Cool Downlight, finding sustainability in searching for efficiency

TAGS: Design for dissassembly, energy efficiency, material reduction

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1. Project definition

Cool downlight (Spain)
2012 - 2018

The Cool downlight was designed and developed by Simon S.A. The brief was to create a very low and compact downlight for bare ceilings. The resulting lamp is very efficient at dispersing light thanks to a made to measure patented design. Another patent resulted from the heat dissipation system, devised to remove the radiator and thus reduce the height of the overall lamp.

The need for this product was identified by the marketing team at Simon which was then turned into a brief for the design team. The design and development of the product was done completely by their designers and engineers. The process lasted 14 months from the conceptualization to the production. All the production is done at Simon except for the reflectors, which must be manufactured employing a very specialised process and were therefore outsourced.

Simon has a multidisciplinary team of designers which oversee the concept; mechanical, electronic and optical engineers that take the product through development; and finally, Simon's marketing team which proposes a brief and evaluates the solution which it takes to market.

They have always minimized the amount of waste product that resulted from production due to the economic impact that this loss may have on the company, which is worsened after it is multiplied due to mass production. In the past few years, they have also realised its consequences on the environment. It is Simon's practice to sell and reintroduce their waste into production lines.

The Cool downlight was designed to have the fastest possible assembly and disassembly and therefore, does not employ any adhesive or fasteners. Instead, all the attachments are magnetic which not only enables the personalization of the product but also facilitates the disassembly and recycling of individual components.

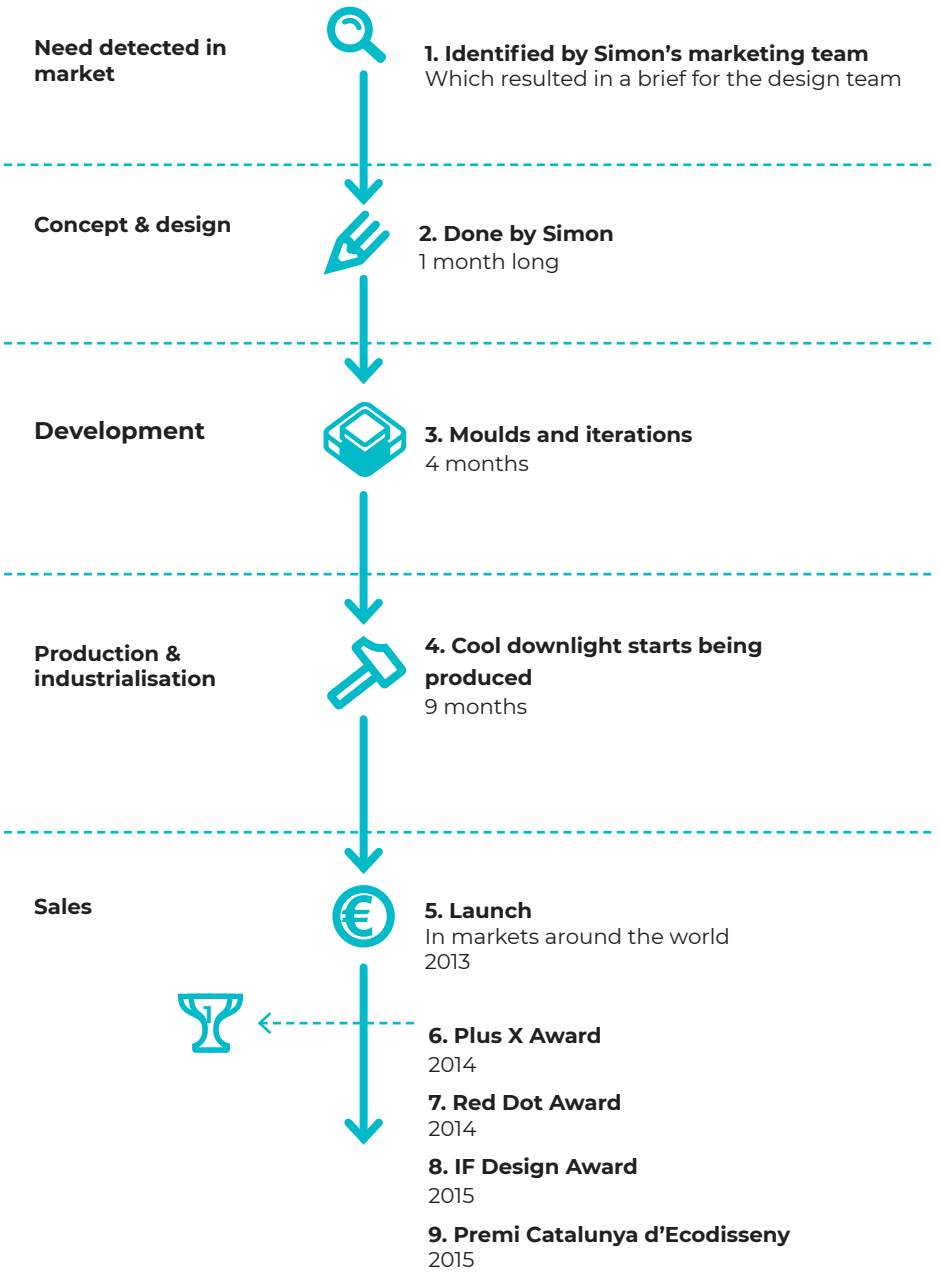
Due to the multi-optic approach used for the Cool downlight, fewer LED diodes must be used to provide the comfortable light for a whole room.

