

SMEs AS AN ENVIRONMENT FOR MASS CUSTOMIZATION IMPLEMENTATION

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Abstract: *More than three decades have passed since Stan Davis coined the term mass customization in his “Future perfect”. Since that 1987, there has been a remarkable progress in industry driven by information technologies. Today, we can say that the future predicted by Davis has come. However, mass customization, as a basis for Industry 4.0 and Industry 5.0, is not implemented with equal ease by all companies that could have advantages from implementing it. Specifically, small and medium enterprises (SMEs) still have great problems with implementation of mass customization. The present paper provides an overview of the research done on mass customization implementation in SMEs in the past three decades. The present research argues that SMEs are a specific environment for mass customization implementation and that they should be treated differently from large enterprises when thinking about mass customization implementation. In this respect the paper analyses the findings from the literature, informed by the industry experience of the author, and discusses idiosyncrasies of SMEs that make them so different from the large companies when concerning mass customization implementation.*

Key Words: *Mass customization (MC), Small and medium enterprises (SMEs), Implementation*

1. INTRODUCTION

Since the term mass customization (MC) was coined by Davis in 1987 [1] there has been significant development in application of MC across the industry sectors [2], [3]. One way to observe this trend is to follow the change in the number of online configurators from year 2007 to 2022 [4] available as well as the number of papers published on the topic in the scientific databases. Today, the MC is also promoted by the Industry 4.0 concept [5], [6] and newest Industry 5.0 concept that is human centric [7]. Thus, spread and impact of MC and “trendiness” of the concept is obvious.

Nevertheless, somehow the small and medium enterprises (SMEs) are sidelined in this discussion [8]. When consulting Scopus database during writing of the present paper in May 2022, only 103 papers were found when using (TITLE-ABS-KEY (“mass custom*”) AND TITLE-ABS-KEY (“SME*”) OR (“small and medium enterprise*”))) search. At the same time the search TITLE-ABS-KEY (“mass custom*”) yielded as much as

5.194 papers. Thus, the papers that mention SMEs in the MC literature in this search compose 1.98% of all the papers in the Scopus database. Even if this estimation is of by a factor of 2 or 3 it is still a very low number.

Thus, there is a clear lack of MC research focus on SMEs. At the same time, SMEs in European Union countries (data for year 2022) compose 99% of companies and employ 100 million people [9]. This number is far from negligible. Furthermore, SMEs are facing serious problems when implementing MC concept, among which the lack of capital and human resources are most notable [10], [11]. However, as we shall see in this paper, there are many more problems that SMEs face when implementing MC.

Starting from this gap in the MC research, the present paper puts in front of the reader an MC agenda from the point of view of SMEs. The present paper examines the available research, points to the gaps, but also points to the specific characteristics of the SMEs that make them worthwhile as a research objects for MC researchers. The paper proposes the MC research in SMEs as an agenda for MC scholars and practitioners alike.

The paper before you represent a result of more than a decade of the research activity in MC field and specifically activity focused on SMEs. During this period, I have come to number of conclusions working with SMEs from various industries. In present research I present my considerations, but also a plethora of conclusions and observations about the SMEs and MC from the available research. My goal with this paper is to disseminate these findings and to help researchers find gaps and stimulate the MC research in SMEs which I find worthwhile and rewarding. All the time I do not claim the present research to be exhaustive since it is done in a free form. However I do hope it to be stimulating for the readers.

The rest of this paper is organized in three sections, namely: Characteristics of SMEs seeking the MC transformation, MC implementation in SMEs, and Final remarks. The “Characteristics of SMEs seeking the MC transformation” section provides an overview of the SMEs’ characteristics which make them a specific form of implementation for MC. The “MC implementation in SMEs” section dives further into some specificities of the MC implementation in SME context. Finally in the “Final remarks” section the main contributions of the present research are underlined, limitations of the research highlighted and the future research noted.

2. CHARACTERISTICS OF THE SMEs SEEKING THE MC TRANSFORMATION

SMEs in general represent a specific environment for change management. Specifically, Ates and Bititci [12] found nine SME-related characteristics that have an impact on the way the changes are managed in the SMEs, namely:

- Lack of strategic long-term planning and short-termism
- Firefighting approach to solve day-to-day problems
- Greater focus on operational and technical issues
- Limited resources
- Command and control culture
- Reacting to external stimuli
- Tacit knowledge and informal decision making
- Poor management skills as the SME grows
- Entrepreneurial orientation and opportunity seeking

In the rest of this section, these SME characteristics will be looked at from the standpoint of the MC seeking SME.

