

Mass customisation and sustainability

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Last year, *World Footwear* ran an article in its May/June issue concerning what was referred to as the 'lean, green and clean paradigm'. Although there is as yet no official standing for such a paradigm, we can summarise its goals simply as 'to produce only what is needed, minimising wastes and inefficiencies throughout the entire manufacturing process, with the lowest possible energy consumption, and respecting and protecting the environment'. It is a way of thinking and acting that is more than just lean, goes beyond green and expands in a certain way the concept of sustainability.

We can best think of it as a multi-disciplinary approach that aims at exploiting the common, overlapping area between three main domains: lean processes and organisation, using power conscious machines, and processing clean materials to produce clean products. Looking at it from another perspective, we can consider

this as nothing less than a roadmap to sustainability, where rules and best practices are adopted. In the green domain this relates to machine design, energy efficiency and power saving. Similarly, the clean domain addresses materials and substances used in products and in their manufacturing processes. Lean teaches us how to structure our organisation at all levels, particularly in manufacturing, minimising waste of all kinds and preserving value with less work, the true meaning of lean (*Figure 1*).

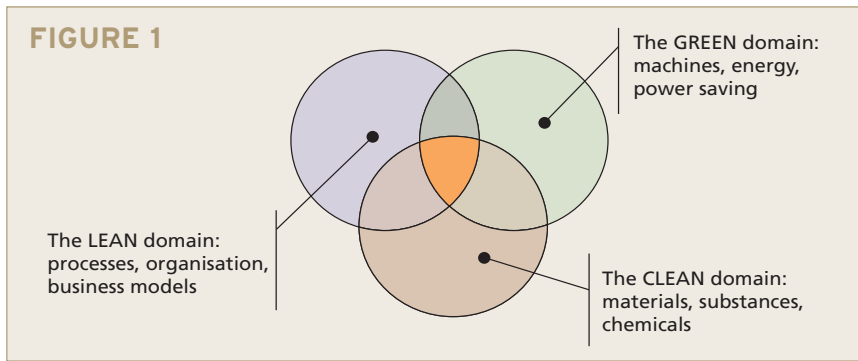
CONSUMER PERCEPTIONS

This leads us to sustainability and its perception among consumers who are becoming more attentive to environmental impact, healthy products and to a careful use of energy resources. A way of thinking that should be turned into an 'added value' for the products we buy and which, at the same time, asks companies to innovate

products and processes in order to minimise their environmental impact, optimise the use of resources of all kinds and adopt organisational schemes in the broad sense to reduce such waste to a minimum.

It is in fact widely recognised and accepted by both consumers and institutions, that the ever more dramatic climate changes we increasingly experience in our every day life are very likely—although not yet proved beyond any doubt—the result of human actions on the delicate equilibrium of the planet. These effects have become more evident and important with the advent of industrial production and, among the largest contributors to such impacts, we have the production of consumer goods. As an example, the European Union has set itself a goal of reducing carbon dioxide emissions by 20% by 2020, a very ambitious goal that can only be achieved if both manufacturers and consumers develop

FIGURE 1



Lean, green and clean: a roadmap to sustainability. CREDIT: SERGIO DULIO

the right mind-set at the same time.

Unfortunately, change in this direction is not easy for manufacturers as it implies relevant investments and challenging reorganisation processes that companies do not seem willing to tackle on their own. On the other hand, policy makers and institutions have proved most of the time to be reluctant or unwilling to enforce this evolution, which explains why these changes have so far happened so slowly. This leaves a big choice and a great responsibility on consumers. Sustainability has to be regarded as an ethical imperative for today's consumers.

With regard to the challenges of climate change that the global community is facing, we simply cannot afford to neglect environmental aspects any more. Manufacturers depend on their customers and, subsequently, consumers have substantial bargaining power. Consumers need to accept this responsibility and should try to influence the behaviour of manufacturers through their own behaviour. The public awareness of the issues of climate and the need for sustainable development is constantly increasing. J. Elkington, in an article for the California Management Review in 1994 titled 'Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development', had already observed this development in the 1990s and termed it 'green evolution'. However, this increase in awareness still has to manifest itself in a widespread change of consumer attitudes in order to truly impact manufacturer behaviour.

