



Business Innovation Observatory



Advanced Manufacturing

Mass customisation

Case study 3

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Business Innovation Observatory
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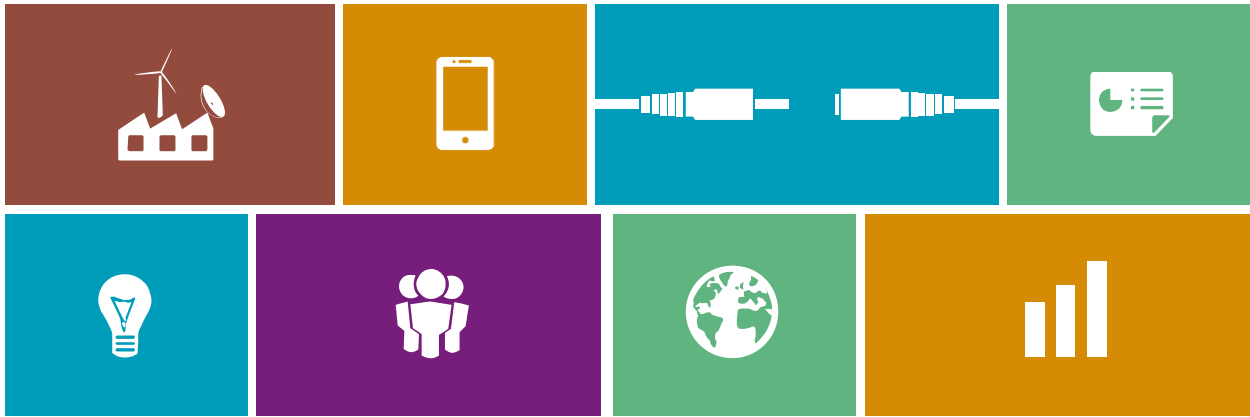
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1. Executive summary

Mass customisation is defined as the making of tailor-made goods or services in an economically viable manner. Within the manufacturing sector, this has become possible thanks to improved manufacturing procedures in mass production. Complementing these advances in manufacturing are new enabling technologies, like web-based configurators, that emerged in the late-2000's and made it possible to integrate customised products manufactured by well-established processes.

Mass customisation has applications across a multitude of sectors and is capitalising on consumers' increased demand for differentiated products. Mass customisation has become particularly important within the fashion industry, where there is an increasing demand for personalised clothes, handbags, shoes etc. Customised clothes has become a niche market and is expected to be worth EUR 27.2 billion by 2020, corresponding to 5% of the global clothing industry. Further to its application in the fashion industry, mass customisation also has growth potential in the automotive and computing sectors.

The implementing of the mass customisation trend will help European firms become more competitive as it would help improve client satisfaction and brand loyalty. In addition, it allows companies to adapt to rapid changes in trends and fashions while meeting the demands and expectations of clients seeking to contribute to the design and production of goods and services.

Despite the potential gains to be made through the implementation of mass customisation strategies, there are still barriers to the uptake of the trend. First, mass customisation strategies necessitate change management as it requires an alteration of a company's business model and the integration of new skills (particularly related to information technology). Mass customisation is often heavily reliant on e-commerce and there is still reluctance from consumers to purchase certain products online. In addition, mass customisation requires lean management in inventories and advanced supply-chain management.

Developing mass customisation requires an enabling business environment that facilitates risk-taking and promotes entrepreneurship. Successful mass customisation companies have benefitted from comprehensive and coherent policies for innovation, enabling the provision of: easier access to finance, business incubators and business networks; high quality mentorship; and close relations with universities.

In terms of public intervention, companies implementing mass customisation strategies need support in networking with research centres, investors and industrial partners. They also need to be better equipped in scaling-up their activities in preparation for "going global", enabling them to profit from a first-mover margin.



2. The emergence of mass customisation

“Mass customisation” (“MC”) was first popularised in 1993 by B. Joseph Pine II in his book *Mass Customization – The new*

*Mass customisation consists in “customis[ing] goods or services for individual customers in high volumes and at a relatively low cost”.*¹

*Frontier in Business competition and defined as “developing, producing, marketing and delivering affordable goods and services with enough variety and customization that nearly everyone finds exactly what they want”*². Since 1993, the concept has been specified, thanks to the evolution of technologies underlying the development of innovative manufacturing processes under mass customisation strategies³. Indeed, MC did not become a tangible innovative business trend until the second half of the 2000’s, once key manufacturing solutions like web-based configurators, rapid manufacturing technologies and more structured customer-manufacturer interaction methods had been developed⁴. These advanced technologies have facilitated the integration of customers’ preferences into manufacturing processes and consequently provided mass customisers with innovative opportunities and solutions.

Experience has also shown that leveraging and developing a strategy grounded on mass customisation is not easy and

*Mass customisation consists in “producing goods and services to meet individual customer’s needs with near mass production efficiency”.*⁵

can be complex and costly⁶ in terms of development, process implementation and inventories. Further to this, adding value to customers is not always guaranteed. Aspects of mass customisation may sometimes only be cosmetic and not fully integrated into a comprehensive business strategy. In that sense, proposing various colours, flavours or technical features may not add value in terms of client experience. That is why mass customisation needs to be ultimately understood as a way to “reduce the customer sacrifice gap”⁷ and so “create the greatest customer unique value at the lowest possible cost”. In so doing, mass customisers have to

develop a strategy that would help them create a competitive advantage, exploit or create new market niches. This can be translated into different business solutions such as websites with configurators that enable customers to design their products. Customers may also adapt and upgrade these customised goods by themselves later on.

When considering these MC strategies, two key success factors arose: (1) the appropriate consideration of value chain challenges when defining the strategy; and (2), the appropriate involvement of the customer in the product life cycle (i.e. design, manufacturing, delivery, use / optimisation). The case of the former underlines the need for mass customisers to consider manufacturing issues before integrating customising options in their value chain. Whereas the case of the latter tackles the added value brought by MC to customers: depending on the product and its related use, customisation may be more relevant during the design phase or during the use of the product. The definition of the most relevant phase for customisation impacts then all the other phases: product design, manufacturing processes and client management.

Mass customisation can be characterised as follows:

- It is an evolution of mass production, which seeks to answer customers’ needs, requirements and wishes for having individualised and personalised goods and services. This also implies the production of high volume at a relatively low cost;
- It leverages on new information technologies and innovative manufacturing processes to ensure high volumes at low cost;
- It is a young trend that enables the transfer of best practices from one industry to another, and so may create synergies and generate value.



3. Mass customisation’s potential and socio-economic relevance

The impact of mass customisation is transversal, as it is not a trend devoted to a specific sector. More importantly, it requires an appropriate adaptation of existing manufacturing processes to be successful. The degree to which MC should be used to answer clients’ needs depends on the level of customisation required by the client and enabled by the technology. In other words, some products require sophisticated customisation while others only require cosmetic changes to better fit client expectations. This array of possibilities have shaped mass customisation’s current environment, which provides an opportunity for developing market niches but also raises barriers to entry and difficulties in raising funds.

Mass customisation is in its nascent stage and is expected to develop further. There is an infinite potential to improve the

“ArtBag is an idea born from the comprehension of the flaws of the modern day standardised mass production along with the emerging trends of ever growing need for individualism and self-expression”. – ArtBag Design

design, manufacturing and delivery of goods and services through MC. One element behind this wide set of possibilities is the recent integration of new and specialised software solutions into manufacturing processes. These Software As a Service (“SAS”) solutions constitute key enablers for

improved interactions between the mass customiser and its clients during the design phase. They also improve internal communication between stakeholders involved in the design and manufacturing phases within the company.

To understand the socio-economic relevance of mass customisation, it is crucial to consider the five following points:

- The trend dynamics of MC and the underlying trends enabling the development of mass customisation;
- The challenges addressed by mass customisation;
- The enablers and key success factors supporting mass customisers in the definition and implementation of their mass customisation strategies;
- The client benefits and consequently the added value of mass customisation, e.g. the ability to offer tailor-made goods at low cost;
- The client perspective, e.g. the barriers preventing a larger use of mass customisation in manufacturing processes.

These five points are tackled in the following sections. They are exemplified through the mass customisation strategies applied by eight innovative companies which were interviewed for this case study. These cases provide insight into the potential of mass customisation strategies in creating value and fostering competition. The companies are active in different sectors but many of them propose Software As a Service (“SAS”) solutions and incorporate information technology applications to manage customers’ wishes and improve related manufacturing processes. A summary of the companies interviewed is provided in Table 1. Detailed strategies of these mass customisers are presented later on to illustrate how they integrate and leverage the potential of mass customisation while proposing innovative business solutions (see Section 3.3 on page 12).

Table 1: Summary table of the example companies used in this case study

Sector	Company	location	B2B/B2C	Business innovation
Fashion Accessories	ArtBag Design	Latvia	B2B and B2C	Offers clients the ability to design their own handbags based on a proposition of shapes, colours and accessories. The bags are then handmade and send to clients.
Software as a Service	Combeeneration	Austria	B2B	Proposes a product configurator system with a graphic engine that enables clients to develop an all-in-one web shop for their products. Clients create their own web shop and manage their customer relationships, orders and delivery. It also facilitates communication with manufacturing centres to provide them with detailed standardised information and supports the management of reporting information from these centres. This IT platform does not imply hardware, software download or plugins from the client side. Each client can modify this website on his own and integrate it into its own corporate website. Tutorials are also proposed.