All these factors greatly reduce the environmental impact of each individual light which is multiplied as it is mass produced.

The fact that Simon has achieved some of the most important design and sustainability awards in the world with this product, and that it has also become a benchmark in the market, only demonstrates that the company's approach to efficiency at all levels has been a success.

KEYWORDS: Multidiscipline, waste reduction, material reduction, design for dissassembling

Timeline



2. Research

Simon S.A. has access to many resources, one of which is Simon's experienced marketing team.

They detected the need in the market for a downlight that did not require the installation of a drop ceiling to hide the body of the light, while having a slim shape that could be integrated properly in the space.

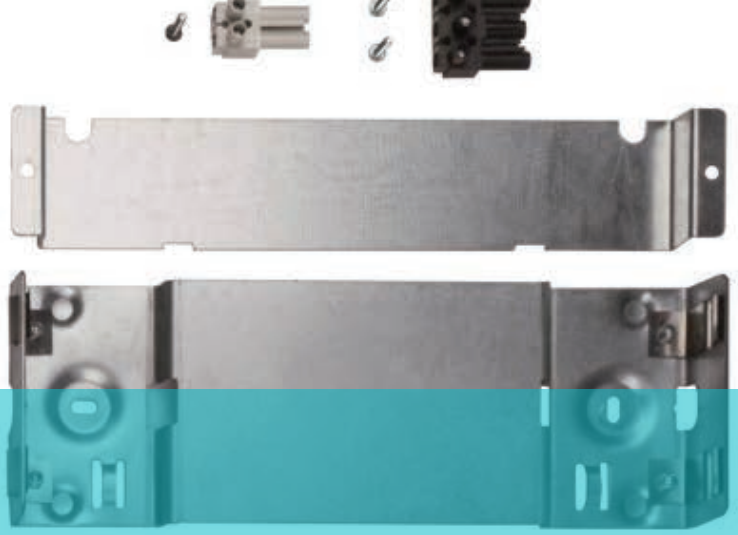
In the second stage of research, they found that it was the radiator that occupied most of the height of downlights. Consequently, decided to develop a technology to enable the removal of this component all together without losing the benefits that the radiator incorporates, in terms of heat dissipation specially, which allows the LED diodes to last longer.

It was also part of the initial brief that the light should be comfortable and efficient. Thus, Simon made great efforts to design an efficient lighting system that fully filled a space, while providing comfortable lighting for the user which is often not achieved when LEDs are employed because of the extreme contrasts they generate between light and shade.

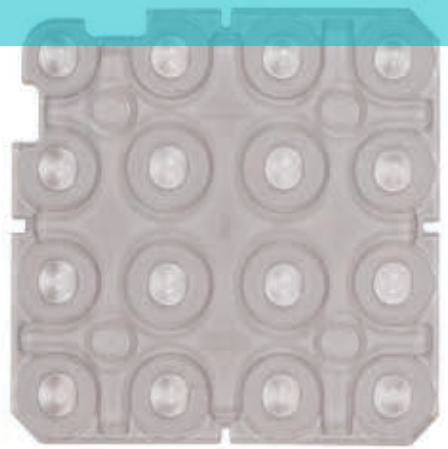
This system required a great amount of cutting-edge research from the optical engineering team as well as an innovative design of the lenses and light diffusers.

