

The factory in the post-industrial era
Variety instead of Flexibility
Mass Customisation: the production system of the future

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Abstract. The world has become and it continues to become more complex as we move well into the 21st century. In this paper sociological-historical, technological-industrial and architectural aspects are addressed and combined to discuss the phenomenon of Mass Customisation as a paradigm shift, where its individual parts find their meaning and deep character only in this context. Only in this context Mass Customisation can be understood, otherwise it creates confusion. If the context changes, then traditional factories and organisations, based on the principles and the ideology implicit in the society of mass production, are out of focus. If Europe continues to base its policies and strategies on profit and cost only, as a single dimension problem, then refocusing is imminently needed, otherwise confusion will be increased and not lessened. Profit and cost mathematics are not enough and sufficient to describe a complex world. Based on Reichtin words that "profit is a matter of definition and cost is not an absolute", it looks as if the world is left to swing to its conventions of the 19th century economics and it is about to flop if refocus does not occur soon. In this new world the former East Europe, can play a very important role. This part of Europe should not try to copy habits and traditions of its counterparts in the West (only a euphemism) but to lead the needed transformation into a pluralist post-industrial era.

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1 Problem Statement and Overview

There seems to be an inherent contradiction on a discussion about factories in the post-industrial era. Nevertheless although there are more than 200 years past the 1st industrial revolution, it seems that not much has changed since this time in the factories of today. In those places where time has so much value, factories look timeless. But does the term *mass customisation* not include also an inherent contradiction? Is it really a contradiction or a mirror of a changing society? If it is so, can traditional factories respond to the challenges that *mass customisation* is imposing? These questions need to be approached in a different context. *Mass customisation* is not simply the opposite of mass production, and is definitely not only production. It is an evolution of and simultaneously a revolution against the mass production society. It is argued that *mass customisation* is a paradigm shift [1] that is characterised from the transition of mass society of the industrial towards a more pluralistic society of the post-industrial era. In order to support this argument, the problem is examined in the context of four different aspects: sociological-historical, technological-industrial and architectural aspects. Within this framework *customer-driven value creation* [2] together with *open innovation* [3] can become the future model for reintegrating the consumer into the production system emerging in the post-industrial era. By integrating the consumer into the production loop, a new type of consumer is generated: the *procumer*, driving the transmutation of the mass consumer society towards a mass procumer society with quite different characteristics.

To defend the thesis of this paper, a quick examination of the structure of post-industrial society is given and why *mass customisation* is the new paradigm shift leading to a different more pluralistic society, integrated in a post-industrial production system. This post-industrial production system will be characterised through the balancing act between two competitive feedback loops: one that through the increase of productivity leads to less and less people of production (mass production loop) and a second one that utilises the creative forces of the consumer to integrate him or her back into a new consumer driven value creation loop. Although these loops are competing against each other, in reality they refer to two different world views in economical and technological terms: The mass production paradigm does not stop in the narrow production process but extends in the financial thought in general: it dictates the accumulation and the separation from immediate pleasure [4]. On the other hand *mass customisation* is by definition against accumulation and is directly connected to the immediate pleasure. This is because *mass customisation* is addressing the custom, the individual, the personalised, and it does not really exist without the active, at some point in time, involvement of the consumer.

2 Sociological-historical aspects

Mass democracy was born from the fall of the civil society according to Kondylis [4]. At the same time another transformation was taking place: the substitution of the synthetic-harmonic scheme, as a structural characteristic of the civil society from the analytic-combinational one and the set aside of the classical civil liberalism from mass democracy. This process, according to Kondylis [4], was realised frequently more as a reinterpretation and change of the liberalism according to the needs of mass democracy rather than an open and programmatic clash between the two. In the analytical-combinational scheme of thought is ideally expressed the manner which gradually covered or absorbed the one, in which the civil class prevailed. The directive idea of originally equivalent ultimate elements or individuals, that all of them were on the same level and that could get combined among themselves arbitrarily and continuously, it was truly adequately reflecting a social reality, where human individuals equal from political as well as from social point of view, can and it is allowed to undertake as such, that is independently from any other social prerequisite, different every time social roles without setting initial limits in their mobility and the game of combinations that this mobility makes possible [4]. This is the beginning of *mass customisation* from the social aspect. Without probably knowing Kondylis defined the sociological aspect of the word “*mass customisation*” since democracy is tightly connected to the individual, the separate, the different, therefore it is easy to see the direct relationship between “*mass democracy*” and “*mass customisation*”.