Sector	Company	Location	B2B/B2C	Business innovation
Software as a Service / Fashion	Crearmoda	Spain	B2B and B2C	Proposes a creative platform enabling clients to create their own style of clothes. Crearmoda also provides fashion advice.
Software as a Service	innosabi	Germany	B2B	Proposes a customizable crowdsourcing and open innovation software, Ignite. This IT tool is used by clients to launch consultations to targeted online communities (about 20,000 people often participate). Its main purpose is to crowdsource ideas by directly asking questions to future clients. Algorithms then analyse the survey answers and prioritise the ideas. Following that, it helps clients in their decision-making process. Ignite also incentivises final customers to participate in the conception and design of future products. In so doing, it improves final customers' brand loyalty thanks to better communication between innosabi's clients and their own final customers. The software also helps clients to better follow market trends.
Mobility	Muses	France	B2B	Proposes an adaptable environmentally-friendly vehicle to favour delivery services in urban areas. This focuses on product transportation between warehouses and city centres. The vehicle is composed of a multi-service platform on which superstructures of cabins may be added. Cabins exist with different sizes and functions to carry diverse goods, including packages, medicines, newspapers and frozen food. As of today, Muses has developed four vehicles; a fifth one is planned for February 2014.
Software as a Service	MyCustomizer	Canada	B2B	Proposes an IT platform for customising the design of various products and favour their manufacturing with detailed and fine-tuned notes.
Computer	Najmtek	France / USA	B2B and B2C	Proposes a laptop with a touch-sensitive keyboard (a programmable multi-touch input screen replacing the classic keyboard of a laptop) that can be fine-tuned according to the specific needs of each client: the UBook. The device uses a dedicated software (NajmSoft) which displays images on the keyboard-screen. In parallel, external accessories are converted to software applications. Finally, the company has developed a download platform (Najmstore) dedicated to applications optimized for multitouch input screen laptops.

3.1. Understanding the dynamics of mass customisation

A cross-industry innovative trend

As illustrated by the eight strategies presented earlier, mass customisation is cross-industrial and applicable to most

"Our market potential in France today is up to 120,000 rounds between warehouses and city centres. That makes 120,000 vehicles since players usually buy one vehicle for one round [...] Our objective is to sell 1,000 vehicles by 2015". – Muses

business sectors. Today, many sectors have successfully implemented such MC strategies: food industry, electronics, large engineered products, mobile phones, personalised nutrition, homebuilding and even foot orthoses⁹.

Following this, a question is raised as to where in the value chain MC provides a competitive advantage for a specific company. In other words: what should the mass customiser modify in its current production processes to differentiate and increase the customer-unique added value? How can a company successfully catch the mass customisation trend? Answers to

these broad questions concern both the **content** (organisational structure, manufacturing processes, design technologies) and the **process** (the steps chosen by the company to implement its MC strategy) involved in a mass customisation strategy⁹.

Mass customisation is particularly important in some industries, such as the fashion industry. This is illustrated by the fact that five out of eight interviewed companies currently work in the fashion industry: ArtBag Design, Crearmoda, innosabi, MyCustomizer and UPcloud. In addition, the most precise estimation of the potential of mass customisation actually considers the potential of the clothing industry as a proxy: **the customised clothing sector would represent EUR 27.2 billion in 2020, corresponding to 5% of the global fashion market**¹⁰.

"In Mass Customisation, being cross-industry is more an asset than a challenge. Since the technology used is cross-industry". – innosabi

In addition to this, the clothing sector also has a clear potential when considering on-line sales; which heavily drives mass customisation thanks to new technologies. For



instance, online-sales of footwear and clothing has increased by 86% between 2006 and 2009 in Germany, corresponding to EUR 5.2 billion in 2009. This market was EUR 24 billion in size in the United-States in 2009¹¹. Its potential is clear when considering that only 7% of clothes were sold online in 2011, compared to 50% for computers and 61% for books¹². Mass customisation can be one of the key factors for catching-up for clothing online-sales as compared to these more mature sectors. This would be supported by currently changing mentalities and habits towards on-line sales for clothes.

Urban mobility is another sector impacted by mass customisation. By developing adaptive vehicles, **Muses** intends to fill a market gap of 80,000 to 120,000 vehicles in France and 500,000 vehicles in Europe. These vehicles focus on the delivery of packages, press, drugstores and catering. This potential is emphasised by the need for replacing the vehicles every 3 to 4 years. If Muses successfully enters this market niche by adding clear value to its clients, the latter will become dependent and buy the next generation of vehicles. In the meantime, Muses would have the time to propose new adaptations, answer unmet market needs, and so attack new markets and create value.

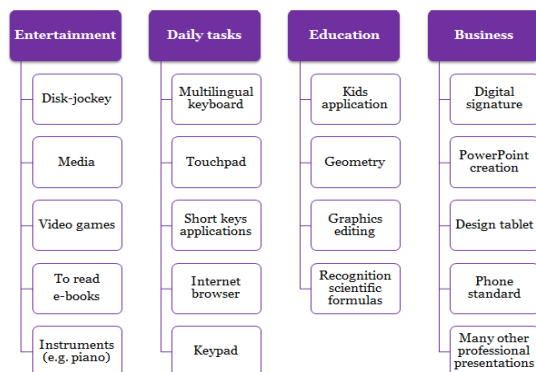
Application areas for mass customisation therefore exist in all sectors. It is a horizontal, non-sector-specific trend. That

Mass customisation is a "strategic mechanism that is applicable to most businesses"¹³

is why, even if an MC strategy had initially been developed for and within a particular target sector, it has significant potential for transferring into / adapting to other

sectors. This is illustrated by the experience of **MyCustomizer** which has developed its customising platform for sport clothes before proposing services to the furniture sector. Another example of the cross-industry dimension of mass customisation is the UBook (i.e. Universal noteBook) produced by **Najmtek**. It is a customisable laptop that can be used by very different industries thanks to specific applications, as illustrated hereafter (Figure 1).

Figure 1: Potential uses of the UBook developed by Najmtek



Source: Najmtek, PwC

Current supporting trends

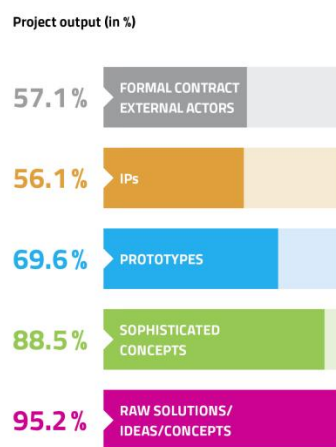
Being a cross-industry trend, mass customisation has developed thanks to other innovative technologies, notably **design, manufacturing, and administrative technologies**¹⁴. They have enabled mass customisation to develop and integrate more comprehensive business strategies.

Indeed, MC impacts product design (especially when considering the integration of clients' views in the process), manufacturing processes (when considering steps between ordering and production) as well as administration (when considering the internal and external management of these processes). For each of the companies interviewed, the predominant supporting technologies have been identified. This illustrates the extent to which each mass customisation strategy requires to be fine-tuned and to be supported by specific technologies or a mix of technologies.

A specific supporting trend and enabler is the **Open Innovation Accelerators (OIA)** market. This OIA market is composed of actors using open innovation techniques to better address clients' needs and propose individualised solutions. These methods include crowdsourcing, workshops, idea contests, the search for market information (client needs) and the search for technical solutions.

A survey conducted in 2013 on the OIA market¹⁵ highlights that these open innovation methods are mostly valued to raise ideas and concepts: 95.2% of the people interviewed for the survey consider ideas as one of the main outputs of OIA techniques (see Figure 2). Mass customisation requires knowledge and anticipation of clients' needs and expectations. OIA methods are very valuable to determine the current wishes of large groups. Most of the communities addressed by OIAs are composed of 10,000 to 50,000 people.

Figure 2: Answers to the 2013 OIA market study



Source: <http://tim.rwth-aachen.de>



*“What really differentiates Digital Leaders is the way they use co-creation and customisation tools (from online-voting to crowdsourced innovation) to really alter their existing products and services”.*¹⁶

A concrete example of an Open Innovation Accelerator is provided by **innosabi**, a cross-industry OIA. This start-up conducts crowdsourcing initiatives for very diverse industries: cosmetics, tractors and cleaning devices. To do so, the OIA leverages the German UnserAlles consumer community which includes 20,000 people.

The 2013 survey on the OIA market also reveals that the market is particularly strong in the USA and is not industry-focused, even though the methods considered are commonly used in the electronics field. This OIA market is getting more mature and strategic for mass customisation, showing continuing growth:

- With a market volume of EUR 2.7 billion in 2013 and the forecast of doubling this figure by 2015 to EUR 5.5 billion;
- With idea contests representing 80% of the open innovation market;
- With 40.3% of the OIA market located in the USA, 25% in Europe, 24.9% in Asia and 9.8% in Africa.

The OIA market is also very fluctuating since 20% of the companies interviewed in 2010 for the same study were either acquired or had disappeared when the 2013 survey was conducted.

As already mentioned, OIA techniques and more particularly crowdsourcing are of particular interest for mass customisation since they enable businesses to receive a massive amount of ideas and concepts from existing and new customers. Moreover, crowdsourcing techniques help integrating consumers right from the beginning of the product design process. In so doing,

“Mass customisation thinks of creating one individual product for each customer. Open innovation is a bit different, it is about integrating the ideas of many into one product” – innosabi

consumers feel more engaged in the brand strategies of products they like. They are also more likely to buy the products for which they provided ideas. That is why crowdsourcing techniques, and mass customisation in general, foster brand loyalty: by integrating clients' views in the design or manufacturing processes, mass customisers raise the attention of clients, increase their willingness to buy customised products, and increase brand loyalty.

