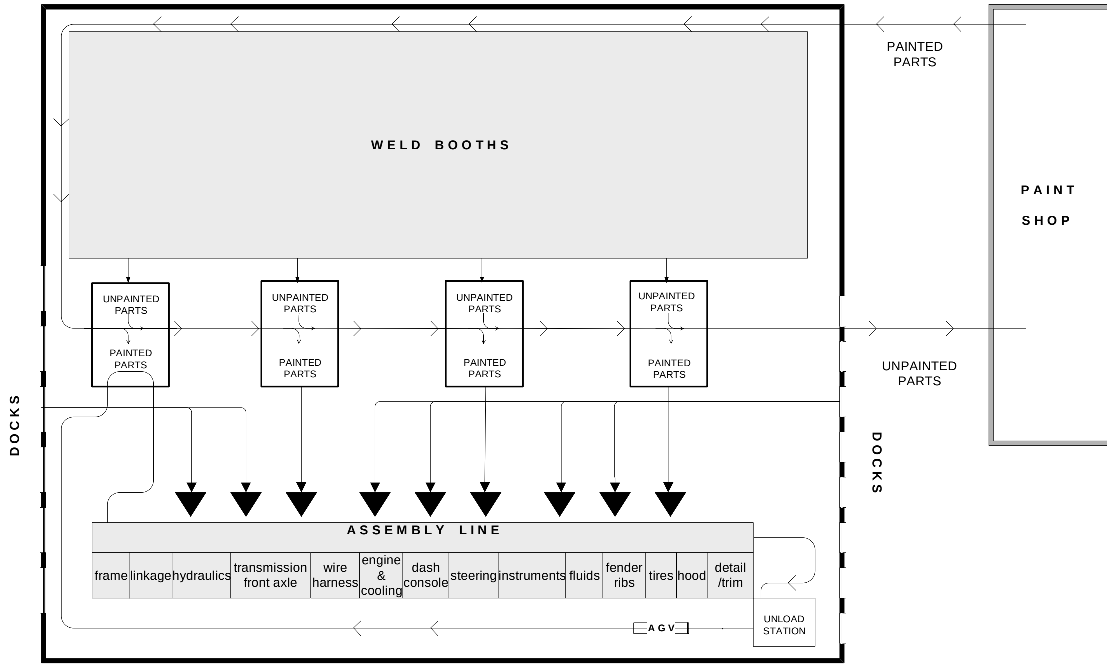

Figure 4: Schematic final assembly plant layout (LT product family)

4.3 Distribution

Downstream to final assembly is a central warehouse, which serves two basic functions. One, its original function, is to pile up inventory in the low-season so that there is sufficient quantity of end items to meet market demand during high-season. The second function is related to the fact that the plant under study basically serves the premium and heavy-duty markets, which are not covered by discounts or home centers. Hence, it has to buffer demand variation from specialty shops and dealers from the factory. Due to the aforementioned trend towards product proliferation, the principle of consolidating inventories in the central warehouse is exposing the company to serious financial and market liabilities. In fact, ending up with unwanted stocks while hitting low order fill-rates is the ultimate risk when a distribution structure has to handle a much higher product variety then the one it was originally designed to handle.

5. POSSIBLE SOLUTIONS TO IMPLEMENT BUILD-TO-ORDER

Overall, John Deere Lawn and Garden Business Group is addressing a very complex environmental challenge, that combines two major hurdles. On the one side we have the intrinsically seasonal nature of the Lawn and Garden Equipment market, which requires the company to inflate and deflate according to market dynamics. On the other side, we have the typical problems of mass customization, namely efficient and effective delivery of product variety and product change.

John Deere Lawn and Garden Business Group management screened a whole array of possible solutions to implement BTO, spanning different functional areas. We briefly recall them as follows.

5.1 Component commonality/ Product platforms

A first, obvious chance to increase the capability of the firm of building to order is component commonality. When commonality includes the frame and eventually other infrastructural components, such as the wire harness or the steering system, then we talk of product platforms.