The central characteristic of mass democracy, that distinguishes it from all previous social formations and makes it a historical novum, is the excess of the scarcity of goods [4]. The excess of the scarcity of goods means first of all that less and less people are obliged to produce by themselves their food and their clothing or less and less people can produce the food and clothing of others. More and more people in other words produce goods that they do not serve the elementary needs of survival, where materialistic needs are created that exceed by far the elementary needs of survival and can be satisfied in many ways simultaneously, that is with the offer of many similar products. Therefore for the first time in the human history a situation has been surpassed that was decisive for the formation of the social life and the moral perceptions: *the scarcity of goods*. A society that exceeds the scarcity of goods and lets into the disposition of its members, consumer goods in bigger and bigger quantities, is necessarily structured as mass democracy [4].

3 Technical-industrial aspects

Mass production demands the activation of the purely technical rationalism, which does not stop in the narrow production process but extends in the financial thought in general: it dictates the accumulation and the separation from immediate pleasure [5]. Mass production characterises the industrial era, being the base for

the generation of mass democracy leading to mass consumption. The gap between the technologically and rationalistically directed production and hedonistic consumption aiming at self-fulfilment could be expanded even further with the progress in technology according to Kondylis [5]. Because he argues that, the increase of productivity will allow to more and more people the transition from the immediate employment in production towards an anti-technological way of thinking and life. *Mass customisation* on the other hand is by definition against accumulation. This is because it is addressing the custom, the individual, the personalised. It has a name and a definite customer as the receiver of the product or the service, that does not really exist without him or her, and it is directly consumed, without passing through any point of stock, other than intermediately needed along the path of delivery. Mass production addresses the anonymous the unknown while *mass customisation*, as an antipode, addresses the eponymous and the specific. It reintegrates the consumer into production loop in the broader sense by letting the customer co-designing the product driving value creation [2,3] and therefore becomes the new paradigm of the post-industrial era. The mass consumer society will evolve towards a mass procumer society (i.e. a combination of producer and consumer). In this way the cost oriented industrial model is shifting to the consumer value driven post-industrial model. There is a major shift to happen in the moment that self-fulfilment will be accomplished not only through a pure consumption of products that are offered for sale (a purely push-mode of operations), but through consumption of self generated value in the form of products or services (a purely pull-mode of operations). In this way the consumer becomes partly producer, finding its position in the value creation cycle that has been interrupted with the enormous increase of productivity in recent years characterising mass production. In this post-industrial era, competition will not be purely based on the financial aspect of production, cost alone will not be the most important differentiator factor, and profit needs to be redefined based on Rehtin [6] words "profit is a matter of definition and cost is not an absolute". Profit in the post-industrial mass customised era will be oriented towards the consumer value generation, and cost will follow the path of value degeneration. New economics will be needed to accompany the paradigm shift that will substitute the classical profit and loss mathematics of mass production through new theories based on what we would call *consumer-driven value economics*. The *mass procumer* society, can become a model for the new global society that will reunite once more culture with technology, closing the gap between the two sides against the trend foreseen by Kondylis [5]. This is be due to the fact that *mass customisation* will allow more and more people to use technology for combining consumer needs with technology to achieve a new quality of self-fulfilment. This post-industrial production system will be characterised through the balancing act between two competitive feedback loops (see Fig. 1): one that through the increase of productivity leads to less and less people of production (mass production loop) and a second one that utilises the creative forces of the consumer to integrate him or her back into a new consumer driven value creation loop. Although these loops are competing against each other, in reality they refer to two

different world views in economical and technological terms: The mass production paradigm does not stop in the narrow production process but extends in the financial thought in general: it dictates the accumulation and the separation from immediate pleasure according to Kondylis [5]. On the other hand *mass customisation* is by definition against accumulation addressing the custom, the individual, the personalised, and it does not really exist without the active at some point in time involvement of the consumer.