The segmentation of the mass customisation trend

The segmentation of mass customisation may be approached in three ways. The first approach consists of considering the exact phase of the value chain which needs to be customised. The second approach consists of considering the degree of customer involvement in the

customisation process itself. The third one consists of considering whether the mass customiser adopts a Business-to-Business or a Business-to-Customer approach.

When considering the first segmentation (value chain), customisations may have core, optional or formal impacts. Moreover, customisation may occur during the design, manufacturing, assembling or delivery phase of the product life cycle¹⁷. Finally, mass customisers have two product propositions:

- To propose a product to be customised on a **once-only basis**, or
- To propose a product to be customised on a **call-off basis**, implying repetition and higher economies of scale.

When considering the second segmentation (customer implication), four types / faces of customisers exist¹⁸:

- **Collaborative customisers** who “conduct a dialogue with individual customers to help them articulate their needs, to identify the precise offering that fulfils those needs, and to make customised products for them”;
- **Adaptative customisers** who “offer one standard, but customisable, product that is designed so that users can alter it themselves”;
- **Cosmetic customisers** who “present a standard product differently to different customers”;
- **Transparent customisers** who “provide individual customers with unique goods or services without letting them know explicitly that those products and services have been customised for them”.

Finally, each mass customiser has to decide when he /she starts his / her business whether he / she adopts a Business-to-Business (“B2B”) or a Business-to-Customer (“B2C”) approach. Service offering and interactions with customers would be impacted accordingly. For instance, after having conducted an extensive survey on clients' needs, Muses decided to focus on delivery services (B2B services). It first thought of addressing also the urban people transportation market (B2C services) but preferred to focus on the market that was the most clearly identified and where demand was the most urgent: package transportation between warehouses and city centres. Following that, many mass customers may then decide to adopt both approaches once their starting strategy has been fruitful. This is the case of **ArtBag Design**, a firm that started with B2C before developing B2B product offerings.

“Our business model is built on three channels: individuals with custom made handbags via the website; cooperation with retail stores and online stores; and corporate customers with the development of unique prototypes for companies”.
– **ArtBag Design**



3.2. Challenges addressed by mass customisation

The mass customisation trend has been developing during the last decade because it enabled mass customisers to address various challenges together, including:

- Ensuring **economies of scales** in manufacturing and delivery. Mass customisation intends to individualise products but uses mass production processes. Mass customisers keep the advantage of mass production and its economies of scale - as well as knowledge curve benefits - while proposing adaptation to better suit clients' needs and expectations.

This is for instance the case of MyCustomizer which helps sportswear companies to keep mass producing their products (clothes, bags, equipment) but with design individualisation.

- Answering the **diversity of customers' needs and wishes** by proposing individualised services. While request for individualised goods is increasing, answering every single client need is impossible; especially in a globalised economy. This is why mass customisers often propose products that clients may improve or optimise by themselves.

This is for instance the case of the configurator platform proposed by **Combeonation** that each client may update or the laptop developed by **Najmtek** which can be customised by the client according to its specific needs.

- Answering **the shortening of product lifecycles** by continuously proposing new products and services. While products have shortened lifecycles, clients' habits and expectations evolve. Mass customisation proposes an answer to both of these phenomena by enabling the mass production of products that follow trends and fashion. In so doing, MC provides competitive advantages and first-mover margin to mass customisers. These competitive advantages are then transmitted to their clients.

This is the core business of OIAs such as innosabi. OIAs directly ask consumers their opinion on future products and market trends so as to help their clients follow these trends and propose innovative services.

- Improving the **technical functionality of existing product and service offering** by adapting proven techniques and being continuously innovative. The definition of an MC strategy often starts from manufacturing challenges to overcome. This is translated into new IT platforms, software solutions and adaptive products that require changing internal and

external processes. MC is consequently a solution to improve manufacturing procedures and boost product offering.

This is for instance the case of **Crearmoda** which has developed a new service offering with customised clothes based on its experience in the fashion industry.

Another example for which mass customisation has provided answers to consumers' requests is in the food industry. MC provides tools and monitoring systems to better know the provenance of food and its compliance with regulations (notably quality and safety standards used to assess food provenance)¹⁹.

Mass customisation also constitutes a sector-wise opportunity. Of particular interest is the clothing industry, where the MC trend started. The industry is currently declining and faces competition from transition countries which sell low cost clothes on the global market. In that context, mass customisation is an opportunity for modernising, differentiating and proposing innovative added value to customers.

This opportunity is illustrated by **Crearmoda** which intends to modify shopping habits in Spain and increase online shopping. Today, even if sales in department stores are still higher than online, the company expects a lot from showrooms to present its products and concepts so as to make customers more familiar with the technology. **ArtBag Design** has also started with a website but recently opened a retail store in Riga to present its products and better interact with clients.

These two experiences illustrate the potential of mass customisation to bridge intangible dimensions such as online designing with very concrete aspects like retail stores. Both aspects lead to job creation and growth. In that respect, mass customisers present high growth potential in Europe. For instance, according to **MyCustomizer**, one third of the products sold online by the sportswear market leader - Nike - are customised, have a 10% sale growth every year and are sold with a 30% premium while remaining affordable. This illustrates both the equilibrium between mass production and customisation as well as growth potential for mass customisation.

3.3. Mass customisation strategies illustrating the trend

Detail regarding each of the interviewed company is provided in the following paragraphs. They present the innovative solutions provided by mass customisers and demonstrate how each strategy uses the potential of mass customisation to improve its manufacturing processes and create value.



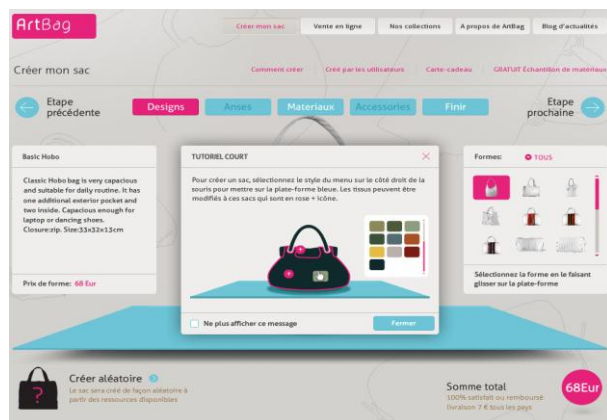
Problem 1 – Offer the possibility to clients to design their own handbag and order it online.

Innovative solution 1 – ArtBag Design has developed a website that enables clients to design their own handbag based on a proposition of shapes, colours and accessories. Handbags are then made by hand and delivered to clients by mail.

ArtBag Design also develops new bags for companies and looks for more automated processes in that perspective.

Business relations	B2B and B2C
Customisation face	Collaborative (when developing new fine-tuned bags) and adaptive customisations (when considering the customised bags designed online)
Enabling technology	Design technology
Basis	Once-only (in B2C relations) and call-off (in B2B relations) basis

“Now everyone is going to individualisation” – ArtBag Design



Problem 2 – Enable companies to manage their own mass customisation strategy through IT tools and facilitate their client management, manufacturing procedures and sales management.

Innovative solution 2 – Combeention proposes a product configuration system as an all-in-one web shop. This online service does not involve hardware, software or plugin from the client side. Each client creates its configurator and embeds it on its own website. It can then manage its own web page, its own clients as well as its production processes and sales.

Business relations	B2B
Customisation face	Adaptive customisation
Enabling technology	Design technology
Basis	Call-off basis

“We anticipate a 400-600% growth per annum for our company in the next 3 years with an annual revenue of EUR 1 M in the first 12 months after the public launch” –

Combeention

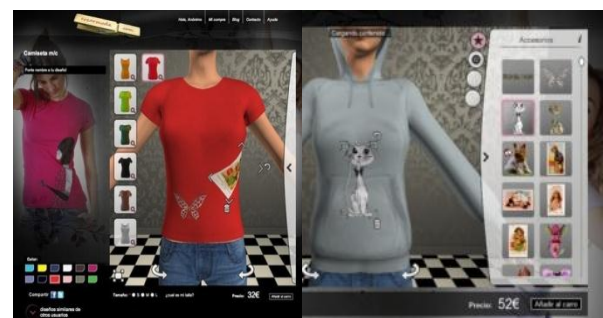


Problem 3 – Enable customers to develop their own fully-customised clothes online thanks to a product design simulator.

Innovative solution 3 – Crearmoda has developed a 3D simulator that enables customers to design their own clothes and create their own style online.

Business relations	B2B and B2C
Customisation face	Collaborative customisation
Enabling technology	Design and manufacturing technologies
Basis	Basis Once-only basis

“The idea of changing the way people buy clothes; that is the innovative part of our project” – Crearmoda



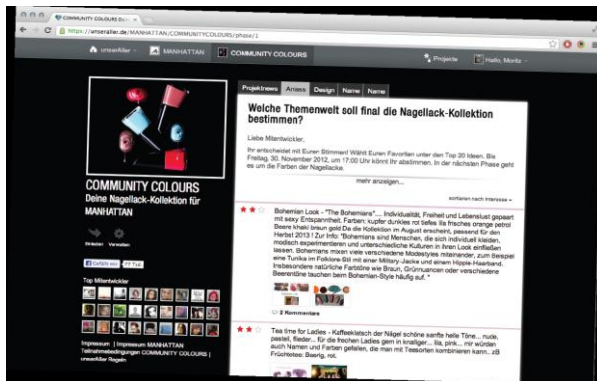
Problem 4: Facilitate and improve dialogue between companies and customers on product and service concepts as well as design through crowdsourcing.