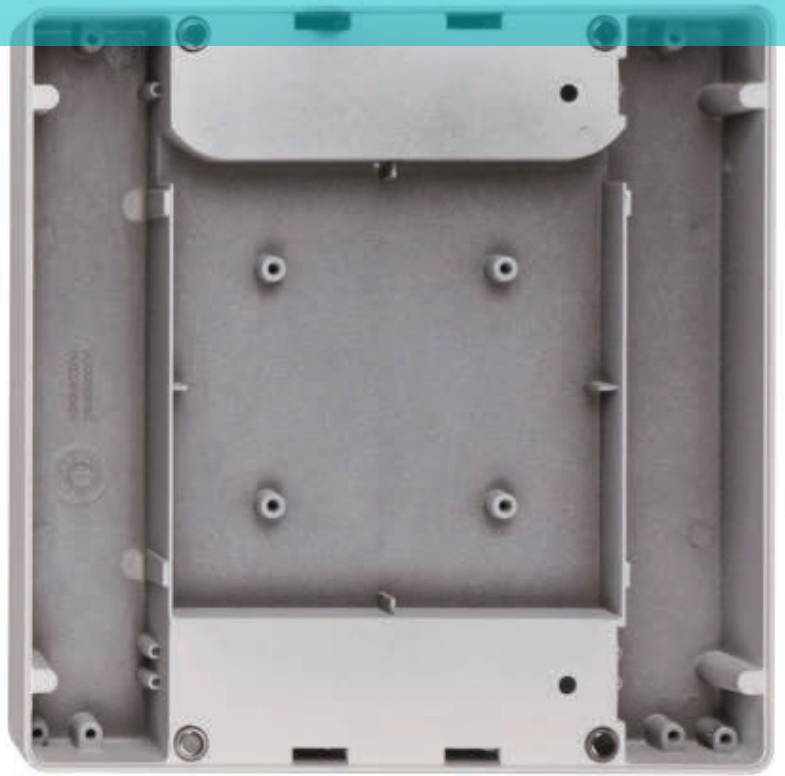
Despite that these conditions do not seem to have an influence on the environmental aspects of the product, they became a key factor in winning efficiency, and also converted the product into something revolutionary in the sector that many other companies are now trying to recreate.

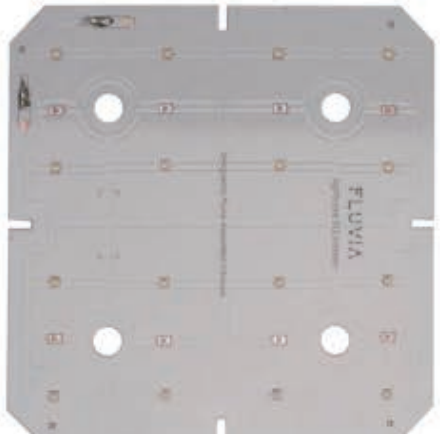
KEYWORDS: Customer surveys, market research, technical analysis



Cool downlight uses an unibody criteria that reduced the amount of different pieces and materials. Moreover, this solution enabled the improvement of assembly times in the factory, reducing the cost and facilitating the recovery of materials and components in the recycling phase.







3. Analysis

From the initial brief to the final concept there were multiple aspects to consider, research and implement.

Firstly, the downlight had to be in accordance with the appropriate technical regulations. These were revised at the start of the project as well as throughout the design journey in order to evaluate their completion.

Secondly, a set of design requirements and constraints were extracted from the brief and the research stage and fixed by the design and marketing teams. These served as guidelines in the development stage and as evaluation criteria for each iteration.

This set of criteria started with minimizing the height of the downlight as traditionally the body is so large that in order to hide it, ceilings have to be dropped and a lot of the height of the space is lost. During research, Simon noticed that it was the radiator that occupied most of that space and thus, decided to develop the technology necessary to eliminate it.

Another point that the design had to address was that the light had to be efficient and comfortable. The efficiency of LEDs has made them lead the market although it is not the best option when it comes to light comfortability.

