Mass Customisation and Highly Individualised Solutions. Stretching Mass Customisation Beyond the Traditional Paradigm of Industrial Production.

Morelli, Nicola; Nielsen, Louise Møller

Published in:
MCPC07

Publication date:
2007

Document Version
Publisher's PDF, also known as Version of record

Mass customisation and highly individualised solutions. Stretching mass customisation beyond the traditional paradigm of industrial production.

Abstract

Globalisation if creating large changes in our social and economic system, whereas demand patterns are becoming more and more diversified and highly localised. The difference between global production and local demand relates to a paradigmatic shift in the way of looking at production and consumption patterns. The reference to a paradigm shift helps emphasising the inherent limits of industrial production and the elements of changes brought about by the possibility to generate highly individualised solutions. The concept of mass customisation was introduced to extend the domain of industrial production beyond its original limitations, however it is strongly linked to the paradigm of industrial production and not always usable to support and explain new ways of organising value creation. This paper proposes an analysis of this paradigm shift through three cases, which emphasise some elements of mass customisation that are still relevant to the new paradigm. At the same time the paper emphasises the limits of this concept and the need for a new perspective view to interpret the ongoing change in production and consumption systems.

Introduction: Mass customisation between two paradigms

Globalisation is a scary buzzword used in many logical contexts: when talking about markets we use this term to indicate the extension of a market logic to the whole planet.

We implicitly apply the same criteria dominating the markets in industrialised countries to the cultural contexts of industrialising countries and suppose people in those countries will eventually live as we are living today (assuming that the planet support the our highly resource-intensive lifestyles). When thinking of industrial production we use the term globalisation to indicate the progressive shift of industrial production from industrialised countries to new areas, where the costs of labour is lower. The implicit assumption in this case is that industrialised countries are facing a phase of "de-industrialisation" in which manufacturing-related jobs will decrease rapidly. This causes pessimism and fears about our economies. Such pessimism also generates suspicious interpretations about the growth of the service sector, which are seen as a burden to the manufacturing economy (Boden and Miles 2000).

However globalisation could also suggest a different perspective, even when based on the same assumptions: global markets are not globalising needs, which in fact are always linked to a (cultural, economic, social and technological) context. Furthermore industrial capability to satisfy complex demands is supporting a differentiation of needs, and the fragmentation of markets to smaller and smaller segments: industries are now aiming at satisfy individuals, rather than target groups. This is particularly evident in developed countries, where they can be supported by advanced services and infrastructures.

While manufacturing is being shifted to developing countries, the demand for industrial products in developed countries is becoming more and more complex. Such a change is the result of deep social, cultural, economic and technological changes that are challenging the ultimate presumptions upon which industrial production was based. Such changes concern the structure of society (ageing of society, migration flows) the

structure of social groups (the crisis of the traditional family) and the physical and technological infrastructure that support economic systems (networked societies, new environmental problems).

Those problems are often transcending the boundaries of global production systems and asking for local and individualized solutions. At the same time those problems are likely to create new opportunities for innovation and employment in those countries that have lost manufacturing jobs.

The divergence between global production and local perspectives can be related to a paradigmatic difference between two ways of looking at industrial production and consumption systems: a new paradigmatic framework is emerging, which is grounded on the network economy, is highly context sensitive for what concern both production and consumption aspects, includes end users in the production process and allows for highly individualized solutions. (Manzini, Collina et al. 2004).

The difference between the two perspectives may be seen as a paradigmatic shift or simply as an advanced stage of industrialization. The authors of this paper are well aware that the changes outlined above do not present any real elements of discontinuity that would clearly define a paradigm change. However the definition of two different paradigms may help focusing on the fundamental element of this epochal passage, thus exploring the potential of mass customization in this context. For this reason this paper will refer to the existing situation as the paradigm of industrial production and the emerging paradigm as the paradigm of highly individualised solutions.

