Customizations vs. Platforms – A Conceptual Approach to COSI

Jenny Bäckstrand, Martin Lennartsson

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Jenny Bäckstrand[0000-0001-7867-3895] and Martin Lennartsson[0000-0002-6619-7489]

[1] School of Engineering, Jönköping University, Gjuterigatan 5, 55111 Jönköping, Sweden
{Jenny.Backstrand, Martin.Lennartsson}@ju.se

Abstract. In recent years, many manufacturers have experienced an increased demand for customized products and services, which requires the manufacturer to simultaneously offer both standardized and customized products. Consequently, several manufacturing strategies must be efficiently employed. These companies do not express the same prerequisites as 'pure' ETO companies since they need to be able to differentiate customized orders from standard orders, but also be able to differentiate between the manufacturing dimension and the engineering dimension of customization. Whereas standard orders can be processed with a platform approach, the customized orders contain specific requirements and information represented by 'customer-order specific information' (COSI). This paper defines and presents competitive scenarios where platform constraints are combined with COSI for efficient customizations. Implications for the approach and a path forward is discussed.

Keywords: Customizations, ETO, Customer order specific information, Product platforms

1 Background

One of the main challenges of today's manufacturing is to be able to be efficient and contributing to high effectiveness, i.e. customer satisfaction [1] while being responsive in order to comply with changing customer demand. Customer satisfaction is defined as "the extent to which a product's perceived performance matches a buyer's expectations" [2]. All companies wish they could produce exactly *what* customers want *when* they want it, since it would not only satisfy customers but also reduce cost [3] and create competitive advantage [4]. The essential problem of customization is how to produce a customized product within the company's capabilities while maximizing customer satisfaction [5] since going too far in customization would ruin efficiency but on the other hand, being too rigid in customization would risk customer satisfaction [1]. The answer to this balance between customer satisfaction and supply chain efficiency is often mass-customization or 'assemble-to-order' (ATO) strategy where standard modules are assembled according to customer requirement.

Mass-customization is generally delivered through standardized products or custom-assembly of modularized components or by product platforms [6] where the view of customized products are that they "[…] are slight variations of standard configurations"

[7] hence neglecting the product development aspect for providing ‘truly’ customized products [8]. Accordingly, not all products can be assembled to order or completely be built on a modular concept, some customers require customizations that affects the design of the product, and the products hence need to be engineered-to-order (ETO). Hence, moving from an era of mass-production of stock items to mass-customization of unique product; the engineer-to-order (ETO) approach is gaining in importance and many companies are finding that the engineering effort involved in the ETO typology is overwhelming their traditional systems [9].

Another issue not covered by literature but prominent at our business partners is that many manufacturers have to handle multiple manufacturing strategies [10] simultaneously; they might carry one line of high volume standard products (MTS), one line of low volume standard products (MTO) while giving the customers the possibility to adapt exiting products (CTO) or order pure customizations (ETO). These companies do not have the same prerequisites as ‘pure’ ETO companies that traditionally manufacture capital goods with extremely low buying frequency such as customized installations, airplanes or ships [11] since the function receiving the orders need to be able to differentiate customized orders from standard orders. Customized orders includes different information for each order and the customer requirements is represented by the ‘customer-order specific information’ (COSI) [12, 13]. Furthermore, they need to differentiate between the manufacturing dimension and the engineering dimension of customization, in line with Rudberg and Wikner [14].

The purpose of this paper is to define competitive scenarios where platform constraints are combined with COSI freedom for efficient customizations.

2 Methodology

To fulfil the purpose of the paper, a multi-method approach is adopted. First, a conceptual model. In line with Hevner *et al.* [15] we build upon the design science method where the design cycle is initiated with the development of a conceptual framework describing the relationship between commonality and distinctiveness. The purpose of analytical conceptual research is to add new insights into traditional problems through logical relationship building. These studies usually employ case study examples to illustrate these conceptualizations [16]. The next step in the design cycle will hence be to ‘assess’ the framework using empirical data.

3 Theory

3.1 Manufacturing situations

The point in the manufacturing flow when the customer order is received is referred to as the customer order decoupling point (CODP)[17]. The CODP separates the forecast-driven flow from the customer-order-driven flow in the supply chain (by Käkelä and Wikner [18] referred to as separating speculation driven activities from commitment driven activities). Hence the position of the CODP, results in different product–market situations or manufacturing situations. This is commonly referred to as make-to-stock (MTS) assemble-to-order (ATO), make-to-order (MTO), and engineer-to-order (ETO) [19]. ETO can be seen as a special case of MTO. In both cases all of the production flow is driven by actual customer orders. However, in the ETO case both the design and engineering activities are driven by customer orders, but these activities are not a part of the production flow. In that sense it is possible to separate an engineering dimension (ED) from the production dimension (PD) [20], see Figure 1.