Innovative solution 4 – innosabi has developed a fully customisable crowdsourcing software platform – ignite - enabling dialogue between companies and communities (clients’ internal and external communities) in order to raise ideas and concepts.



Business relations	B2B
Customisation face	<i>Collaborative and adaptive customisations: The ignite platform was developed together with clients from various industries so as to capture best practices (collaborative customisation). Now, 10 to 15% of the platform appearance can be adapted according to the client, the remaining 85-90% is part of a generic IT environment (adaptive customisation)</i>
Enabling technology	<i>Design and administrative technologies</i>
Basis	<i>Once-only basis</i>

“The open innovation market is growing so much, only because of the technology”. – innosabi



Problem 5: Facilitate delivery services in urban areas with adaptable vehicles able to answer specific needs while proposing in parallel an environmentally-friendly solution.

Innovative solution 5: Muses has developed a vehicle that can be adapted to specific needs of transporters that have to circulate in urban areas and deliver products. The main need addressed is the distance to cover between warehouses or collection points in suburban areas and delivery points in city centres. In addition to be adaptable and flexible, this vehicle is adapted to urban circulation, environmentally friendly and able to cover a distance of 90 km autonomously.

Business relations	B2B
Customisation face	<i>Collaborative (when considering the discussions on the design of the grounding platform of the vehicle and its added cabins) and adaptive customisations (when considering the proposed options and modulations of the vehicle)</i>
Enabling technology	<i>Design and manufacturing technologies</i>
Basis	<i>Call-off basis</i>

“Being an innovative company is not a barrier” – Muses



Problem 6: Improve the design customisation of products through IT tools while facilitating manufacturing implications of mass customisation. Clients and companies are willing to customise their standardised products while reducing the challenges and issues involved in production by the customisation process.

Innovative solution 6: MyCustomizer provides an IT customising platform available to companies which are willing to provide their clients with customised products.

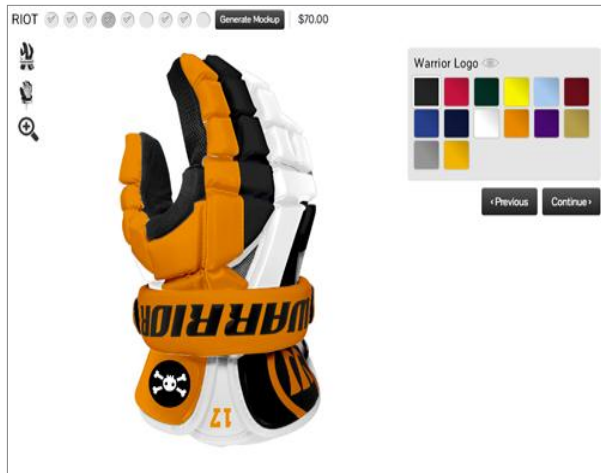
MyCustomizer’s own clients can design and update their fine-tuned platform thanks to a simple design of the tool. In that view, MyCustomizer can adapt to any sector (clothing, shoes, furniture) and can easily be fine-tuned with only little support from the start-up company. The companies can consequently decide very easily and rapidly to propose new customisation features (colours, shapes) or remove the existing ones and consequently adapt to their production capacities.

In that process, MyCustomizer enables the set-up of very clear and synthetic notes with instructions to be address to manufacturing centres, for setting up the production of the customised products. This B2B solution is therefore aimed at having an impact on the manufacturing process, by dramatically reducing its complexity. Finally, MyCustomizer proposes IT support (real-time chatting and phone services) and links to social networks.

Business relations	B2B
Customisation face	<i>Adaptive customisation</i>
Enabling technology	<i>Design and manufacturing technologies</i>
Basis	<i>Call-off basis</i>



“Three barriers previously holding back mass customisation are diminishing: first, manufacturing processes now enable mass production along with customisation; second the management of clients’ requests now enables to take into consideration thousands of orders simultaneously; and third the changing attitude of the general public which no more consider customisation as luxury”. – **MyCustomizer**



Problem 7: Need for laptop with a keyboard that can be adapted to specific needs. Several devices are often needed when they could be combined into one. A unique adaptive laptop would permit to have the specific set of functionalities that each client needs.

Innovative solution 7: Najmtek has developed a computer with a touch-sensitive keyboard that can be adapted to the specific needs of clients, such as schools, doctors, media agencies, space agencies and police departments. With this innovative solution, a client can have different keyboards at disposal, reducing his need for various devices. And, more importantly, he / she can develop his / her own keyboards according to his / her needs and wishes (both for professional and entertaining purposes).

In parallel, Najmtek proposes a store where clients can buy accessories and applications, and where developers may create their own applications and sell them in the store thanks to a Software Development Kit (“SDK”).

Business relations	B2B and B2C
Customisation face	Adaptive customisation
Enabling technology	Design and manufacturing technologies
Basis	Call-off basis

“With Ubook, you imagine and create your own keyboard, with all the shortcuts you need, the unique one that perfectly fits what you have been expecting from so long”. – **Najmtek**



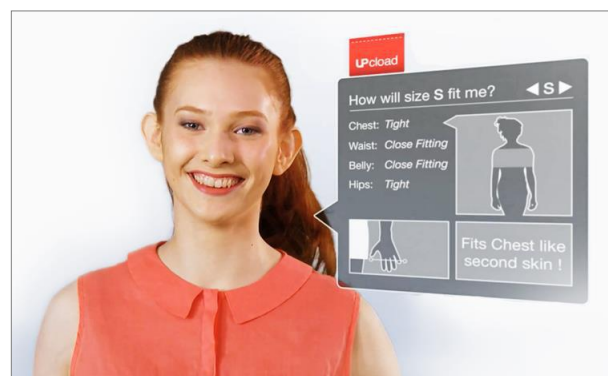
Problem 8: Determine the right size of clothes to buy online according to the characteristics of each individual customer.

Innovative solution 8 : UPcloud has developed algorithms able to define the most suitable size for clothes so as to facilitate online shopping. Algorithms use data provided by customers (weight, height, gender, age), samples of figures that customers select according to their own shapes and an extensive database of clothe sizes (about one million of products are integrated in UPcloud’s database).

Based on these elements, the IT tool provides customer with a size recommendation and a selection of clothes that best suit him / her. This IT tool is integrated into UPcloud’s clients’ websites.

Business relations	B2B and B2C
Customisation face	Transparent customisation
Enabling technology	Administrative technology
Basis	Call-off basis

“We launched our platform in February 2012. Since this time, we learned a lot and adapted the technology to make it easier and quicker. Before it was a webcam, now it is an algorithm”. – **UPcloud**





3.4. Enablers and key success factors for successful mass customisation

The degree to which a company can better meet customer needs by integrating mass customisation features in its value chain depends to a great extent on the leverage this same company can do on a few enablers. Such a company also needs to tackle the key success factors implied by MC. In other words, there are companies providing B2B services and tools which, if integrated into manufacturing value chains, are able to decrease barriers to entry to mass customisation. To do so, three enablers are mobilised by successful MC companies.

The first MC enabler is represented by the development of **IT platforms and web-based facilitators**. These technologies provide knowledge systems that are able to manage three key elements for MC strategies: design information; manufacturing modifications; and relations with manufacturing centres. Moreover, MC strategies are also supported by web 2.0 and social platform technologies, enabling work at a global level with very low transaction costs.

When looking at the vision, mission and perspectives expressed by the interviewed companies, it is clear that internationalisation is one, if not the most important point that has been brought forward by all of them. The use of fast and real-time communication tools constitutes an essential asset to remain in the competition and keep one's competitive advantage.

A recent study on digital readiness also provides insights so as mass customisation enablers being pivotal for the development of new business models²⁰. Consequently, it is clear that MC development is fostered by the improvement of digital possibilities and their integration into manufacturing processes. In other words, the more digital media is diffused in the society, the more mass customisation will develop and offer business opportunities. At the firm level, these IT tools are considered as crucial corporate assets helping the company to attract new clients and attack new markets.

More specifically, innosabi estimates that social media represents 50% of the tools used by the open innovation

"We do not have a proper shop. We have a facebook account where customers may upload their creation".

– **Crearmoda**

actors. These media tools are also often used by mass customisers. For instance MyCustomizer has adapted its MC platform to integrate social media. The other 50% of open innovation tools are friend discussions, blogs, twitter and the sending of prototypes to clients for testing and approval. This illustrates that the development of open innovation - and consequently of mass customisation - goes along with the development of social media and discussion platforms.

The second MC enabler corresponds to the design and development of **flexible production processes**. Since mass customisation requires making manufacturing processes evolve, mass customisers need flexible work processes and adaptive supply-chain systems. In parallel, MC strategies may also help adapt manufacturing processes thanks to better information and communication between design and manufacturing phases. This is one of the added values of the IT platform proposed by MyCustomizer. The Canadian start-up has developed templates of instruction notes for manufacturing centres so as to help them producing the customised products. These instruction notes may be adapted by the client to be fully consistent with its own processes.

"The average delay of delivery is between one and two days.

The process is very fast".