In the paradigm of industrial production the value creation process was conceptualized in terms of value chain (Porter 1985). According to this concept, value creation is not

only sequential, but also implies that value is ‘added’ along the production process, up to the moment in which the product was sold. In this framework customers were seen as destroying the value created during the production process. For producers, industrial value was ‘realized’ in the transaction which joined and separated them from customers.(Ramirez 1999)

The new paradigmatic condition maturated with technological advancements, which allow work practices to be less linear and sequential. Distributed processing and concurrent engineering made the process of value creation more synchronic and interactive. This was the favourable condition to review the role of the customers. In the new framework value is no longer “added” until the point of sale – to be destroyed by the “consumers”- but is rather co-created by a network of actors, including the traditional value producers (manufacturers, service providers) and customers.

As it often happens during major paradigm shifts (Kuhn 1962; Arbnor and Bjerke 1997) the two paradigms are co-existing in the same time. However the ultimate presumptions supporting the old paradigm of industrial production, which could be very effective to interpret the logic of globalisation, would probably be not sufficient to explain the emergence of new solutions that address localised and highly individualised needs.

New methodological approaches, emerged to correct the lack of explanatory powers of the old paradigm, are creating links to the new ones. Mass customisation is probably one of those approaches. Here the rigidity of mass production was mediated by the new technological possibilities to differentiate the offering, thus targeting to narrower, but more differentiated target groups. The limit of the old paradigm, however, is in the persistence of industrial products as the link between producers and customers: in this context mass customization can only refer to products (Kaplan and Haenlein 2006).

Furthermore mass customization integrates the customer in order to obtain specific information about needs and desires that can be translated into product specifications. Although such integration would increase product variety and reduce the size of target groups it would not allow for solutions that fit extremely small, even individual target groups. The logic of industrial production cannot be bent to individual solutions, unless a paradigm shift is considered, which review those factors from different perspectives and on the basis of different ultimate presumptions. Such a paradigm shift has been (explicitly or implicitly) described as a shift from material production to value co-production (Ramirez 1999; Berger and Piller 2003) from economies of scale to economies of scope (Normann and Ramirez 1994) , from traditional production-consumption systems to new systems which enable final users, by promoting them to the role of active co-workers (Manzini 2005; Morelli 2006).The perspective of a paradigm shift is therefore challenging the concept of mass customization, posing some fundamental questions about the validity of such concept, its characteristics and its implications in the new paradigm.

Mass customisation and product architectures

One factor that substantially contributes to the shift from mass production to mass customisation is the shift from a vertical/integrated industry to horizontal/modular one.

Fine (Fine 2000) describes such a shift as connected to a change from integrated product architectures to modular structures, which allow faster development pace and frequent and profitable product upgrade (Fine 2000). Such a change is described as a *"double helix".* According to Fine(Figure 1), products begin their lives in integrated product

architectures. In this phase manufacturers are exclusively using internal production capabilities.

After some time the manufacturers will experience the pressure to disintegrate (modularize) the product architecture – in order to facilitate innovation processes, thus keeping up the fight against niche competition. The modularisation also makes it possible to reduce the product complexity and to compensate for the organizational rigidity.

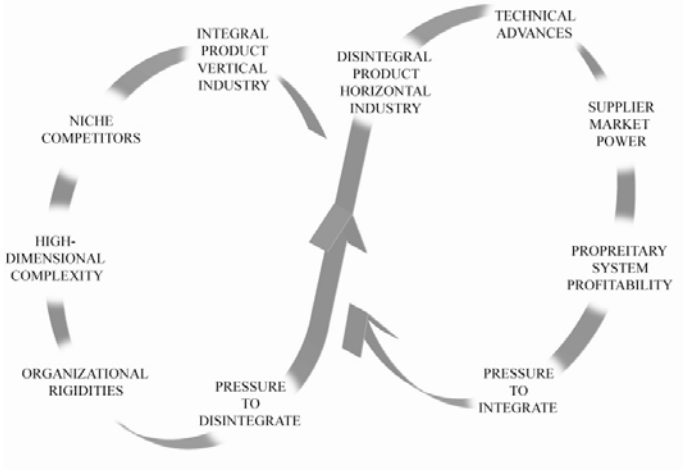


Figure 1 The "double helix" (Fine; 2002)

Personal computers are an example of products, which have followed the loop of the "*double helix"* from an integrated to a disintegrated architecture.