MASS CUSTOMISATION

Let us now consider mass customisation, another topic that *World Footwear* has featured on numerous

occasions in previous issues, particularly with regard to its applications and practical implementations in the footwear sector. Why should we be thinking of mass customisation (MC) in relation to sustainability? Because, if the push towards a green evolution, a sustainable economy and lean, green behaviour must come from the consumer, there is no better business model than mass customisation to empower consumers and give them the opportunity to impose directly or indirectly, virtuous behaviour on manufacturers.

The success of a mass customisation business model does indeed depend strongly on a company's ability to interact with its customers. Mass customisation is strictly customer-centric and thus demands the customer to take an active role in the value creation process. Therefore, companies that have been able to successfully adopt a mass customisation strategy have also been forced to integrate customers as much as possible. This business approach encourages a 'customer-active paradigm' with customers seeming to have stronger bargaining power and influence on these companies.

In this respect mass customisation sounds like the best chance that we, as consumers, have to stimulate our producers into adopting sustainable behaviour, thanks to the enhanced role that this business model affords us. The companies engage themselves in listening to consumers' desires and, in some cases, to involve them to such a degree as to make them co-designers of the products they will later buy. Intercepting this growing sensitivity towards environmental issues and sustainability becomes yet another effective way of satisfying customer

demands. Products will become greener because consumers will prefer them greener, design them greener and buy green ones more than otherwise.

FURTHER DIMENSIONS

There is, however, another dimension to mass customisation in relation to sustainability that we need to introduce here, the claim that it is inherently sustainable for at least three good reasons. First, it is about producing goods on demand. This means producing (i.e. allocating materials, consuming energy and dispersing carbon dioxide in the environment) only items that are certain to be purchased, instead of remaining unsold in a warehouse or on a retailer's shelf. This is in itself a huge source for savings. In the final chapters of 'Mass Customisation and Footwear: Myth, Salvation or Reality' by C.R.Boer and S.Dulio, a rough calculation of this effect was attempted.

An early survey in 2001 showed the potential market for customised footwear in Europe to be around 1.5 billion pairs of shoes per year which, although it sounds like an enormous amount, is in fact less than 10% of the world's annual shoe consumption. Taking a figure of 30% as representative of the typical share of shoes that are unsold or returned every year, we have roughly 500 million shoes consuming approximately 3 kWh of energy each



Outline configurators allow customers to have a direct influence on the shoes they wish to buy. CREDIT: CALZOLERIA RIVOLTA

(a reference figure quoted by Timberland at that time), which would be produced but not sold. This accounts for 1.5 billion kWh wasted each year. If the potential of MC was fully exploited, that 30% would not exist and a huge amount of power would be saved. Even if we consider this extra optimistic scenario, it does give us an idea of just how big the potential might be in avoiding wasting energy uselessly. In a more recent book by Boer, Bettoni, Pedrazzoli and Sorlini titled 'Mass Customization and Sustainability' and published last year, these argumentations are fully presented together with precise calculations of the overall effect of MC on sustainability.

The second inherent positive effect of MC relates to the longer lifespan a customised product tends to have. Buyers have a much stronger affection for a pair of shoes they have designed or configured to meet their most intimate desires, will take more care of them and also keep them for longer. Consumers will therefore live with fewer shoes for a longer period of time. Perhaps not the best outcome for footwear manufacturers but, most certainly, a positive point for the environment.

Finally, there is a third consideration we can make that also has a positive side. MC customers establish a very loyal kind of relationship with the companies they buy their shoes from. It is therefore more likely that they will enlist in 'cradle to cradle' initiatives, in which the producer takes care of the

FIGURE 2: BREAKDOWN OF CO₂ EMISSIONS

VALUE CHAIN	CO ₂ EMISSIONS	% OF TOTAL CO ₂ EMISSION
Order Transaction	9.9 kg CO ₂	25.13%
Delivery of Material	0.181 kg CO ₂	0.46%
Production	13.63 kg CO ₂	34.60%
Distribution	5.778 kg CO ₂	14.67%
Buying Process	9.9 kg CO ₂	25.13%
TOTAL	39.181kg CO ₂	100%

CREDIT: KLEER/STEINER

'End of Life' of the product when the customer, after a long and successful lapse of time in which they enjoyed their customised shoes, wants to dispose of them. This can lead to recycling initiatives in which parts of the shoes are separated, recycled or taken in in more efficient disposal schemes than simply throwing them into a landfill. Nothing that normal producers cannot do, but it might well mean that the extra costs of this service would be 'embedded' in the price premium for a customised shoe as compared to the typical margins of traditional manufacturing and classical retailing.