– **Crearmoda**

The third MC enabler is represented by the implementation of appropriate **governance structures and communication settings**. The main MC challenges being related to the adaptation of former manufacturing processes to new and more flexible production chains, the management of supply-chain and stocks require appropriate governance structures together with efficient ways of analysing, processing, and transmitting information. These updated governance structures need to handle all customising possibilities, ensure product manufacturing and manage resources (time, skills and inputs). That is why mass customisers define their offer together with management structures when developing their innovative ideas.

Governance structures also need to be simple, direct, horizontal and based on networking with other stakeholders who may work in the same business or not. For instance, when changing from technology (between a webcam procedure and the development of algorithms to estimate the most suitable size of clothes for the client), UPcloud has developed new governance structures and integrated new management capacities with the hiring of more experienced managers. In parallel, the start-up had to communicate its technology change and present its new approach.

So far, key success factors have also emerged from successful MC strategies. Among these factors, three crucial capabilities supported companies developing B2B mass customisation strategies²¹:

- **Solution Space Development**, meaning the ability of the company to create an environment favouring the selection of options for its clients. This is particularly visible with the development of online configurators, such as Artbag Design, Combeeneration, Crearmoda and MyCustomizer.
- **Robust Process Design**, meaning the capacity of the company to adapt and recombine its existing manufacturing and value chain processes (deriving from mass production) to implement the mass customisation



strategy and so enable the production of differentiated outputs and services. Crearmoda took about a year to ensure a smooth integration of its configurator platform into its previous processes.

- **Choice Navigation**, meaning the ability of the company to guide its customers when identifying and defining their problems, needs, expectations and solutions. This should be proposed in a simple way so as to reduce the paradox of choice²² to its minimum. That is why mass customisers often propose services along with their products. This is for instance the case of ArtBag Design and Crearmoda which propose fashion advices. Another example is MyCustomizer, which has set-up hotline services to help clients fine-tuning their configurator. Finally, Najmtek provides clients with a Software Development Kit to help them developing applications for the UBook.

In addition to these company capabilities, most of the successful MC strategies have also applied the following CURA framework (Table 2)²³:

Table 2: The CURA framework

Curation	Curate the product's customisation by taking away unwanted choices, offering a narrative for customer self-design, and interpreting the meaning of product choices.
Usability	Create a user experience that will enable customers to succeed as self-designers, including an ability to discover options, a mechanism for eliciting choices, and guaranteeing ease of use in manipulating product choices.
Resonance	Solve a real product need for individualised customers with features that resonate.
Anticipation	Predict the wants and needs of customers-as-individuals, including what combination of features will delight, what new features should be introduced, and how to recommend resonant ideas that customers did not know they wanted.

Source: J. P. Gownder, PwC

When considering business applications of this CURA framework, this is translated into:

- **Active listening and discussion with the client** before defining the MC strategy. For instance, Muses conducted an extensive market survey to understand the needs of its future users and align the technical vision with the business objectives of the project. Following the concept definition, the project was refined thanks to large-scale demonstrations with delivery services partners. In the end, the final value proposition resulted from selection and focus: while Muses intended to propose vehicles for both businesses and citizens, it

decided to only focus on product delivery in urban areas, making sure it answers a clear existing need.

- **Simplicity** of the product or service provided. Mass customisers take great care in reducing the number of steps in their process. That is why ArtBag Design, Crearmoda and MyCustomiser have developed their configurators so that they can be used and adapted by non-initiated users. Simplicity is particularly important when proposing IT platforms to clients having only few IT skills internally.
- **Flexibility** of the customised product or service. By providing online visual prototypes of final products and by enabling further changes and optimisation, mass customisers can propose products that clients may either customise upstream - thanks to IT configurators or large-scale demonstrations with Muses - or downstream, such as Najmtek with the Najmstore.
- **Efficient internal and external communication.** With the use of information provided by stakeholders through crowdsourcing, pilot testing and networking. That is why the idea ranking and support in decision-making provided by innosabi after online consultations is particularly relevant for clients; By attracting the best talents, which may sometimes be challenging for start-ups in the competition with large established IT companies. That is why UPcloud insists in proposing attractive salaries and in making employees feel part of the company adventure; By handling customisation design challenges and their related manufacturing issues as early as the design phase and, in doing so, reducing manufacturing errors. That is why MyCustomizer proposes templates of instruction notes for technical centres. Manufacturing challenges have to be taken into consideration upstream and influence the propositions made for customisation.

3.5. Client benefits: exploiting the potential of mass customisation strategies

Mass customisers offer solutions that help clients improve their business performance (B2B relations). They also provide customised goods to final consumers (B2C relations). Experience has shown that the main added value of MC strategies is in differentiation. In their B2B relations, mass customisers provide their clients with the three following benefits:

Provide a more adapted answer to client's needs. Mass customisation offers the opportunity to improve client management. This aspect is of particular interest when considering that customer agility drives 45% of today's firm performance²⁴. By providing more adapted answers to clients' needs, MC helps to:



- Resolve the paradox of choice by proposing solutions to balance costs and benefits of customisation. This is notably the case of the UBook produced by Najmtek: if the laptop requires adaptation, it also replaces many other devices.
- Improve the visualisation of product offerings thanks to visual solutions such as configurators. This is for instance the case of Combeeneration which proposes a configuration platform that clients integrate into their own websites.
- Adapt customers to the product by themselves. This optimisation is often only limited by the technology or the creativity of the user. For instance, Najmtek is attacking very diverse markets at the same time, including: education, retail, health, spatial agencies and police departments. All of them may adapt the UBook to their own needs thanks to simple programming language and the Najmstore.

Improve clients' business and working conditions. Mass customisation enables clients to develop their own business, by:

- Enabling them to focus on their core business. For instance, many mass customisers propose software platforms to their B2B customers. From a client point of view, these configurators are outsourcing. Clients have consequently more time to focus on their core business. In the meantime, the mass customiser optimises the technology used for the platform in order to remain at the top of the technology. This is the business model of MyCustomizer vis-à-vis its sportswear clients, such as Warriors. In so doing, each actor of the B2B relation focuses on its core business and leverages its own competitive advantages.
- Improving their manufacturing processes thanks to detailed information on products to be customised. In that vein, MyCustomizer proposes templates of instruction notes for manufacturing centres that can be fine-tuned. Manufacturing issues are consequently taken into consideration as soon as the design phase to ensure the production viability of the customised good.
- Improving decision-making. Softwares developed by mass customisers often help managing administrative tasks related to manufacturing. This is the case of Combeeneration which enables its clients to manage orders, notes for machinery centres, reports from manufacturing departments, sales and delivery. These functions are integrated into the design configurator that clients incorporate into their own websites.
- Answering different needs at the same time. For instance, the UBook of Najmtek is an adaptive laptop

that combines various devices. Clients have consequently fewer devices to transport with them. They also have only one tool to use; which reduces the time required for adaptation and training. The UBook is also eco-friendly since it reduces the need for raw materials (former devices becoming useless). Muses is another example which combines eco-friendly technologies with urban mobility.

Enable to adapt to new needs and trends. In their B2B relations, mass customisers help clients remaining at the top of the competition and improve their own client's relations by:

- Knowing in real time the needs or expectations of their clients thanks to open innovation technologies, such as crowdsourcing in the case of innosabi.
- Improving client's satisfaction rate and brand loyalty, such as UPcloud which enables online clothes shops to increase their conversion rate by two times and reduce their item returns by 10%.
- Integrating upstream the future optimisation made by the client. This is the case of Najmtek with its sharing platform, the Najmstore. This platform is open to clients' own innovations. That is why Najmtek developed a Software Development Kit helping clients optimising their UBook by themselves. Clients may then post their applications on the Najmstore and propose - or sell - them to other clients.

To guarantee all these client benefits, MC requires continual research, processes improvement and testing.

3.6. Client perspectives: barriers preventing the increased uptake of mass customisation

Mass customisation raises issues that prevent all European companies to leverage its potential. The latter may be related to the manufacturing processes implied by MC strategies or related to mass customisation itself.

"The key is to think of [mass customisation] as a process for aligning a business with its customers' needs".²⁵

First, mass customisation deals with manufacturing issues that prevent all companies from implementing MC strategies. These manufacturing issues are as follows:

- **Data and information collection / analysis.** Data is needed to define what customers want and assess where there is space for solution. These data management challenges may be related to crowdsourcing tools and their related challenges, as illustrated with innosabi which ranks ideas proposed by online communities and supports clients in their decision-making processes.