IBM, the first manufacturer of personal computers in the 80s initiated the disintegration of the computer architecture, which made it possible to produce the hard disk, the processor, the operative system etc. separately, and then assembly them afterwards into a PC. This strategy also allowed innovation in one of the components to be easily

integrated in the whole product, thus increasing the innovation speed of the whole product.

The process of disintegration and modularisation of the product architecture in the PC industry made the concept of mass-customization feasible. When the architecture of modules and interfaces was defined it was possible to customize the final offering by combining different components into a set of predefined options.

Dell is a clear example of this type of mass-customization. At the Dell-homepage different personalized computer offerings can be combined according to the costumer's requirements. A wider range of configurations is possible by proposing different qualitative choices for each component. As a consequence the final combination is the one that closely meets the specific user's needs.

The process of disintegration and modularisation, though, is not a final development stage of products' life. In computer industry, for instance, some of the actors in the supply chain, such as Intel (processors) and Microsoft (operating system), were able to shift the focus from the single component to the more integrated solutions. Windows operating system, for instance, was shifting the focus to the software (and use-related) component of a PC, thus proposing the integration of different functional units, such as web browsers, email, server operating system and multimedia contents. However it is worth noticing that the new integration happens at a different logical level, the hardware on which the whole process started becomes less relevant, what is instead relevant is the integrated combination of software and the possibility to offer a *solution*, rather than a simple product (a personal computer). Seen from the old perspective of a

hardware manufactures, such as IBM, this paradigm shift was initially not fully understood and caused serious strategic problems.

Co-existing paradigm

Within the previous production paradigm there are innovation drivers that can not be seen or formulated. Simply because these do not fit the ultimate assumptions on which the paradigm is based.

In the following section some of these will be presented with the aim of providing some insights on diverging and converging aspects of the two paradigms.

Apple I-pod, from modularisation to highly individualised solutions

Unlike the traditional loop in Fine's "double helix" the Apple I-pod is an example of a product, which has been initiated on a disintegrated platform/architecture.

The intention behind the I-pod was to make a *"computerized musical object"* by combining the *"MAC computer world"* and the concept of a MP3-player.

The I-pod's development was handled by different partners with the objective to reduce production time as much as possible.