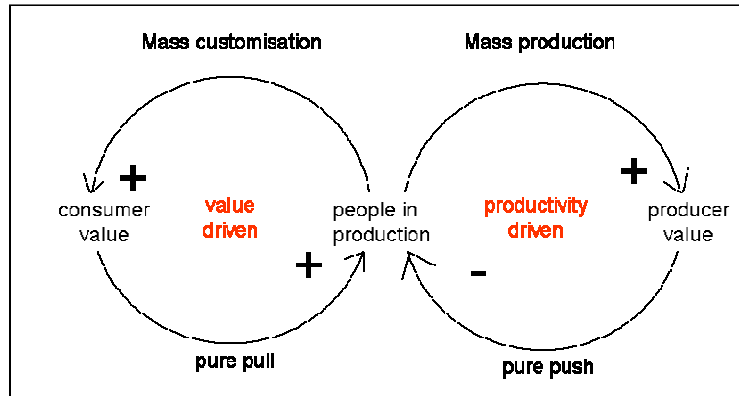


Fig. 1. The post-industrial production system

System dynamics analysis may be used at this point to study as to how this dynamical system may evolve in the future. It is definitely true that the coexistence of the two economic models mass production and mass customisation will continue for many years in the future. An example of this future trend is illustrated in Fig. 2 based on a study conducted in the US, concerning market trends on all products sold in this market, showing that in the year around 2030, the number of mass customised products will equal the number of mass produced ones with the trend in favour of the mass customised products.

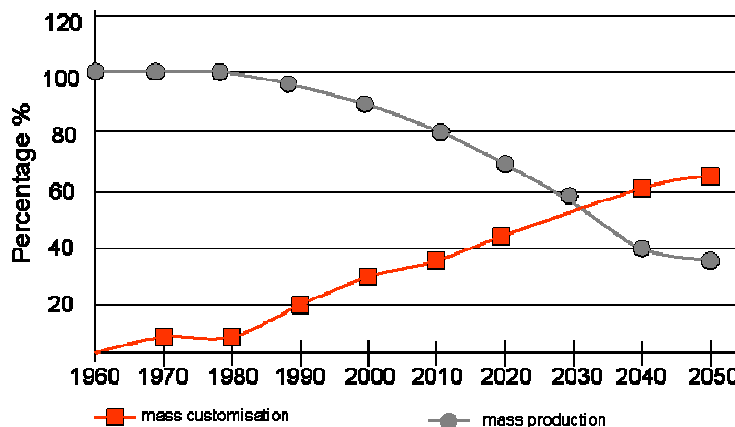


Fig. 2. The US market shares of the two economies until 2050 [7]

4 Architectural aspects

In architecture an analogous evolution is observed: The movement of modernism in the beginning of the century had as target to use the “*function*” as the prevalent element over “harmony” of the civil society. The wish to make housing available at affordable costs to the poor and simple people led to phenomenon of “mass housing”. The idea that the “machine” would liberate the human being gave the idea of “functionalism” to the modern movement. The “*function*” became the most important factor that prevailed over any “*aesthetic*” element of the civil society architecture. Like Ford who envisioned common people, not just the wealthy, owning their own automobile, in the same way modern architecture took it as under its flag the supply of houses at affordable prices [5].

With the rise of post-modern era that Jencks [8] locates around the mid 1970s a new paradigm in architecture has evolved. The new paradigm was aided by computer design and production. This resulted in what Jencks calls in the first edition of his book: *The language of the Post-Modern Architecture, 1977*, “computer modelling, automated production, and the sophisticated techniques of market research and prediction that allow to mass-produce a variety of styles and almost personalised products. These are now as cheap and easy to build as the ubiquitous dump box of modernism”. This is clearly a declaration of mass customisation in architecture. Furthermore, in the magazine *Detail* [9] we read: “Economic pressures call for rationalisation and standardisation in the production of rented housing today. At the same time, growing differences in our housing needs presuppose the utmost freedom of use. What Mies Van de Rohe recognised in 1927 in the context of the Weissenhof Estate has now become reality. One major need for *variability* is the incalculable element in mass housing, namely the tenants themselves. In contrast to the single family house, neither investors nor architects know precisely for whom they are planning. In multi-storey housing developers have relied hitherto on the conventions of the market and their own subjective experience, whereby the nuclear family for which most dwellings are conceived plays only a subordinate role in our society today. New concepts are needed to meet the rise of one- and two-person households as well as flat-sharing groups and extended families in which various generations would like to live together in a single development”. The idea of the involvement of the customer in the design of the object is observed also in the architectural field. Gehry was exercising what is called *participatory design* [8]. Gehry was working closely with clients in the design phase of the building. Similar evolution is noticed in the field of fine arts at the same time. Here the ideal is the production of infinite number of combinations based on a restricted number of ultimate elements and construction rules. The centre of gravity of the theoretical attention is not so much on the production level of the individual combinations, but on the field of the ultimate original elements (archetypes) and the construction axioms (mass customisation) [8,10].