- **Balance between customisation and cost / complexity of operations.** Customisation induces higher costs which require to be overcome by revenues. Mass customisers also look for improved client satisfaction. For instance, Combeeneration's clients have to integrate the online configurator to their website; which implies costs. That is why they expect a positive return in terms of sales, simplification of procedures and improvement of manufacturing processes.
- **Organisational changes.** These changes result from (1) the adaptation / recombination of existing processes, (2) the communication and interaction with customers to define / refine their needs and (3) change management towards corporate inertia. In other words, integrating an MC strategy implies carefully managing change. This change consists of the use of new machines, the need for a new mix of skills, the need for innovative client management and the development of new partnerships with various sectors and sometimes with the academic sphere. UPcloud had to manage such organisational changes when it switched technologies; preferring the use of algorithms instead of webcams for defining the size of clothes. This switch implied to develop the new technology, integrate it into its existing processes, hire more experienced managers, redevelop the business model, handle the clients and ensure employees' commitment via appropriate internal communication. In the meanwhile, UPcloud could not focus on attacking new markets (such as shoes) or seeking new clients.
- **Economies of scale management.** Developing an MC strategy may induce to integrate mass production processes after having used tailor-made techniques. That is why mass customisers often face issues during the scaling-up phase. For instance, ArtBag Design currently produces handmade bags but reflects more and more on automated processes for its corporate clients. This scaling-up phase will induce to buy new machines, find a bigger location, hire new people and new skills, train these new employees and manage clients in a more formatted way.
- **Supply-chain management.** MC strategies start by considering supply-chain issues before defining the potential for customisation. Moreover, these supply-chain issues often involve worldwide delivery since most of mass customisers target global markets. Supply-chain management is consequently key, as exemplified with MyCustomizer which provides its clients with instruction notes to facilitate the manufacturing of customised goods.
- **Inventories management, sales projections** (volume and schedule management) and **risk management** related to the demand side. Mass

"The key point is the capacity to transform a prototype into a product: overcome the step of the prototype". – Muses

customisers must pay attention to their stocks and have lean-production processes. They also need strong and continuous relations with their suppliers. These points have been critical for Crearmoda when the company started its online customisation service since it modified its approach towards inventories and schedule management.

- **Internationalisation.** Markets targeted by mass customisers are often global or require fast international growth to guarantee first-mover margin. That is why Najmtek decided to have patents in many countries before attacking each market. The French start-up has therefore secured its market niche in each country. This approach is long and must address each market separately while developing the product prototype.

Second, mass customisation strategies also imply specific barriers that may prevent companies from proposing MC solutions to their clients:

- **Choice of the right customisation.** Mass customisers have to identify the idiosyncratic needs of customers and market gaps. In that perspective, crowdsourcing activities may be useful to collect ideas, needs, opinions and trends (innosabi). Prototyping (Najmtek) and large-scale demonstrations (Muses) are also feasible options to define appropriate customisations.
- **Need to have a clear understanding of clients' needs and how to integrate them into existing manufacturing processes.** To illustrate this point, the technology change performed by UPcloud is insightful: in order to determine customers' most appropriate clothe size, the start-up first developed a webcam procedure before developing algorithms which was finally considered more convenient for clients.
- **Need for market testing and prototyping.** This element is supported by the development of a "virtual product testing"²⁶ environment enabling clients to choose and test their products (exemplified with Artbag Design, Crearmoda, Combeeneration and MyCustomizer in the present case study). Another illustration is the development of prototypes before attacking markets so as to present tangible goods to financiers and customers (Najmtek). Finally, mass customisers may also implement large-scale demonstrations, like Muses in two French cities.

Eventually, the main issue for the future of mass customisation is to become operational across sectors and leverage on best practices from one sector into another. This implies that best practices in some sectors are acknowledged and then adapted to other sectors²⁷. This method would create new markets and jobs and foster development.



3.7. Summary of mass customisation's socio-economic impact

To summarise, the uptake of mass customisation can have the following socio-economic benefits:

- Fostered competitiveness of European companies on the global markets thanks to new competitive advantages, better focus on core business and improved internal manufacturing processes;
- Job creation and cross-mutualisation of skills from diverse fields: IT, engineering, marketing and management;
- Development of existing market niches and creation of new market segments thanks to new approaches and innovative answers to currently unmet needs;
- Development of new business models, based on innovative visions and cross-fertilisation of different

sectors such as fashion and new information technologies;

- Internationalisation of European mass customisers which are willing to take advantage of first-mover margins by exporting their products and services.

For instance, Najmtek is currently developing a new market niche: customised laptops with touch-sensitive keyboards. The company is currently in its go-to-market phase. It is able to produce 200,000 UBooks in the next six months. It also plans to hire 35 people, in addition to many sub-contracts. To do so, it needs EUR 15.3 M. The company has estimated that investors would have a return on investment after only 18 months. An American bank already agreed to provide a guarantee of EUR 19 M to the investor that would finance the company for its first firm order. In the near future, the firm intends to have 100 employees as compared to the four employees currently working on the project.

4. Drivers and obstacles

Factors related to business environments may either favour or hinder the emergence and development of mass customisation strategies. Even though many of these factors are not specific to the trend, they constitute either clear support or important obstacles to business development in the field of MC.

Among the drivers supporting the trend, mass customisers consider the access to an enabling business environment the most important. This is the main support companies expect from the public sphere. It is also a multidimensional factor that requires coherence and comprehensiveness of its dimensions to be effective. As far as obstacles are concerned, access to finance is considered as the most critical, especially when successful SMEs intend to scale-up and expand internationally.

"The first three main challenges we are facing are: (1) technological barriers, (2) the financing issue and (3) access to market". – Muses

Access to talented and highly skilled labour force is considered both as a key enabling factor and challenge for MC strategies, more particularly when knowing that mass customisers are often very small teams. Mentality change is another trend driver. It comprises (1) the increased willingness to dispose of customised goods, and (2), the development of online shopping and (3) the approach towards risk-taking in the MC field. Finally, public support is also considered as important, even though it first passes through the enabling environment previously mentioned. All

these enabling and challenging factors are considered at regional, national and EU levels in the following paragraphs.

4.1. Benefitting from an enabling business environment

The first driver for mass customisation is the general environment in which mass customisers created their business and in which they currently develop. This intangible and multi-dimensional factor is complex to apprehend and is not only composed of direct public support such as grants. It is however triggered by the public sphere and requires comprehensiveness and coherence to be efficient.

Hereafter are presented the enabling components of business environments in which the companies interviewed have been developing. Most of them constitute best practices that can be easily transferred from one country / region to another:

- **Ease to create a company while improving second chance and time / facility to adapt to the market.**

Most mass customisers are new, small companies. As a result, mass customisers better develop in countries where creating a business is easy. This is for instance the case of Crearmoda which decided to make its initial business model - a 25-year old family business in textile and more specifically clothes distribution in department stores - evolve and integrate IT technologies for mass customisation. A similar story



happened to MyCustomizer. One of its founders was previously an employee of a sportswear company which became later the first client of the IT platform. Finally, ArtBag Design was created by a person who benefitted from Latvian and EU support for unemployed people.

- **Ease to work between large companies and SMEs.** Mass customisers are often small companies that collaborate with large companies. Such relationships help the trend to develop and supports synergies between sectors. This is the case for innosabi, which is established in Munich and benefits from large companies doing business in the area.
- **Implication of politicians.** Networking being a key asset, successful MC strategies often benefits from politicians' support to contact networks and travel to meet investors and future business partners. For instance, the German Ministry of Economy organised a four-day business trip in the Silicon Valley with 100 companies, including innosabi. During this trip, the companies met American investors and potential clients.
- Integrate successful and promising SMEs in the **boards of industry representatives.** Such boards rarely include young start-ups doing business in innovating trends. However, integrating these companies would enable such boards to better take into account the evolution of innovative trends and integrate innovative SMEs in discussions relative to the future of the industry. This is for instance the case of innosabi's CEO, who is the first start-up representative to integrate the board of Bitkom, the German Federal Association for Information Technology, Telecommunications and New Media.
- **Communication** on supporting initiatives for innovative SMEs. All countries in Europe organise initiatives to promote innovation. However, communication should sometimes use social media, involve successful innovative companies to present their business case and more generally spread the information to the targeted community.
- **Proximity with universities and research centres** is also a plus. For instance, **Muses** is currently working

"We are trying to participate to a contest in September 2013 at the Facultad de Bellas Artes (the Fine Art University of Bilbao, Universidad del País Vasco): students would be able to collaborate and integrate their designs to our platform".
– **Crearmoda**

with a university to study sociological aspects of its concept implemented in a few cities. In Spain, **Crearmoda** intends to make students participate to its platform while being in a competition organised in a local university. In parallel, **Combeeneration** benefitted from the advice of a scientific adviser working at the University of Applied Sciences in Salzburg and Franck Piller²⁸, one of the most recognised specialists in mass

customisation who helped the start-up defining its MC strategy and product offering.

- **Patents and rewards.** Since mass customisation is grounded on the potential of first-mover margin generation, it is key to have an environment where innovation is incentivised. Most of the companies interviewed won prizes and received awards. A specific example is provided by Najmtek which has adopted a unique method: being granted of patents in most of the countries possible before attacking all identified markets globally. The start-up currently has patents in seven territories corresponding to 60% of the laptop market, notably the United States, China, France, Singapore, South Africa and Israel. In parallel, international and European patents have been published and Taiwanese as well as Malaysian patents have been filled. In the meantime, the company received the prestigious reward of "European ICT Innovation of the year 2012". This experience, along with all successful MC strategies, illustrate the extent to which regulation is a key enabling factor that provides companies with exclusiveness and identified market positions.

"Why always helping big companies in Europe? On must also consider SMEs!".
– **Najmtek**

4.2. The key phase of scaling-up and its financing

Interviews with mass customisers have revealed that the key phase - and the main barrier of the trend - is the scaling-up stage. It follows the stage of prototyping and precedes a more massive business industrialisation. Hereafter are presented a few quotations in relation to this phase and its related challenges (Figure 3).