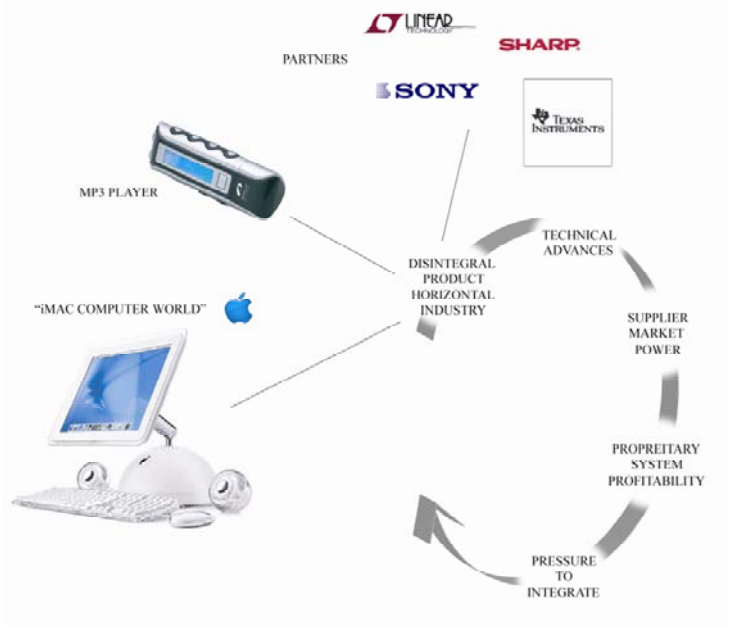


Figure 2 The actors involved in the modularisation of the I-pod architecture

- *Portal Player* provided the design (and coordination) of the audio components.
- *Wolfson Microelectronics* provided the digital to analogue converter.
- *Sharp* provided the flash-memory;
- *Texas Instruments* provided the fire-wire controller;
- *Sony* provided the battery; and
- *Linear Technology* provided the power-system.

Apple themselves did the case design and the interface design. (Sutton 2002)

This division of the development required a disintegrated product architecture with defined interfaces from the beginning.

However the final Apple offering is in fact very integrated. Because of this integration it is quite easy to recognise the specific characteristic of the product/service provided by Apple, while the system is quite resistant to intrusions from competitors (I-tunes music

can only be played by apple systems). The integration, however, happens at a higher level. The focus is no longer on material products (the I-pod) but on *music distribution*, and integrates the content, music, and its distributors.

At this level, and only at this level, individual solutions are possible: music tracks are downloadable one by one and customers can create their own individual compilation of favourite tracks. At this level mass customisation is *stretched* to its extreme condition of highly individualised solution.

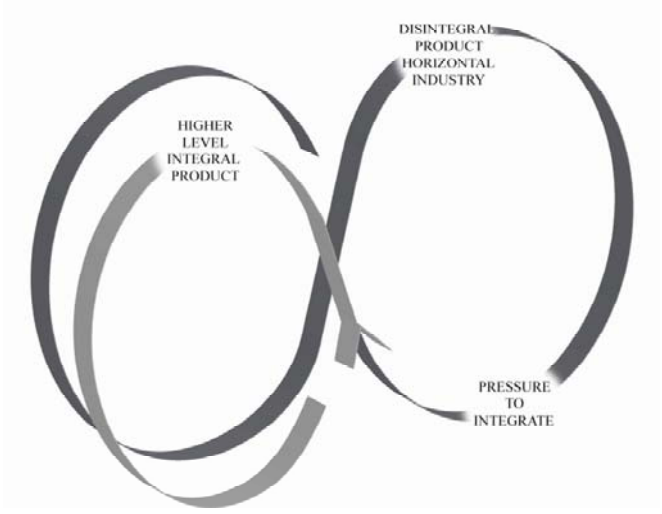


Figure 3 Disintegration and re-integration in the Apple architecture

Here again, the Apple offering seems to have made an extra turn in "*The Double Helix"*.

The case design, the interface design, the numerous add-ons, the I-tunes-system etc. have been able to move the product to a higher level of integration – as shown in Figure 1. The I-pod is an innovation which has created a new way of perceiving and using music. Technological innovation is not the only driver to this new system and a technology-based perspective cannot explain the relevance of the innovation. Only by analysing the

changes in users' understanding and attitudes towards music the integration at the higher level appears clearly.

It is a synergy between easy interaction, selectable (personalized) music from I-tunes, appealing visuals, material/component quality and countless applications.

And the I-pod assures that the users (co-creators) capabilities and resources in any context of use can be involved – from a beginner to an advanced level of use.

Mi-Adidas Mass customization and knowledge creation:

A mass-customization offering might not only be a way to fit the composition of a given product with the customer's identified needs. (As it was shown in the Dell example)

In some cases it can also be seen as a way to gain lead-user information, preference and knowledge, which then can be transferred into the ordinary product program.

