

The Future of Footwear 4.0: from RoboShop to Factory on Demand

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Tematiche: Fabbricazione additiva

Introduction

A pivotal case of open innovation, this joint project between ELSE Corp, ATOM Lab and Shoemaster, represents a fundamental step towards the 360° integration of all the processes involved in the manufacturing of personalized and on demand footwear. 'RoboShop' is the store-factory of the future where a customer's personalization and purchasing experiences are merged with the live experience of the manufacturing of their own shoes, called 'RoboShoes', in a perfect digital fabrication scenario.

A joint project

The three partners came together to showcase their two versions of the project, presented consecutively at SIMAC Tanning Tech in 2017 and then in 2018. SIMAC is the international event with the most qualified offer of machinery and technologies for footwear, leather goods and tanning. ELSE Corp was founded in 2014 and offers technological solutions for Virtual Retail and Cloud Manufacturing to fashion brands, retailers, manufacturers and designers. ATOMLab, the research laboratory of ATOM, develops innovative technologies and projects for new methods of production. The third partner in this project, Shoemaster® is a part of the ATOM Group, offering innovative CAD/CAM systems for the realization of footwear models in 2d and 3d. The project demonstrated a streamlined vision for the future of the footwear industry based on ELSE Corp's 'Virtual Retail' business model, a strategy for the Digital Transformation of the entire value chain of brands, retailers and manufacturers. By incorporating Virtual Retail into Industry 4.0, the project integrated industrial 3D CAD into the mass customised footwear manufacturing process.

The context

The global market for Footwear is projected to reach US\$371.8 billion by 2020 – this is a sizable industry for which the development of sustainable solutions is paramount. Waste is a huge problem in the industry and Poor Fit and Poor Demand Planning are major contributors. By providing customers with accurate solutions to buy products that fit them well both in terms of size and style, can ensure a reduced rate of returns; by facilitating a transition to a Virtual Retail model, businesses can reduce product returns rates and stock issues. The method of production used for the RoboShoe emphasized the sustainability message through the possible quick disassembly of parts for easy recycling and the materials used for parts that can be individually recycled to produce new parts.

The project

In 2017, **Factory on Demand**, explored “**just-in-time**” hybrid manufacturing. The three partners had the opportunity to show the public a prototype vision for the future of 3D industrial

CAD integration for mass customized footwear, from design of the product to retail sale and from the customized sale to the modular and on demand production.



Fig. 1. The starting point of the 'Factory on Demand' in 2017 called the Virtual Shop

In the updated version of the project, which was shown in February 2018, **RoboShop**, demonstrated an **"assemble-to-order"** process for ultra-rapid footwear manufacturing in the store-factory of the future where a customer's personalization and purchasing experiences merged with the live experience of the manufacturing of their own shoes, in a perfect digital fabrication scenario. The setting was completely digital, starting from the first phase of 3D CAD modelling of the RoboShoe collection by Shoemaster, to their customization and order processing in ELSE Corp's else.shoes™ platform and to the robotic production by ATOMLab. Taking into account the significant new updates to the functionalities of ELSE Corp's else.shoes™ platform, specifically to its **MyStyle** SDK for Product Style Customization in 3D and **MySize** SDK, for 3D Foot Scanning and Virtual Fitting; the 'RoboShop' in the updated version of the project offered new features and was able to recommend to a customer their 'Best-Fit' in terms of size and style.



Fig. 2. The starting point of the Innovation Arena in 2018 called RoboShop

The processes

FACTORY ON DEMAND: Just-in-time hybrid manufacturing

The process began in ELSE Corp’s 3D Virtual Boutique – the store of the future, where once the visitor’s data was recorded and their feet scanned via the integrated 3D scanner, they could customize the ‘RoboShoe’ models in 3D through the virtual product configurator. Custom orders were then sent via ELSE Corp’s cloud-based manufacturing 4.0 middleware (**ELSE-ware**) to ATOM’s "Factory on Demand", dedicated to the hybrid production of the mass customized footwear products.