Figure 3: Quotes from interviews regarding the need for PPPs

"We are stuck with the lack of "go to market" finance, especially for high-tech companies [...] Strong ideas are ready to go on the market but fail because they could not get funding" – **Combeeneration**

"Industrial investments are complex. Few organisations support the industry. Such organisations exist for R&D but do not exist for industrial projects, which are capitalistically too important for ordinary investors" – **Muses**

"At the beginning it was more important to target investor events, now it is more important to focus on industry events [...] Our main challenge now is to become global and scale up". – **UPcloud**

"Access to finance was double but entering new markets is much more complicated and challenging" – **ArtBag Design**

"In Europe, there is lack of financing and a lack of support to help innovative companies develop. That is why they prefer to sell (exit) instead of growing" – **Najmtek**



According to most of the companies interviewed, **seed financing** is not the real issue for developing a mass customisation strategy. For instance, **Crearmoda** benefitted from a EUR 30,000 grant from the Basque government which corresponded to 70% of the project and enabled the company to develop the most challenging and costly part: adapting the IT technology to the fashion sector.

innosabi provides also insights on the means available during the seeding phase in Germany. First, German firms benefitted from the regulation on business angels. This regulation enables business angels to get a 20% tax return on their investment. Second, the German start-up benefitted from new regulations on UG (Unternehmergeellschaft), a new legal status for small companies and entrepreneurs requiring less capital than for normal limited liability company, GmbH. When setting up an UG, a minimum share capital of only EUR 25,000 is required. Third, the State of Bavaria financed half of the company's salary for one employee.

Bottlenecks are more often occurring when **growth financing** is needed, which follows seed financing and

precedes large investments. This phase is particularly important for mass customisers because they often need to become global fast so as to promote their products worldwide and benefit from first-mover margins. By doing so, they avoid copycat by larger companies and local SMEs.

Following this, scaling-up also implies the **Europeanisation** of companies and **access to new markets**; which can be challenging. For start-ups, this expansion implies to access clients in unknown environments. That is why **support in market intelligence** - at both national and European levels - could be of great help for European mass customisers.

“Access to new clients and markets was more challenging than expected: it takes time to educate people internally for entering new markets such as Germany”. – ArtBag Design

Table 3 hereafter synthesises the support - especially the financial support - received by the eight companies interviewed in parallel to their current needs for scaling-up, especially financial needs.

“Support and more specifically financial support is there [...] If you have an idea, you can always do it”. – ArtBag Design

Table 3: Support received and needs for scaling-up experienced by mass customisers

Company	Support and sources of funding	Needs for financing and scaling-up
ArtBag Design	<ul style="list-style-type: none"> Benefitted from an incubator when developing the website and the customising platform Benefitted from financial support issued by the city of Riga and Latvia as well as from the European Social Fund since the founder of the company was unemployed 	<ul style="list-style-type: none"> Thinks of developing mass production machines for their line of services devoted to corporate clients, instead of using artisans (as they do now) Looks for a bank loan and private investors to finance its second part of development Looks for mentorship and support in developing management and soft skills
Combeeneration	<ul style="list-style-type: none"> Self-financed Benefitted from an incubator but was disappointed by the support provided by the special promotion agency suggested by the incubator R&D-Funding from the “Austrian Research Promotion Agency” (FFG) 	<ul style="list-style-type: none"> Looks for go-to-market funding. In that view, the firm has contacted a new development agency and waits for an answer. Otherwise, it will look for venture capital, even though it is difficult to find it in Austria Needs between EUR 1 M and EUR 2 M in the next 12 months
Crearmoda	<ul style="list-style-type: none"> Won a contest for innovative companies in the Basque region Received a subsidy of EUR 30,000 from the Basque government, corresponding to 70% of its seed financing needs Supported by Creativity Zentrum²⁹, an incubator in Bilbao (under the format of a non-profit foundation) that provided technical and business advices 	<ul style="list-style-type: none"> Currently not interested in finding investors, especially because the company has not found the adequate interlocutors to become investors in Spain
innosabi	<ul style="list-style-type: none"> Benefitted from the business angel regulation in Germany The State of Bavaria financed half of the company's salary for one employee 	<ul style="list-style-type: none"> No particular financing needs at the moment Preference for networking support at the EU level as compared to grants



Company	Support and sources of funding	Needs for financing and scaling-up
Muses	<ul style="list-style-type: none"> Was one of the four projects selected by the Yvelines General Council proposing clean urban vehicles in 2010 and received a grant of EUR 750 k to develop a demonstrator Part of the “pole of competitiveness innovation enterprise” Supported by regional business angels 	
MyCustomizer	<ul style="list-style-type: none"> Benefitted from the Canadian Scientific Research and Experimental Development (SR&ED) Tax Incentive Programme³⁰ Currently benefits from the imitative of the Canadian Development Bank under the form of a convertible note because the company was selected at the end of the accelerator programme Benefitted from grants from a local centre for development (Société de développement économique Ville-Marie - CLD³¹) Benefitted from the technological entrepreneurship support services provided by the Maison Notman³². Integrated an accelerator programme with mentoring and coaching (FounderFuel³³) 	<ul style="list-style-type: none"> No particular financing needs at the moment Preference for administrative support and easier communication between businesses and investors
Najmtek	<ul style="list-style-type: none"> Self-financed thanks to a French SME working in informatics: profits of this SME were used to invest in Najmtek up to EUR 2 M as seed financing Benefitted from the French Research tax Credit No capital-risk used Received prizes and awards 	<ul style="list-style-type: none"> Looks for EUR 15.3 M to produce the first 200,000 UBook units in the next six months Hopes to have important public purchasing, since the UBook can be used by various insitutions (i.e. education, health facilities, police departments) and public agencies (i.e. spatial agencies) all around the world Would like French financing options similar to a zero interest rate loan. The company would be able to reimburse such a loan during the next 2-3 years and fully bear the risk
UPcloud	<ul style="list-style-type: none"> Benefitted from German federal grants, support from the city of Berlin and the Region-Bundesland. These grants helped them attracting business angels Received funding from 18 private investors Received prizes and awards 	<ul style="list-style-type: none"> Looks for scaling-up funding: between EUR 5 M and EUR 10 M for the next 12 months

4.3. The importance of multidisciplinary skills

As presented by the 2013 survey on Open Innovation Accelerators³⁴, OIAs comprise IT solutions using web 2.0 and social media. They also utilise knowledge-intensive services involving the recruiting of experienced project managers and analysts. Finding and hiring such managing profiles is challenging for many of the mass customisers. This is for instance the case of UPcloud which acknowledged a noticeable change when switching from one technological option to another and had to hire experienced consultants to

support them in that process. Support in technical skills and management mentorship are also expertises that companies look for when integrating incubators or accelerators and when working with business angels. The need for finding the right mix of expertises in small teams is a common pattern among mass customisers.

For instance, the open innovation accelerator innosabi comprises five main skills: mechanical engineering, electrical engineering, finance, web development knowledge and marketing skills along with consumer management knowledge. These areas of expertise are very different and need to be carefully integrated to be well leveraged upon. This is particularly important when considering that most of

“A very diversified team is important when working in innovation”. – innosabi



mass customisers are SMEs with few employees, such as innosabi with 11 employees in Germany and 2 in Bosnia.

In that vein, the evolution of Crearmoda's business model has been established with only four people specialised in informatics and sales. In the case of Muses, 25 people are full-time employees while a total of 40 people currently work on the project and 100 are expected to be involved in 2015. Again, very different backgrounds are collaborating, ranging from engineering to operational manufacturing skills.

When considering the capacity of mass customisers to attract and retain talents, the companies interviewed have

“Montréal has four universities and a very high proportion of students compared to the number of inhabitants. It is a gold mine”. – MyCustomizer

different approaches. Some consider that talents are difficult to attract, especially for start-ups (innosabi, UPcloud), others are very optimistic on the potential of young graduates (MyCustomizer, Najmtek, Muses). The main point to remember is that mass customisers are in competition with multinational companies on the talent market for key skills: IT technologies; engineering; marketing; sales and management. This outsider position is difficult. That is why mass customisers propose attractive salaries and make sure that talents feel part of the company adventure.

4.4. Changes in cultural mindsets and consumption habits

The development of mass customisation is linked to three changes in mentality and consuming habits:

- Change in consumers' attitude towards customised goods and their role in manufacturing processes;
- Change in shopping habits;
- Change vis-à-vis innovation and risk-taking.

The MC trend is a direct result of the first mentality change.

The general public nowadays consider that customised products are no more only luxury goods. Consumers are now willing to possess customised products at an affordable price. Moreover, consumers are increasingly confident and knowledgeable of the products they want and how to obtain them. This situation is tied to new technologies and social media which communicate around new trends and products / services.

“In South America and the United States, people tend to buy more online”. – Crearmoda

Finally, consumers are more able to contribute to product development through the application of new technologies. This is due to the development of easy-to-use applications that have instinctive commending tools. This capacity of the future customer to integrate the manufacturing process may

be exemplified by open innovation methods that leverage web communities, such as the unuserAller platform - a 20,000-member community - in the case of innosabi. These communities help crowdsourcing ideas and testing concepts. They also provide “out of the box” perspectives that Open Innovation Accelerators analyse and use to provide their clients with insights for decision-making.

For instance, mass customisers using open innovation solutions leverage cross-ideation techniques to sort and rank ideas with algorithms. In doing so, unbiased solutions emerge from the community and clients may select their preferred ideas for pilot testing.

Furthermore, the success of mass customisation is linked to changes in shopping habits. Nowadays, e-commerce is rocketing and drives mass customisers proposing web-configurators such as ArtBag Design, Combeation, Crearmoda and MyCustomizer. On the other hand, these web configurators have to adapt to culturally different consumers habits as well as to changing customers' habits. These changes happen at different paces all over the world, which impacts mass customisers in two ways:

- Mass customisers have to develop an adaptive MC strategy to approach foreign markets;
- Mass customisers have to develop strong networks to be aware of changes and follow global trends.