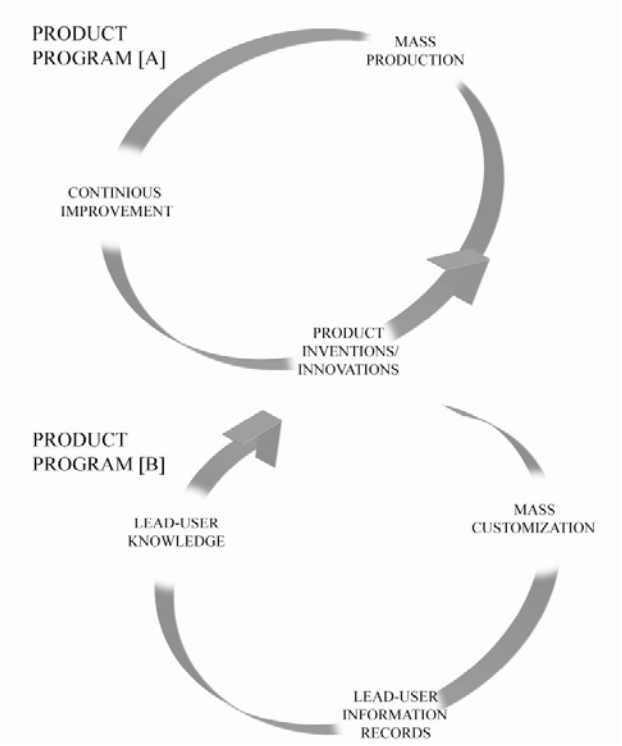
The *Mi Adidas* is a case that proves this.

The Mi Adidas product program aims at delivering an offering that fits the user's feet construction, the performance in terms of weight distribution and the user's preferences in relation to the design.

Nowadays, sport shoes manufacturers are able to provide several levels of product differentiation, based on different activities and performances to individual tastes. The market segments served by this industry can narrow down to small groups of people, on the basis of sets of choices available on a website. This kind of mass customised offering is in fact based on producers' capabilities to respond to a differentiated demand, on the basis of the information coming from marketing research or possibly from the recording of users' choices from an online database.

The Mi Adidas project adds a level of interaction between producers and users. In order to collect user-specific information special Mi Adidas shop-departments were made and distributed to great parts of the western world. In these departments the costumers measurements and selections were placed into a database and send directly to the production-plant. Here the information were translated into product specifications, the shoes were produced and then delivered to the costumer - all in 21 days. (Berger and Piller 2003)

In the ordinary perspective the Mi Adidas is a secondary product program compared to the ordinary Adidas delivery of shoes to the market. On a global scale, indeed, Adidas is still articulating its offering on the traditional market segments, built upon technical inventions, identified trends or specific styling.



But what happened in the Mi Adidas case was that the information from this program captured knowledge that was useful in the ordinary product development, because the Mi Adidas held a date-base of real user-preferences and a set of costumers that could be identified as lead-users (choosy users, who are ready to wait 21 days and pay around 30% more for a pair of shoes). Therefore even the clients for the ordinary product program are buying more than an ordinary pair of shoes, which any manufacturer can make, but instead the tacit and explicit knowledge provided by a large number of lead-users, on the basis of their real life experiences.

Likewise the Apple I-pod case, the Mi Adidas product program introduces a new level of integration, by generating a new service: the feet measurement points in the Adidas shops. Individual solutions become possible only when focusing on the customers' individual needs, that can be captured in the touch points, the Adidas shops, where users are able to combine their functional needs, physical characteristics, individual experience and aesthetic preferences.

The knowledge that can be captured by intensifying the link with the users transcends the ordinary mass customised solution, although it coexist with it and is able to feed the ordinary mass customised system with useful information.

Jyske Bank: Modularisation and individual solutions in the service sector

For several years now, Jyske Bank, the 4th biggest bank in Denmark, has promoted innovative ways of managing the relationship with clients. Several years ago, the bank changed the layout of the offices, in order to create a familiar environment for clients, when talking with consultants.