The nine-step **Factory on Demand** combined 3D CAD design, Cloud based 3D Product Customization and the robotized, **just-in-time**, on-demand and hybrid manufacturing of footwear through a **semi-automated** and fully traceable production life-cycle, starting on the Cloud and managed by a flexible industrial workflow. Through ELSE Corp’s **3D Product Configurator**, based on industrial 3D CAD product data and shoe last meta-data, visitors customized and ordered individualized shoes. After this, **Customized Hybrid Manufacturing Orders**, generated-in-real-time and structured to be fully compatible with any manufacturing OS or ERP system for both, traditional and digital manufacturing, were sent automatically via ELSE Corp’s cloud based manufacturing 4.0 middleware (**ELSE-ware**) to the next step in the cycle where the just-in-time, hybrid production of the shoes began. The nine steps that followed can be seen below in figure 1. The process involved robotic machinery, 3D printing and manual stitching processes – making it a truly hybrid manufacturing process.

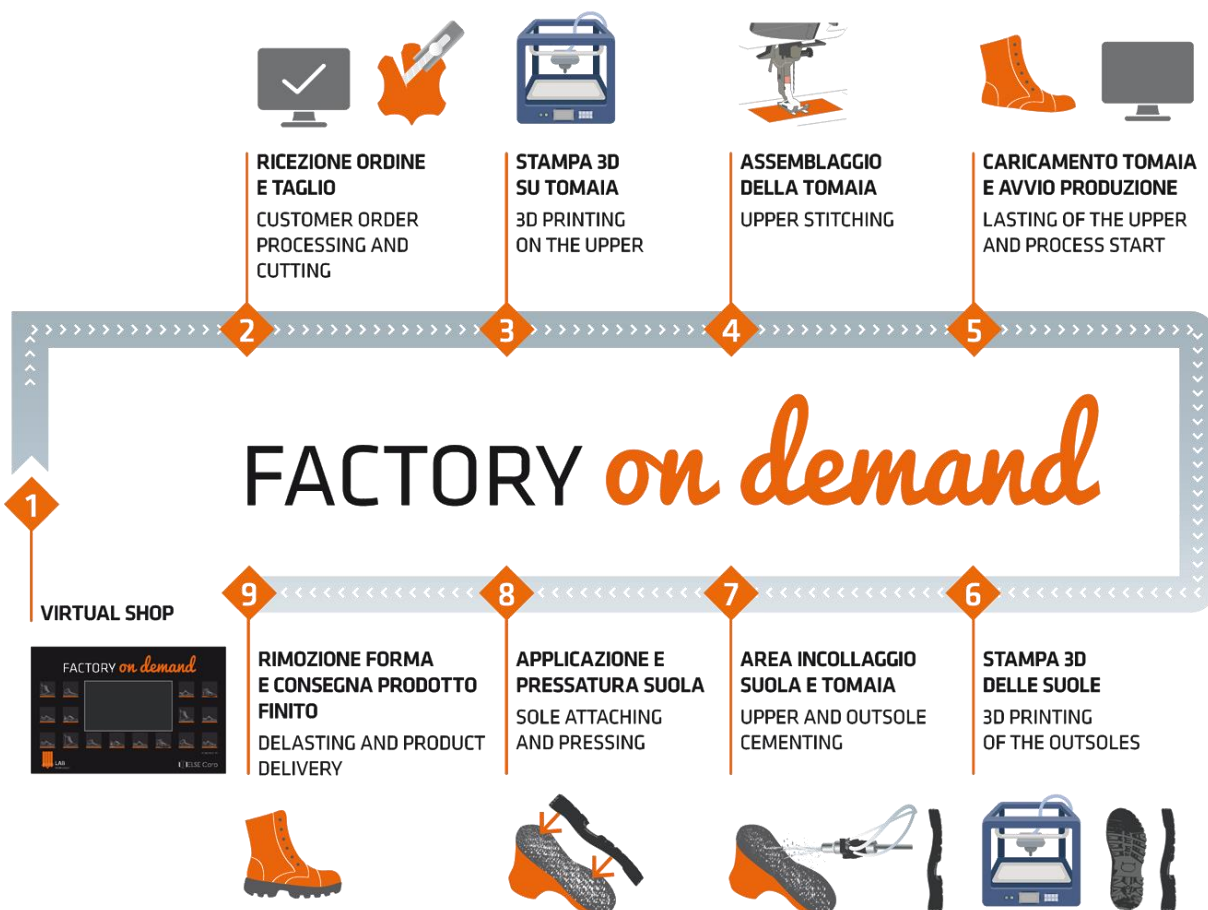


Fig. 3. The Nine-Step Factory on Demand

INNOVATION ARENA: Assemble-to-order Ultra-rapid manufacturing

The second year of the project demonstrated the ultra-rapid manufacturing of “assembled to order” shoes, in a compact, shop compatible setup with a flavour of sustainability and a look to the future of the footwear product. The claim of the 2018 message was demonstrated through the onsite manufacturing of two different “concepts” of shoes: RoboShoe ‘Classic’, a