While the benefits of product commonality for rapid product change and for mix flexibility are widely documented in the literature, we cannot say the same for volume flexibility. The effect of component commonality on volume flexibility is indirect. Component commonality reduces the total setup time across the supply chain, so that a larger percentage of available time is actually devoted to production. Accordingly, if we assume that building the common component requires approximately the same time that is needed on average to build any of the non-common component it substitutes, we can conclude that – ceteris paribus – component commonality allows for increasing the maximum theoretical production output.

The practice communizing components is not necessarily as easy and straightforward as the literature is sometimes suggesting. First of all, there may be a number of technical problems. For example, the same frame, let's say for "premium market" tractors should be compatible with different engine mounts and with different transmissions. When a technical problem is overcome there may be a cost problem. For example, having a common frame through all a set of families would imply having an over-sized frame for the less powerful and durable models. In addition, it may be hard to prove the advantage of component commonality across families if the accounting system does not explicitly consider the costs of complexity related to managing a higher overall number of component across a set of product families. Sometimes for issues of product consistency or pride engineers prefer to design a new components rather than trying to adapt their design to use an already existing component. Finally, marketing may oppose component standardization on the basis that it negatively affects customers' perception of the company product offer.

5.2 Supplier flexibility

Given the fact that most components are purchased by suppliers, their flexibilization is indeed critical. Undoubtedly, end product variety tends to migrate upstream the supply chain, so that suppliers too are affected by component proliferation. A first imperative, therefore, is to increase suppliers mix-flexibility. However, what appears to be the major concern on the supply side is volume flexibility. Were John Deere to react Build-To-Order to market demand, the supply chain has to do that too.

At present, one of the major ideas contemplated by the Business Group management is to help key suppliers replicate the same logic discussed before. By increasing mix flexibility they can indirectly increase volume flexibility.

It is unclear whether such kind of approach can relieve suppliers from the need to bear significant inventories before seasonal peak. To make things more difficult, certain suppliers have the power to refuse to keep inventories, such as engine suppliers. In addition, for different suppliers there may be different approaches to achieve volume flexibility, depending on the product and production technology.

5.3 Assembly flexibility

As observed in section 5.2, final assembly plant mirrors a focused factory approach and a level of automation that may have been more appropriate at the time when the plant was conceived. Now, the impossibility to reconfigure in reasonable time and at reasonable cost an assembly line from a product family to another is a major obstacle to both volume an mix flexibility. Volume flexibility may be increased by diverting to unsaturated product lines demand exceeding a given assembly line capacity. Mix flexibility, meant as the capability to build any product on any line without excessive setup costs, may then allow for volume flexibility referred to a specific product family.

Reconciling mix flexibility and volume flexibility may in this case require a careful standardization of the interface between the product and the assembly line, so that the same assembly line can, ideally, process any product model. It is important to note that certain solutions for increasing the theoretical capacity of the assembly line and its volume flexibility may negatively affect mix flexibility. Such approaches as Design For Manufacturing, for example, try to cut assembly time by reducing the part count of the products. Reducing the part count of the products requires integrating different parts into one or less parts. Unfortunately, when different parts are consolidated into a single one, we may loose commonalities across different products. If we have sufficiently high volumes for such consolidated part, the benefits of simplified assembly may outweigh the cost of part proliferation. However, if volumes are lower, as it typically happens in presence of product proliferation, then a lower part count is more important than a faster assembly. In other words, there may be a trade off between volume flexibility and mix flexibility.

5.4 Workforce flexibility

As for the workforce is concerned, two possible directions for flexibility improvement are being considered. One the one side, the need for workforce flexibility can be reduced, for example by simplifying assembly operations. As we just discussed, assembly work simplification cannot be performed by just reducing part count, as this may lead to missing commonalities. A possible approach, instead, may be to design different parts in such a way that the assembly process, i.e. how do they actually fit with the other parts, is standardized. No matter a given part may vary, the worker's task would be exactly the same.

On the other side, greater training may be needed. In this case, the firm is working with unions in order to define appropriate agreements that may allow the firm to retain well-trained workers, even though they are not actually working the whole year.