In 2003, though, the bank started a new strategic plan that in few months changed radically the way clients are interacting with the service. A disintegrated structure and horizontal structure is not new in bank services: the services available in a bank mobilise a network of actors, from financial consultants, to loan agencies, credit card companies and several other commercial partners.

In fact even the following turn in Fine's "*The Double Helix"* model (new integration) would not be new for the banks, because an average bank offering is often integrating the activities of many of those partners, thus providing mass customised services for their customers. Such offering however has always been a black box for customers, who usually need a consultant to access to the various offering from a bank. In this sense, the offering of the bank is integrated in the bank consultant's mind, but it is not accessible to customers. Seen from this perspective the traditional banks' approach is very similar to the traditional producer-user approach, which does not suppose the customer to have any active role in the offering.

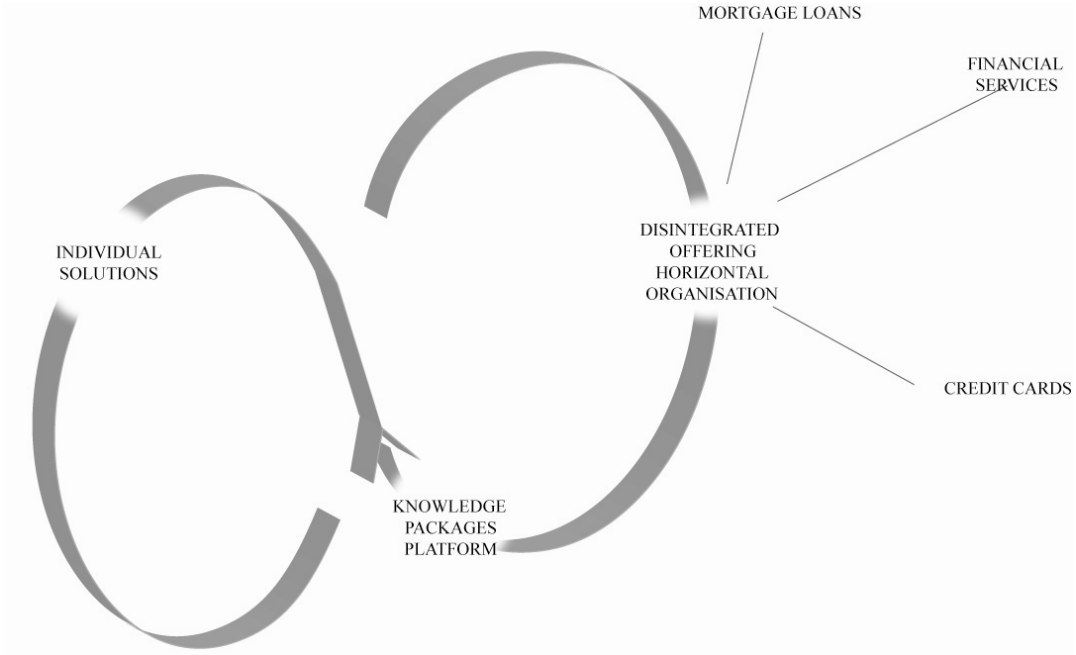
The aim of the new strategic plan of Jyske Bank was to make solutions directly visible to the customers. In order to do this, the bank redesigned the internal space of all its branches, by creating a sort of *market space* at each branch entrance. In such a space, the bank's offering are *packed* in boxes, similar to software packages (as in software packages, what is sold is information, not material products. Although people can download the same information from the internet, they often prefer to receive a package, as a sort of material proof of what they buy). Each box corresponds to an integrated solution for a specific aspect of customer's life (*what should I do if I want to donate some money to my grandchild*? *What should I do if I want to move home*? *What should I do if I want to invest my money*?*...or to by a new car*?) Each pack provides

knowledge about the services provided by the bank to support those customers' activities. The package has a barcode that activates a video on an information point, before the counter, where the customer can get an overview of the information included in the package. Other features of the layout, such as a coffee machine (with a special selection of coffee) and some reading space to get inspiration about travels, investments or home improvements offer an inspirational space, in which the customer should feel familiar and free to choose the services offered by the bank.