Finally, the development of mass customisation is related to mentality changes towards innovation and risk-taking. Many companies interviewed underlined the discrepancy between American and European mentalities towards innovation. For instance, during its trip to the Silicon Valley with 100 German start-ups, innosabi insisted to bring back lessons learned from their meetings with American companies and investors.

“The start-up life in high tech, especially in Europe is really not easy. There are so many lacks everywhere that really need to be solved in order to make Europe become a “NEW” innovative continent instead of being “the old continent” only! ”. – Najmtek

These lessons concern self-confidence, inspiration, risk-taking, openness and risk capital with venture capitalists. They are aspects that should be better developed in Europe. Overall, innosabi highlights the necessity to “connect the dots” to better guarantee success in the MC field, as well as in innovative businesses in general³⁵.

Such a perspective is also revealed by the approach taken by Najmtek. The start-up has less difficulty to develop in the Silicon Valley than in Europe thanks to the support of the State of California. The company also benefits from the “Silicon Valley image” while the whole concept has been developed by French engineers.



4.5. Public support for mass customisation solutions

Public support has different components, such as: direct grants, organisation of forum and industry fairs, support in

“When evolving in high tech, you need an American label. The “label France” cannot be exported or sells less”.

– Najmtek

networking and support to incubators and accelerators. This support can either be tangible - such as grants - or intangible and diffuse, such as support in networking. So as to show the extent to which appropriate public support is crucial for helping mass customisers, example of Najmtek is used to demonstrate a comprehensive public support solution and illustrate the ease for a European start-up to be supported by the State of California.

A detailed description of the public support provided to Najmtek is presented hereafter. The experience of Najmtek is enlightening to illustrate how government institutions can intervene to support innovative companies and help them develop / settle on their territory.

- Initiated in France, the project did not benefit from any French support apart from the Research Tax Credit; the most recognised supportive tool in France to support research, development and innovation. The firm was also part of a French incubator even if its needs did not really fit into the usual needs of start-ups. The Najmtek project was considered too large and too international to be appropriately handled by an incubator. That is why the firm did not apply for being part of an accelerator.
- In the meantime, the CEO of the firm sent an email to the State government of California to present her project. A person within the Californian administration was designated as their main contact in charge of (1) negotiating with cities for visits, (2) providing local information on regulation (tax and labour law as well as salary habits and social policies), (3) finding empty infrastructures that would best fit Najmtek’s needs and (4) ensuring that the French company meets the right people (investors, clients, partners) in a very short period of time. This contact person was also in charge of agenda settings so as to improve time and energy of all stakeholders.
- In addition to this networking support, the company received subsidies for their office and material. Moreover, the State government paid for company’s salaries during a “certain period of time”.

- Finally, the firm benefitted from a technical incubator in California which provided: (1) finance mentorship, (2) marketing expertise, (3) support in defining the go-to-market strategy and (4) advice on partnership relations management.

Following this example, European mass customisers have very diverse opinions on the appropriateness of developing their business in Europe. Some of them think that the EU is a nice place to innovate and develop and where appropriate financing mechanisms exist (ArtBag Design, innosabi, UPcloud). Others feel that the EU does not provide the enabling environment that start-ups and innovative SMEs require, as compared to the United States and Asia (Combeeneration, Najmtek). The experiences provided by the companies interviewed eventually show that each situation is particular and that promising innovative companies are able to develop in the EU. In parallel, most of the companies interviewed present the United States - and Canada in the case of MyCustomizer – as examples to follow and inspirations for Europe.

“What is happening in Europe is incoherent. For instance, French diplomas are well-recognised and young university graduates are highly sought. But we cannot benefit from this pool of potential in Europe”.

– Najmtek

Finally, when asking mass customisers what they particularly expect from public support, they had the following answers:

- **Impulse and incentivising regulation**, such as policy on urban eco-friendly mobility in the case of **Muses**;
- **Support in networking**, such as (1) physical presence of public actors during forums to present supportive public tools available for innovative companies, (2) organisation of travels to meet investors and potential partners, and (3) networking with large companies and foreign partners;
- Promoting demonstration projects and participating in the experimental use of products, such as Muses’s vehicle in different cities and Najmtek’s laptop in public agencies and ministries;
- **Financing** for investment and development. Grants did not appear as the most relevant tool to support mass customisation. Mass customisers would prefer loans with public guarantees and support in contacting investors.



5. Policy recommendations

In the context of high unemployment, competitiveness deficit and stagnation or even declining growth in the European Union, mass customisation constitutes an innovative trend that can foster the business performance of European firms. In that view, a clear focus should be made on a few elements that would support the development and growth of firms developing mass customisation strategies and incentivising those who have not developed one yet.

Establishing an enabling business environment.

“Out of 100 start-ups, 5 are successful. On the other hand, 95% of success is not a goal. I would be surprised if 20% of start-ups were successful. Failure is not a problem. It is however more accepted in the US. From failure, you learn a lot. It is important to keep encouraging people to set up their own businesses. That is the real spirit of entrepreneurship: even if you fail, keep on going. Do better next time”. – UPcloud

Innovation requires that all public entities act in the same direction, with clear orientations and with simple procedures. This involves **administrative simplification**, for instance, the establishment of single administrative contact persons at local level, providing companies with information on financing opportunities and regulatory measures. Administrative coordination between countries could also be improved, and more particularly tax administrations. For instance, inosabi faced issues with double taxation when developing in Portugal and had to wait for a year to be paid by

its Portuguese clients, sending documentation to both German and Portuguese administrations without coordination or information transfer between the two structures.

Further to this, mass customisers could benefit from more **structured market intelligence** where information would be easily available at one entry point. Moreover, administration could propose **support services in the setting-up and putting together of administrative dossiers** to help start-ups applying for grants and competitions. Finally, regulations defined at different levels of government and interacting with one another (such as for soft mobility in the case of Muses) have to create a clear, coherent, and comprehensive environment for a certain period of time. This is important to guarantee **the legal certainty** in which companies can develop.

Facilitating access to finance. Adapted financing means are needed by mass customisers entering their go-to-market phase and looking for scaling-up financing. This phase has been identified by mass customisers as the most critical because it often implies new investments, hiring and location change. It is also a phase for which appropriate financing is

lacking. Policy-makers could consequently facilitate access to adapted financing means.

Facilitating the international development of mass customisers. Companies would need to be supported when developing in Europe. Mass customisers could receive (1) advice on different business cultures, (2) advice on best locations to invest according to their business, as well as (3) information relative to market penetration and best ways to attack a specific market in a specific country. The organisation of **networking events at the European level** would also foster synergies and growth in the mass customisation field.

Supporting entrepreneurship and favouring an entrepreneurial spirit.

To better develop, start-ups need to work in an environment favouring risk-taking and innovation. This may be supported by grants, tax credit and a smooth bankruptcy policy. Successful mass customisers also explain their achievements with mentorships and networking platforms (forum, workshops, and technology fairs) where they can discuss and meet other entrepreneurs. Such initiatives can be supported and publicly promoted at local, regional, national and European levels. In parallel, public policies should facilitate retraining of people willing to create mass customisation companies.

Promoting the European Union as an innovative location.

The EU should better communicate on the successful innovative companies in the mass customisation field. The EU should also promote these companies on

*“It is now time to use the R&D pool of expertise in Europe”.
– Muses*

the international scene. The potential market for mass customisation being global, the EU should put forward its existing assets and skills - mostly in terms of higher education in engineering - and develop an EU branding in the high-tech field. To do so, the EU could further highlight European high-tech start-ups which have been successful in developing and implementing mass customisation strategies.

Improving communication between entrepreneurs and investors.

Mass customisation being a trend leveraging new technologies, relations between businesses and investors could be improved through more direct communication. Such communication may include social media and interaction between representatives of innovative companies. The physical presence of government representatives and of development agencies in innovation forums is also perceived as useful. In so doing, policy makers would present the public programmes promoting innovation and would provide contact details of individuals able to support companies in their development.



6. Appendix

6.1. Interviews

Company	Interviewee	Position
ArtBag Design	Zane Lase-Lasmane	CEO
Combeeneration	Klaus Pilst	CEO
Crearmoda	Mercedes Suengas	CEO
Glubal	Chris Armbruster	COO
innosabi	Catharina van Delden	CEO
Muses	Patrick Souhait	CEO
MyCustomizer	Christian Painchaud	CEO
Najmtek	Sophie Ennadi	CEO
UPcloud	Sebastian Schulze	CEO

6.2. Websites

ArtBag Design	http://www.artbagdesign.com
Combeeneration	http://www.combeeneration.com
Crearmoda	http://www.creamoda.com
Glubal	https://www.glubal.com
innosabi	http://innosabi.com
Muses	http://www.mooveco-muses.com http://www.mooville-by-muses.com
MyCustomizer	http://mycustomizer.com
Najmtek	http://www.najmtek.net
UPcloud	http://www.UPcloud.com

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- ²⁸ Frank T. Piller is a professor of management and director of the Technology & Innovation Management Group of RWTH Aachen University, Germany. He also is a Co-Director of the Massachusetts Institute of Technology Smart Customization Group in Cambridge, United-States.
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- ³² More information on the Maison Notman is available here: <http://notman.org>
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