5.5 Form postponement

Another potential approach to build to order is form postponement. Also in this case its implementation is not as straightforward as it may appear from the literature. Form postponement may be applied at in different points of the supply chain. Product variety-generating activities performed by suppliers may be, for example, performed at the final assembly plant. For example, instead of soldering on the frame the different supports for the engine at stamping plant, such supports could be bolted at final assembly plant, at the beginning of assembly line. The benefit for stamping plant would be a higher repetitiveness in frame manufacturing and, hence higher capacity and volume flexibility. Implementing form postponement more downstream the supply chain may be not that easy. For example, a possibility may be to perform certain product differentiation activities at the central warehouse. Indeed, this would imply building a factory in the warehouse, duplicating a number of resources such as people, equipment and floor space. In addition, such resources would be affected by the same seasonality problems of upstream operations. Going further down the supply chain, it may be that dealers perform some product differentiation. This is clearly impossible for discounts and home centers. As for specialty stores and dealers, they already perform some basic customization, like installing certain attachments. However, increasing the breadth of customization activities would imply having higher components inventories in retail stores, which is not seem as very practicable. Finally, the idea that the end consumer customizes the product by himself is even more unpractical, as working on the tractor requires skill, tools, and experience.

5.6 Forecast reliability ranking

As many informants put it clearly, a full build-to-order capability is not really feasible given the huge seasonal variations of this business. Something will have to be built to forecast and stored for seasonal peak. A potential solution to reduce the inventory risk may be to rank forecasts based on their reliability, so that only the most reliable forecasts drive actual inventory build-up. Items characterized by more uncertain market demand may be going to be built-to-order.

Commitment from marketing here becomes crucial. In fact, forecast reliability is not only a matter of different historical variances for demand of different items. Forecast reliability can be selectively increased for certain items if marketing commits to support with appropriate promotion such items. Therefore, an appropriate coordination between marketing and production planning may indeed smooth some of the uncertainty.

5.7 Demand management

A more advanced approach to build-to-order may be to alter demand, or to change the time when final demand materializes. For example, customers may get incentive to order off-season, or there may be pre-season promotions may be offered. Alternatively, the company may try to trade customization, or some sort of discount, for fast delivery. In this way, product availability may become less important for customers, as they may be less interested in getting the product immediately, if they can get it really as they like. The important assumption behind this kind of approach is that customers really care about product customization, which, as we saw, is not true for all customers.

5.8 Disciplined product change

A final area of potential improvement toward Build-To-Order is to perform product change in a time-phased manner, so that it does not interfere with seasonal peak. Most product changes, in fact, may be concentrated in periods where the supply chain is not strained by the spring production peak, with the exception of safety-related product changes. Most of the changes, indeed are commanded by either marketing or engineering because of technical or competitive issues, thus locking precious resources. Of course imposing such kind of "disciplined product change" is not easy as it goes against thee unwritten "power hierarchy" of the company: marketing first, than engineering and then supply chain.

DISCUSSION AND CONCLUSIONS

Meeting the joint requirement for mix and volume flexibility is a very demanding objective. The present preliminary exploration of this problem highlights clearly the fact that, while these two goals may display some mutual trade-off, they may be synergistic as well.

Increasing volume flexibility essentially means increasing capacity without increasing fixed costs. Accordingly, every action aimed at increasing operational efficiency without tying capital in fixed assets, tangible or intangible, is increasing volume flexibility. Techniques aimed at increasing mix-flexibility may be considered as a way to reduce resources consumed to switch across different product variants. Therefore, as mix-flexibility captures a specific resource-sparing approach, it indirectly contributes to increase theoretical capacity for a given level of product variety within a manufacturing system. Most important, to the extent that mix-flexibility is achieved without increasing fixed costs, it positively affects volume flexibility.

Before turning this implicit proposition into a full-blown theory or joint mix and volume flexibility reduction, much remains to be done. First of all, we expect to observe what actual decision will be taken by John Deere to address such challenge, as well as their operational outcomes. Then, we believe that the same phenomenon will have to be studied in other settings as well, so that other significant independent or context variable may eventually included in our theorizing effort. Needless to say, we believe that an eventual theory of Build-To-Order, i.e. of joint volume and mix flexibility reduction, will necessarily have to undergo a large scale test.

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