Figure 4 Jyske bank's offering is proposed in software-like packages at the entrance of each branch. A bar code associated to each package activates an information video on the screen in the same area

The perspective shift of Jyske Bank consists in the commitment to really and actively involve the customers in the selection of the offering the bank can propose. In the most traditional relationship between a bank and its clients the bank is usually very active in proposing its offering to the customers. In the new perspective instead, it is the customer that is supposed to ask for a specific service. The integration of the modular structure of service takes place in each of the *knowledge packages*. It would be

reasonable to say that the solution platform created by the bank is a semi-finished solution that allows the customers to integrate the service according to their needs.



Stretching mass customisation beyond the industrial production paradigm

The "double Helix" model proposed by Fine supports the interpretation of the three cases. In all of them there is a shift from a disintegrated structure to an integration of a complex and discontinuous volume of (tacit or explicit) knowledge into a meaningful offering.

The integration happens when the focus moves from the product to the user's experience (i.e. sport activities; lifestyles), or latent need i.e. personal music, individual financial solutions, etc.

The disintegrated structure is essential for creating mass customised solutions and is part of the normal process of complexification of companies' offering. However the innovative factor in the three cases presented in this paper is in the logical shift that

allows for the integration of all the elements. This shift is stretching the concept of mass customisation into the new paradigm of highly individualised solutions.

Pine and Gilmore (Gilmore and Pine II 1997) define four forms of mass customisation. Among them, the form that is producing the broadest change (in the product offered and in its representation) has been defined as "collaborative". According to the authors: "*Collaborative customizers conduct a dialogue with individual customers to help them articulate their needs, to identify the precise offering that fulfils those needs, and to make customized products for them*". Here the collaboration between companies and customers is very intense; however the aim of the collaboration is still to provide a product, rather than stimulating customers to generate their own individualised solution. Producers and customers still keep their role clearly separated and the product is mediating between them.

The integration into high customised solutions instead transcends the product and focuses on the customers' co-production, which in many cases is made possible through the organisation of a service. The service component in the three cases mentioned above is in fact a critical factor of change. This condition, according to (Kaplan and Haenlein 2006) would bring highly customised solution out of the domain of mass customisation. The two authors indeed exclude that mass customisation could refer to services, because services are already implying the integration of customers in the value creation process by definition. The authors admit that some fundamental characteristics of mass customisation, such as customer integration and individualisation of products may apply to services, but they suggest that those cases be investigated under a different terminology and not labelled as mass customisation.

In other words mass customisation refers to conditions, such as customers' integration in the production process, that are bridging two paradigms, although the inherent reference of mass customisation to industrial products excludes that this concept can be used across the paradigm shift.

The old paradigm of industrial production is not able to capture the significance of the new forms of industrial offering, because they represent a different type of system architectures and because they provide a "solution platform", rather than final products. Such solution platforms integrate modular structures based on products and services (the I-Pod and I-Tunes, Adidas shoes and the measurement point, financial services and Jyske bank's "knowledge package"). Furthermore they represent a challenge to the traditional separation of roles between producers and users; indeed they are often based on partnerships between different social and economic actors, who are participating in the value co-production process with different goals (profit, social improvements, personal goals) (Evans 2004). This also implies a revision of the role of business companies at the global and local level: they no longer hold the prominent role they had in the traditional production system; they are now becoming organizers of value creation networks (Normann 2001). In this role they must mediate among different interests and goals, creating new *meanings,* which work as *attractors* for the aggregation of solution platforms.