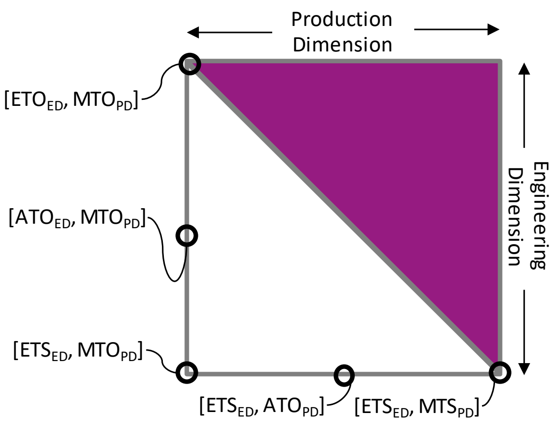

Fig. 1. The two-dimensional CODP space, based on [20]

The term ETO_{ED} is used to depict the situation when a new product is designed and engineered to order. On the other hand, the situation when a product is designed before the company gets an actual customer order could be interpreted as if the product design is already "in stock". Thereby, this situation is termed "engineer-to-stock" (ETS_{ED}). In this sense, a second dimension of decoupling points, referred to as the engineering dimension, covering the continuum between ETO_{ED} and ETS_{ED} is defined.

Furthermore, only after the customer order is received, it is suitable to adapt the product to customer requirements, i.e. to customize the product [21]. However, this does not imply that everything that is manufactured after the CODP is by default customized, but everything manufactured before the CODP should be standardized [22].

3.2 Customization

According to Lampel and Mintzberg [23] there is a continuum of customization strategies ranging from pure standardization via segmented standardization, customized standardization, and tailored customization to pure customization, see Figure 2.

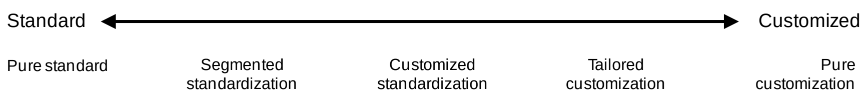

Fig. 2. The customization spectrum, based on [23]

Käkelä and Wikner [18] further define three categories of solution spaces where the single-point discrete solutions space corresponds to MTS/MTO or mass-production, the multiple-point discrete solutions space corresponds to ATO or mass-customization and the continuous solutions space corresponds to ETO or individualization.

3.3 Platforms

Robertson and Ulrich [6] argue that the platform approach is a way of achieving successful mass-customization and define a platform as "the collection of assets that are shared by a set of products". These assets are divided into the four categories; components, processes, knowledge and people and relationships. The challenge is to balance commonality and distinctiveness and still be competitive, which is also emphasized by [24] and [25] including competitiveness as a key element of platform fundamentals.

3.4 Postponement

The concept of suspending differentiation activities until after the customer order is received in order to increase certainty is referred to as postponement [26]. The concept promotes that the differentiation of goods in terms of form, time, and place can be postponed to as late as possible Yang *et al.* [27].

3.5 Combining postponement, positioning of the CODP, and customization

Gosling *et al.* [28] have further developed a framework by Yang and Burns [29], combining manufacturing situations [17], different postponements strategies [26], and different levels of customization [23] based on the operating processes of manufacturing (from design to distribution), see left side of Figure 3.

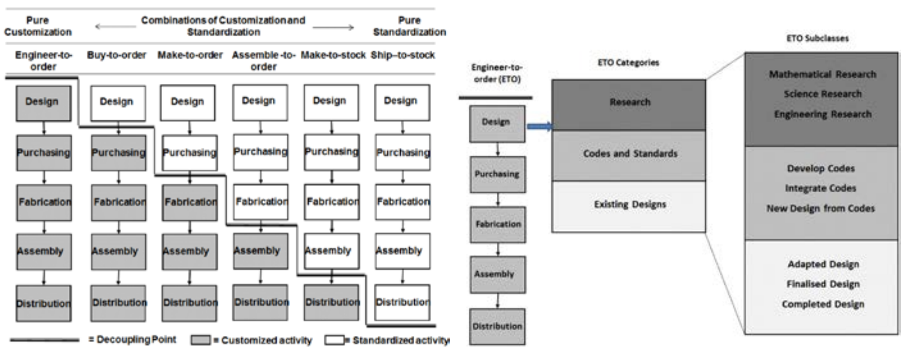

Fig. 3. Refining and unpacking the ETO supply chain, based on [23, 28, 29]

The development focuses on the ETO-situation when the customer is allowed to customize also the design phase. This phase is then broken down into nine ETO subclasses, see right side of Figure 3. The resulting framework in Figure 4 illustrates a spectrum of customization strategies, classifying different engineering decoupling points (EDP) thus providing a basis for considering the level of customization and standardization in design activities, as well as considering those activities that are speculative and those that are performed to a specific customer order.