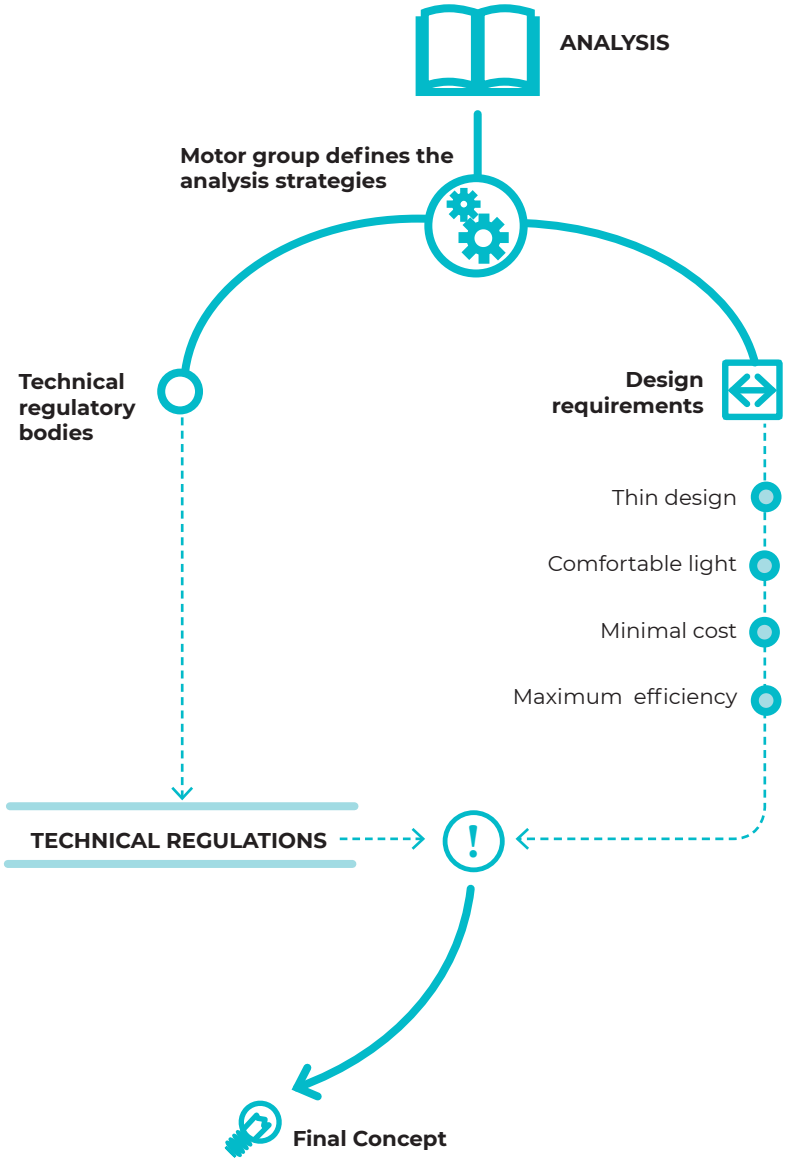
The light of an LED is intense and provides almost no difussion, so the shadows and contrasts that it creates are strong and really uncomfortable to the eye. This problem is made worse when using multiple LED's as the shadows will multiply.