Finally the redefinition of economies of scale into economy of scope, started with mass customization, has particular relevance in the paradigm of highly customized solutions. Mass customization initiated the process of integration of customers into the value creation process by capturing non-codified information from customers that are relevant into the production of new products. This aspect is critical in the organization of highly

customized solutions. It would not be possible for companies to operate on the local context if this implied the creation of new knowledge for each solution. Likewise the early industrialization processes that codified the craftsman's tacit knowledge into a system of industrial procedures, in order to multiply the efficiency of production processes, the new challenge for companies and organisations is to generate forms of codification that allow for the reproducibility or reusability of the knowledge acquired in each local and individualised solution, in order to optimize the use of immaterial resources in different local contexts. In this sense the paradigm of highly individualised solution requires that new forms of industrialisations are found, which focus on knowledge creation and reproduction, instead of material products.(Manzini, Collina et al. 2004)

Conclusion

In the hypothesis of a concrete shift in the paradigmatic conditions regulating the present social and economic models the concept of mass customisation is an essential ground for reflection, because its characteristics can immediately relate to the emerging paradigm. However this concept was created as an extension of the domain of industrial production, made possible by technological advances. The legacy of mass customisation is therefore linking this concept to the old paradigm of industrial production. For this reason mass customisation is sometimes unable to explain or support the enormous potential of the changes brought about by the last evolution of production and consumption systems. A methodological approach to new solutions within the new paradigm should therefore consider mass customisation as an essential source of methods and tools; however the emerging conditions and the demand for highly

industrialised solutions also require a logical shift that goes far beyond the ultimate presumptions of the paradigm of industrial production and therefore call for new conceptual frameworks beyond mass customisation.

REFERENCES:

Arbnor, I. and B. Bjerke (1997). *Methodology for creating businesss knowledge*. Thousand Oaks, Calif. ; London, Sage.

Berger, C. and F. Piller (2003). "Customers as Co-Designers." *IEE Manufacturing Engineer*(August/September 2003): 42-45.

Boden, M. and I. Miles (2000). *Services and the Knowlede Based Economy*. London and New York, Continuum.

Evans, S. (2004). Partnerhsip Building. *Solution Oriented Partnership. How to Design Industrialised Sustainable Solutions*

E. Manzini, L. Collina and S. Evans. Cranfield, Cranfield University. European Commission GROWTH Programme.

Fine, C. H. (2000). "Clockspeed-Based Strategies For Supply Chain Design." *Production and Operations Management* 9(3): 213-221.

Gilmore, J. H. and B. J. Pine II (1997). "The Four Faces of Mass Customization." *Harvard Business Review* 75(1): 91-101.

Kaplan, A. M. and M. Haenlein (2006). "Toward a Parsimonious Definition of Traditional and Electronic Mass Customization " *Journal of Product Innovation Management* 23(2): 168-182.

Kuhn, T. S. (1962). *The structure of scientific revolutions*. Chicago ; London, University of Chicago Press.

Manzini, E. (2005). "Enabling Solutions for Creative Communities." *Designmatters*(10): 64-68.

Manzini, E., L. Collina, et al. (2004). *Solution Oriented Partnership. How to Design Industrialised Sustainable Solutions*. Cranfield, Cranfield University. European Commission GROWTH Programme.

Morelli, N. (2006). Globalised markets and localised needs - relocating design competence in a new industrial context. *Engineering & Product Design Education Conference* Salzburg.

Normann, R. (2001). *Reframing business : when the map changes the landscape*. Chichester, Wiley.

Normann, R. and R. Ramirez (1994). *Desiging Interactive Strategy. From Value Chain to Value Constellation*. New York, John Wiley and Sons.

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York, Free Press.

Ramirez, R. (1999). "Value Co-Production: Intellectual Origins and Implications for Practice and Research." *Strategic Management Journal* 20: 49-65.

Sutton, R. (2002). *Weird ideas that work 11½ practices for promoting, managing and sustaining innovation*. New york, Free Press.