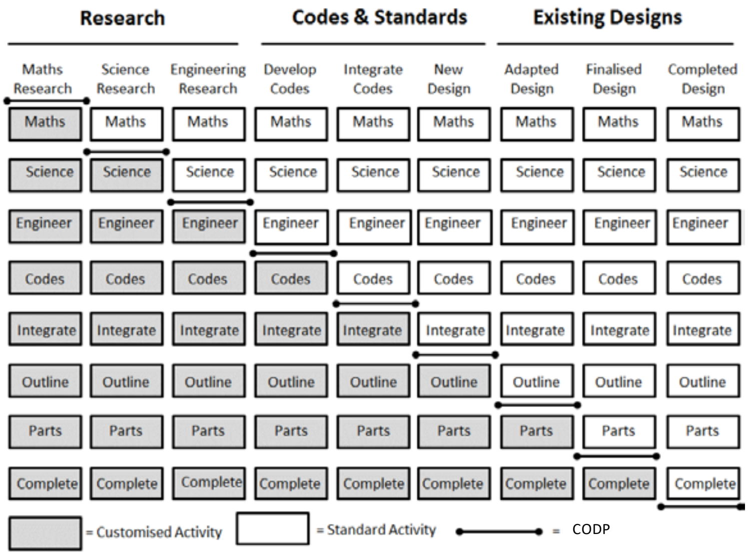

Fig. 4. The EDP-framework, based on [28]

4 Results

By extending the EDP-framework and in line with [18], the ETO scenario can be described as a continuous solution space where the customizations are individualized.

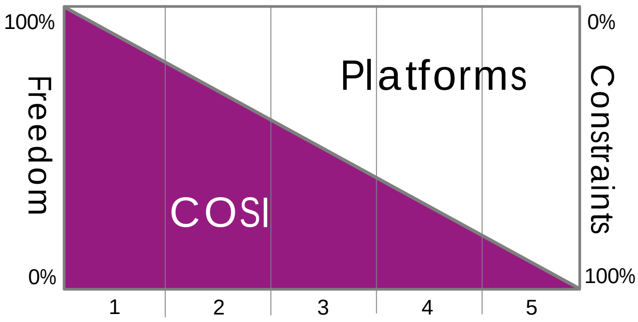

Fig. 5. The freedom-constraints continuum for customized orders

The customer order specific information (COSI) triangle in Figure 5 hence represents the competence needed to understanding and fulfilling the customer needs [30].

In order to define scenarios where platform constraints are combined with COSI freedom for efficient customizations, five distinct scenarios are created, where scenario 1 represents the highest level of freedom and hence the unlimited possibilities for customization. Scenario 5 on the other hand represents solutions or configurations where pre-defined solutions spaces are used to fulfill the customer requirements.

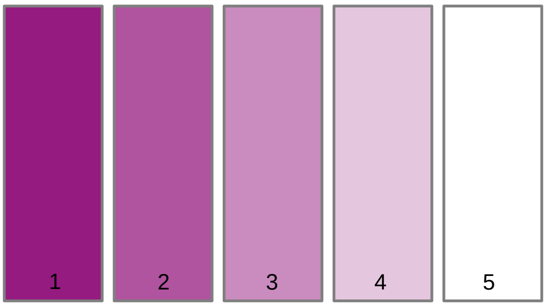

Fig. 6. Scenarios combining platform constraints with COSI freedom for efficient customizations.

5 Conclusion

A risk with using a product platform approach is the trade-off between commonality and distinctiveness [6]. Examples from the car industry shows that lower-end models can cannibalize on the higher-end models if the distinctiveness is not large enough [31] while other examples show that if post-order COSI is incorporated into the platform, then an incoherent platform will emerge. Thus, when the scenarios are validated with support from empirical data, in line with [15], there should also be a train of thought developed regarding the continuous management of both COSI and the platform. Otherwise there is a risk of different company specific scenarios shifting towards either end of the spectra. While both ends of the spectra may be hazardous for an ETO-company in terms of either, a too wide product offer, diminishing efficiency or, a slimmed down efficient production where products are made to standard but not desired on the market. Therefore, the scenarios present an opportunity for ETO-companies to assess the current product mix and, whether they are moving towards any of the ends of the spectra. Moreover, it becomes important when regarding the employment of multiple production strategies in order to cater to an array of customer segments and still maintain efficiency.

5.1 Further research

To classify and characterize customer orders for the different scenarios, empirical data must be gathered for different ETO-oriented companies. Such data can also add information on the suggested resolution of five (5) levels regarding the anticipated number of scenarios. Additionally, on a longer horizon, in line with the previous discussion a strategy should be developed regarding the management of the scenarios. Further, it would be of interest to investigate if the suggested model is aligned with the trade-offs presented by Gosling *et al.* [28], i.e. that lead times decrease from scenario 1-5 as well as the level of uncertainty from customer requirements.

The conceptual model presented in Figure 5 suggests that the dependency between COSI and the platform is linear. However, practitioners should be aware that in reality the relation can be both steeper or flatter depending on the products offered.

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