ANY PITFALLS?

Mass customisation and sustainability would apparently seem to go quite well together, two paradigms that perfectly complement each other. But, is that really so? Two recent studies offer an interesting insight. The first one was published a couple of years ago by Robin

Kleer and Frank Steiner from the Aachen University in Germany. They studied the case of the company Selve, a manufacturer and retailer of high quality ladies and mens customised shoes, with shops in Munich and London, and manufacturing facilities in China. Their purpose was to calculate the total CO₂ emission involved in all the selling, manufacturing and delivering processes of each pair of customised Selve shoes. It turned out that the total carbon footprint (total emission) was about 39 kg of CO₂. This total figure may not be particularly revealing as the study did not contain any comparisons with footwear produced traditionally. It does nevertheless offer some useful hints on potential pitfalls that could counter-balance the positive effects described earlier (Figure 2).

The three major sources of CO₂ generation are the manufacturing process (accounting for almost 34% of the emission), the order transaction (when the customer goes to the shop to

FIGURE 3: IMPACTS OF MC ENABLERS ON SUSTAINABILITY KEY PERFORMANCE INDICATORS (KPIs)

MC ENABLER NAME	IMPACT OF SUSTAINABILITY KPI		
	WASTE PRODUCTION	WASTE CONSUMPTION	EMISSION
Involve current and potential customers	None	None	None
Support customers via human resource	None	None	None
Support customers via IT and technical resource	None	None	None
Improve robustness of production processes	Decrease	None	None
Knowledge creation	None	None	None
Modular product design	Decrease	Decrease/None	None
Define solution space dimension	None	None	None
Elicit customers' requirements	None	None	None
Postponement	None	None	None
Integrate suppliers	Decrease	None	None
Select flexible partners	None	None	None
Deliver at point of sale	None	Decrease	Decrease/None
@ Home delivery	None	Increase	Increase

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get their feet scanned) and purchase (when they return to collect their shoes). The first big contribution depends very much on the manufacturing location. In this instance China which may well involve rather inefficient power usage combined with the 'dirty' energy generation often associated with that country. The second two items are, on the other hand, strictly connected with the necessity for the customer to travel to a physical shop for the initial foot measurement and model selection and to go back there to collect the shoes.

A shorter supply chain, with a local production site much closer to the destination market, together with a greater use of the upcoming digital technologies that could spare the customers the double trip to the shop, could greatly reduce the CO₂ footprint. Both these evolutions would come at a cost or a somewhat higher transaction risk for the customer. These, however, are possibly drawbacks that future generations of environmentally conscious consumers will be ready to accept.

In another more recent study Pourabdollahian, Pillar and Taisch of Aachen University in Germany and the Polytechnic of Milan in Italy, presented an empirical study to assess the environmental impact of the MC business model. The authors considered three major key performance indicators (KPI): waste production, energy consumption and the amount of emissions (Figure 3). The study did not really aim at developing any quantitative model to assess or predict such indicators but rather to investigate the dominant opinions among academics, the shoe industry and producers of customised footwear about the correlations between a certain number of characteristic elements of the MC business model and the three environmental KPIs.

To no one's surprise, it emerged that the academic and industrial worlds seem to have different opinions on these matters. Researchers appear to have a more swinging position between positive or no impact, while the industrial world is definitely more optimistic on such effects. In particular, among the several aspects that define the MC business model, four are perceived to have a positive (decreasing) effect on the KPIs: robust process design affecting primarily the reduction of waste, modular product design with an impact both on waste reduction and energy consumption, integration of suppliers that again is seen to reduce waste and, finally, delivery at point of sale that has a positive effect both on energy consumption and emissions.

The outcomes of the study are certainly interesting and would somehow seem to indicate that a positive correlation between mass customisation and sustainability does in fact exist. The indications emerging from the study are however too partial and, in certain cases, contradictory, so it is then difficult to draw any final conclusion on how relevant this impact is considered to be by the MC community. So, looking back at all we have discussed and after analysing the academic work that has been done on this topic, here are some known facts. Mass customisation is a business model that 'inherently' leads to sustainability, provided that some basic implementation choices are made correctly, there is a general perception that going for mass customisation can positively affect some environmental key performance indicators although the amount and enablers of such effects are still controversial and, finally, that it is certainly a topic that deserves further attention and research. 

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