4. Summary

In this paper sociological-historical, industrial-technological and architectural aspects have been addressed and combined to discuss the paradigm shift of *mass customisation* as a whole. Only in this context *mass customisation* can be understood, otherwise it creates confusion. If the context changes, then traditional factories and organisations, based on the principles and the ideology implicit in the society of mass production, are out of focus. If Europe continues to base its policies and strategies on profit and cost only, as a single dimension problem, then refocusing is imminently needed, otherwise confusion will be increased and not lessened. The world has become and it continues to become more complex as we move well into the 21st century. Profit and cost mathematics are not enough and sufficient to describe a complex world. In this new world the former East Europe, can play a very important role. This part of Europe should not try to copy habits and traditions of its counterparts in the West (only a euphemism) but to lead the needed transformation into a pluralist post-industrial era investing heavily in *open innovation* and *consumer-driven value* projects. Profit in the post-industrial mass customisation era will be equal to consumer value generation, and cost will follow the path of value degeneration. New economics are needed to accompany the paradigm shift that will substitute the classical profit and loss mathematics of mass production through new theories based on what we would call *consumer-driven value economics*.

5. Further research

The dynamic evolution and transformation of the mass production industrial economy towards a *mass customisation* post-industrial economy can be studied using system dynamics models. Such models can be of great help for companies wishing to invest into new technologies and industries for meeting the needs of the post-industrial society. Furthermore new economics will be needed to accompany the paradigm shift that will substitute the classical profit and loss mathematics of mass production through new theories based on what we would call *consumer-driven value economics*. It will create new employment opportunities and participants relationships. It will also help abolishing patents, by reinforcing open innovation and acceleration of value creation for all participants not just the producer. The combination of system dynamics models in conjunction with the new economics makes this approach a powerful tool in the hands of organisations for strategy development in the post-industrial era.

References

- [1] Tsigkas, A. (2005) “Mass Customisation through Value Adding Communities”, 3rd World Wide Conference on Mass Customisation and Personalisation, September 2005, Hong Kong,
- [2] <http://www.aib.wiso.tu-muenchen.de/neu/eng/index.php?nav=research/cdvc.php>
- [3] Von Hippel, E. (2005) “Democratising Innovation”, The MIT Press Cambridge, Massachusetts, London, England
- [4] Kondylis, P. (1991) “Der Niedergang der bürgerlichen Denk- und Lebensform, die liberale Moderne und die massendemokratische Postmoderne”, Acta humaniora, Weinheim, for the Greek edition, Themelio 2000, Athens, Greece.
- [5] Kondylis, P. (2000) “From the 20th to the 21th century, Intersections in the politics of the planet”, for the Greek edition, Themelio, Athens, Greece
- [6] Maier, M, Rehtin, E. (2000) “The Art of System Architecting”, second edition, CRC Press
- [7] Schultz, D. (2006) “The competition in a saturated market”, Magazine Wood & Furniture, March 2006 (Greek translation of the article)
- [8] Jencks, C. (2002) “The New Paradigm in Architecture”, Yale University Press, New Haven and London
- [9] Detail, Review for Architecture, 46, series 2006, p.139
- [10] Tsigkas, A et. al. (2003) “Towards Knowledge Based Mass Customization: a Framework for an Demand Design (ODD)”, 2nd Interdisciplinary World Congress on Mass Customization and Personalization, TU Munich, 2003