Lack of long-term planning and short-termism – The lack of long-term planning is very problematic for the SMEs seeking to implement MC. This is because MC is a complex concept [2], [3], [8], [13]–[15] that takes years to implement even when the project of implementation is executed relatively smoothly. Thus, without a long-term planning and consistency it can be hard to implement MC for an SME.

Firefighting approach and a focus on day-to day problems - Simply put, SMEs are short-handed, meaning they usually have need for more people on certain positions. And since this is practically a norm for an SME, it is no wonder that many times firefighting approach prevails instead of proactive organization and planning. The problem is that in order to implement MC, an SME company needs to do just that - to plan and organize for a directed and guided complex change. Here I do not imply that the change needs to be radical and done in one-shot. On the contrary, incremental approach is most welcome. However, even an incremental change that has the final broad impact in mind (like MC implementation) needs to start with a long term planning. So, the firefighting approach in an SME is effectively preventing planning since the management and engineers needed to plan the change are busy with putting down fires on a daily basis.

Focus on operational and technical issues – Related to the previous point, many SMEs have a focus on operational and technical issues. This means that the time for strategic thinking is reduced drastically. In the hindsight it becomes obvious, but in the everyday functioning of an enterprise, the narrow focus on “everyday” problems can be overlooked easily. Combined with the “silo” effect of where the knowledge remains closed in different offices/departments, it becomes easy to set aside the strategic thinking.

Limited resources - An SME in general has limited resources. In MC literature limited human, financial and time resources are cited [10], [11]. These limited

resources are one of the main hindering factors for MC implementation. Probably the most important lack is the lack of human resources, since SMEs tend to be overwhelmed with everyday obligations of managers and engineers. Thus, the personnel, and the time are very scarce. If the scarcity of financial resources is added to the list, then the task of implementing one complex concept as MC seems almost unsurmountable.

Command and control culture – In many SMEs the founder of the company is still present. This first generation of entrepreneurs is used to work with a high control that was needed when the company was started. This means that even if a company has 100 or 200 employees, it is possible that the top management is still working according to the “command and control” culture. Thus, the ideas generated across the company do not have the same weight. Specifically, the ideas of the owner are always weighted more than the ideas of the employees. This is often true even if the company is managed by the second or the third generation of the owners. This approach has consequences on the MC implementation, since it is important that all the company functions cooperate and that the “ranks” are set aside in order to generate ideas to move towards MC. In the end ideas must be in congruence with the company current MC maturity level [8] which can be estimated only with participation of all the key company employees.

Reacting to external changes - An SME usually uses reactive instead of proactive approach to change. Thus, most of SMEs are by their nature followers. SME monitors the change on the market, in its industry sector and accordingly reacts by developing and enacting plans for future development. Unfortunately, when faced with a complex concept like MC it is difficult to understand how to react in an effective way, since the number of tools/enablers to consider in order to implement MC is vast. Furthermore, there is no guarantee that one enabler that works for one company will work for another, even if they are similar and in the same industry. Moreover, the MC change is like an iceberg - only small amount of it is visible on the surface. For example, we can see that our competitor has successfully introduced product configurator. However, we do not have a way to understand which enablers did our competitor implement in operations, in marketing, in research and development and so on, in order to achieve this successful implementation of the product configurator. So, this “iceberg” metaphor means that if our competitor has implemented the product configurator, the amount of work surpasses by far the one seen on the surface.

Tacit knowledge and informal decision making - The tacit knowledge presents a specific problem for the SMEs wanting to implement MC. Many times a change can take place only with the tacit knowledge formalized and then put to use in the implementation project. However, this is sometimes hard to do since engineers and managers could be feeling that they are losing control if they share they knowledge with the rest of the company. Thus, this characteristic is closely related to the change culture.

Poor management skills as the SME grows - Many SMEs start as small start-ups and then acquire workers

(both blue and white collar) along the way as they grow. However, the skills needed to start a company of five or ten workers are not the same needed to manage a company of 50, 100 or 200 employees. Furthermore, management skills tend to be neglected in many SMEs. The situation is not any different with SMEs looking to implement MC. Moreover, as they move towards MC, the lack of management skills and the operations management personnel is very likely to be more notable.

Entrepreneurial orientation and opportunity seeking - SMEs tend to stay in the entrepreneurial mode long after they have grown in size. While entrepreneurial orientation is not a negative characteristic per se, it can counter the systematic implementation of complex concepts like MC. To implement MC a consistent strategic planning including the whole company is needed.