relatively conventional pair and RoboShoe ‘Knit’, a more advanced pair featuring a knitted upper. Both concepts had as common elements: a 3D printed outsole and an ultra-simplified manufacturing process that only implied the assembly of the outsole and the upper using new generation glues, automated machines and robots. The assembly process took place in the shop, upon customer demand and with their direct participation in the process.

Here below in Figure 2, is a ‘map’ of the Innovation Arena, consisting of four steps, where a customer began their journey in the **RoboShop** where they had their feet scanned, were recommended the ‘Best-fit’ style and size through ELSE Corp’s Virtual Fitting feature and then they customize their selected model of shoes by selecting the combination of upper and outsole. Once completed, an order is generated with the size of shoelast, upper and outsole to be combined and is sent to the ‘Work & Shop’. The customer would retrieve their order here and begin the manufacturing process. Once fully assembled to order, the customer could leave the area with their newly manufactured pair of shoes.

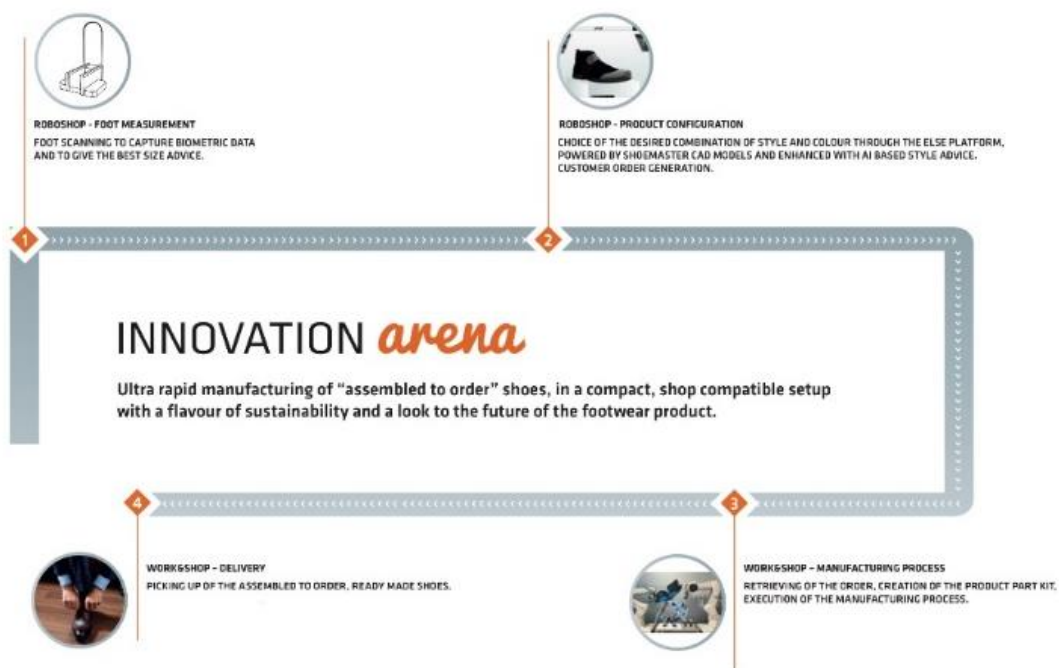


Fig. 4. The Four-step Innovation Arena

The result

Through this project with its future methods of retail, and new innovative strategies for the sales, design, production, distribution and marketing of fashion products, we were able to ascertain the benefits to all stakeholders involved and confirm the viability of this project in bringing a sustainable solution that provides shared value across the board.