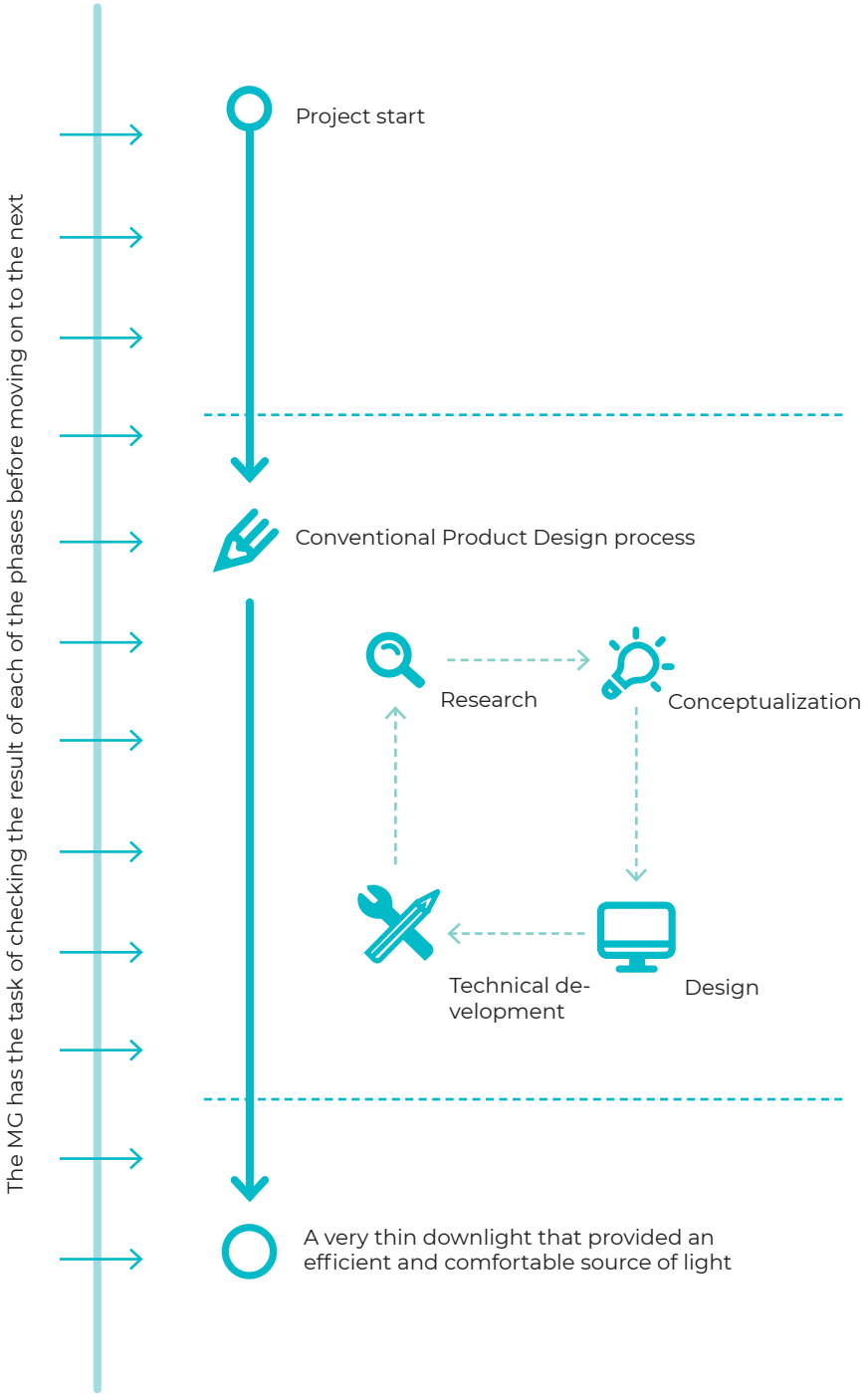
Therefore, they decided to develop a LED set that was highly efficient but distributed light similarly to traditional bulbs, to try to achieve the best of both worlds. The development of this point resulted in a patent.

Although the design was very innovative, they wanted the light to match the pricing of their range and thus the cost had to be minimized.

All of these regulations and requirements were met by the final design of the Cool Downlight by Simon S.A.

KEYWORDS: Technical regulations, user comfort, cost range, design requirements.





4. Concept

Simon's design team has always worked collaboratively and believe that sharing ideas and participatory development are the key to successful design. They work together with the optical, mechanical and electronic engineering teams in order to develop the necessary technology for the design and with the marketing team which evaluates the outcomes.

To design the Cool downlight they followed a traditional design process of research, conceptualization, design, development, prototyping and testing. They sketched their ideas and shared them with the team, with which they were discussed and iterated upon. They employ low-fidelity prototyping to better understand the viability of an idea.

After the design requirements were set, they further researched downlights in order to understand the ways in which they could meet the criteria. After this process they concluded the technical challenges that they had to overcome to achieve the requirements and iterated through different ways to do so.

KEYWORDS: Rapid prototyping, sketches, multidiscipline.

Dozens of real scale prototypes produced both in-house and by external suppliers were necessary to assure that the final solution was going to have a balance between an amazing light difussion, a good heat dissipation, a thin body and an easy assembly-dissassembly.