Thus the characteristics identified by Ates and Bititci [12] are general and apply also to MC seeking SMEs. Specifically, I argue that the lack of long-term planning and short-termism, the firefighting approach, tacit knowledge and limited resources are the ones that impact MC implementation in SMEs to a great extent.

3. COMPLEXITY OF MC IMPLEMENTATION IN SMEs

MC implementation is a complex issue [16]–[20] that provides a competitive advantage when implemented [2], [20]–[25]. These constations apply also to MC seeking SMEs.

While characteristics of the SMEs related to the change management analyzed in the previous section are of the highest importance, there are other aspects of the MC implementation that are equally important for SMEs. These aspects, listed below, will be addressed in the present section:

- SMEs starting point in Craft production-Mass production continuum
- SMEs and MC enablers
- The simplistic assumption of sequential MC implementation.

3.1 SMEs starting point in Craft production-Mass production continuum

Analyzing SMEs that aim to implement MC, we can distinguish clearly two directions from which SMEs can approach MC. The exact direction depends of the position of the SME on the Craft production - Mass production continuum [26], [27]. I argue that most of the SMEs that would like to move towards MC are to be found between the Craft production and MC. At the same time, this is the opposite for large companies which will usually find themselves closer to the mass production on the continuum. Consequentially, large companies will aim to increase their product variety when implementing MC, while SMEs that are tailoring their offer for the customers will seek to reduce their product variety by implementing MC.

Thus, the effort and the type of transformation that SMEs need to undertake will be very different from the transformation from mass production to MC. However, implicitly much of the existing literature, when

discussing the MC transformation, is discussing transformation from mass production to MC, as is the case for the seminal book of Pine [13]. Furthermore, implicitly they are analyzing large companies [28].

To be completely clear, there is nothing wrong with proposing transformation from mass production to MC. This is a valid stream of research that is needed and supported by large companies. However, as consequence, the research should specify if the findings are valid for SMEs, large companies or both.

3.2 SMEs and MC enablers

In the relevant MC literature a number of MC enablers were identified as a part of existing MC implementation guidelines [10], [11], namely: Group technology, Part standardization, Product modularization, Process modularity, Product platform development, IT-based product configuration, Form postponement, and Concurrent product-process-supply chain engineering. All of these enablers can play more or less significant role in the implementation of MC in an SME.

Having said this, it becomes important to understand which MC enablers are relevant for an SME [8]. Only with this analysis done in the right way, the implementation of MC can be planned and organized in a comprehensive MC implementation project.

Thus, it is of paramount importance to understand which of the MC enablers and to what extent are important for SMEs in general. Furthermore, it is important to understand the specific context and MC maturity of each SME [8] in order to be able to decide the exact path for MC implementation.

3.3 The simplistic assumption of sequential MC implementation

Suzic et al. [10] found that the relevant literature on MC implementation in industry points out to a sequential model of MC enabler implementation. This implies that there is a one-size-fits-all formula for MC implementation. However, this approach is too simplistic. In fact, many MC scholars argue that the “one-size-fits-all” solution for MC implementation does not exist [20], [29], [30].

Building on the previously cited scholars and informed by industry experience, I argue that for SMEs and their peculiarities this one-size-fits-all simplistic sequential solution is even more unrealistic. This is because SMEs are strongly influenced by the entrepreneurial spirit and many still function like small start-ups with sheer dedication of the owner. But, even for the bigger SMEs that count 100 to 250 employees, there is still the issue of lack of resources to translate such general instructions into an actionable implementation plan.

4. FINAL REMARKS

The present paper is an initial work on specificities of SMEs that implement MC. It is not comprehensive in any way. In essence it offers an opportunity to reflect on the complexity of MC implementation in an SME surroundings.

On the one hand, I do not claim by any means the exhaustiveness of the work done and do recognize its limitations. Specifically, the sources used could be broader and the rawness of some proposals/observations can be noted. Both of these limitations will be amended in the future work. However, having the phase of the research in mind, I do believe that the reader can ignore these limitations to an extent. On the other hand, I believe that the reader will appreciate some of the analysis and reasonings done based on the relevant literature and informed by the long experience of the author in dealing with implementation of MC in the SMEs.

The future work will be focused on deeper analysis of the specificities of SMEs discussed in the present paper. The work will also be done on providing research propositions for MC researchers and practitioners working with SMEs.

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