5. Prototyping

The prototyping stage was essential in the development of all the innovative technology that was developed to make the Cool Downlight possible.

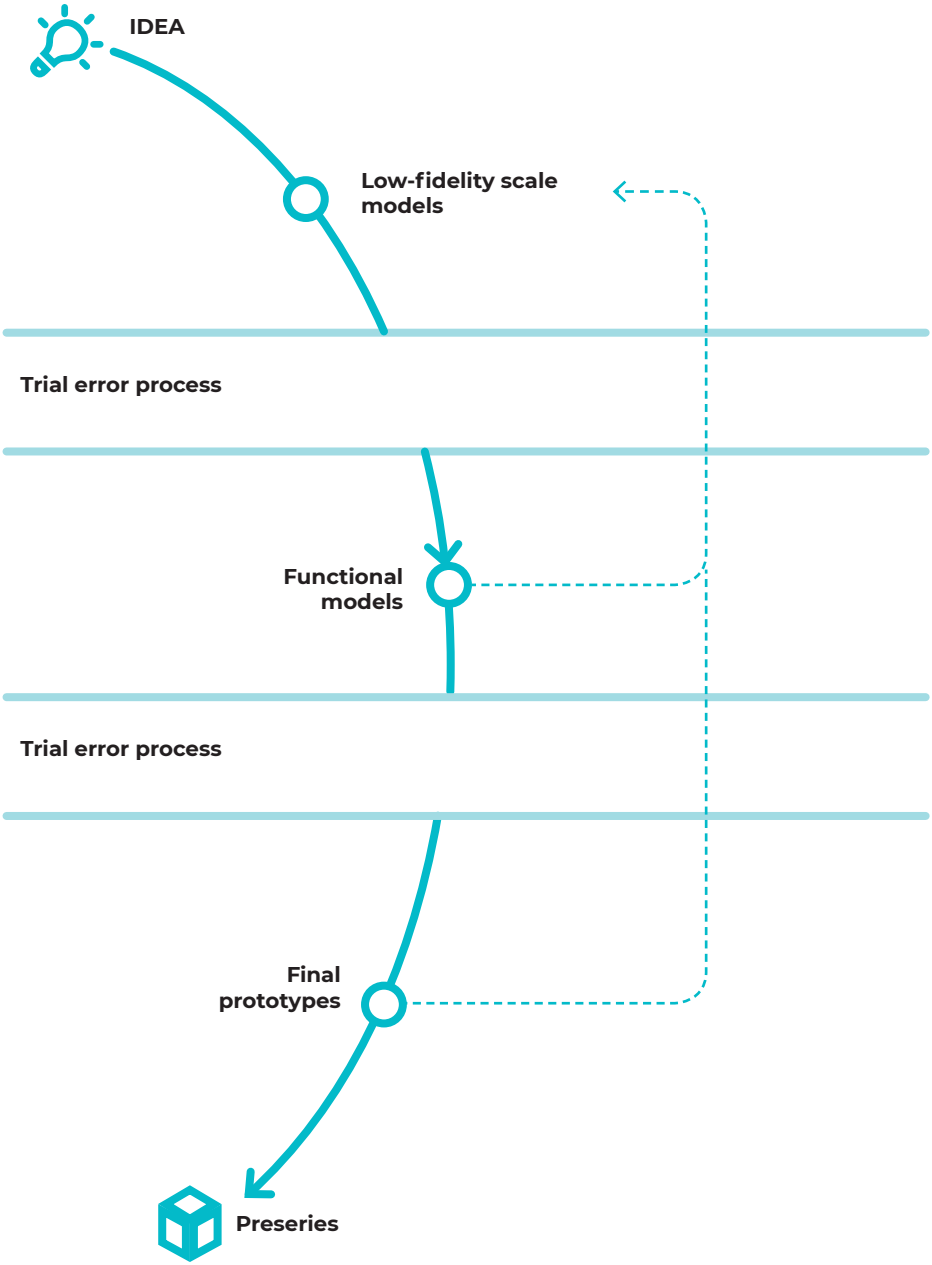
The design team at SImon value this stage as they find it fundamental in developing a product that must work within a space. At different stages of the design process, they employ different approaches to prototyping.

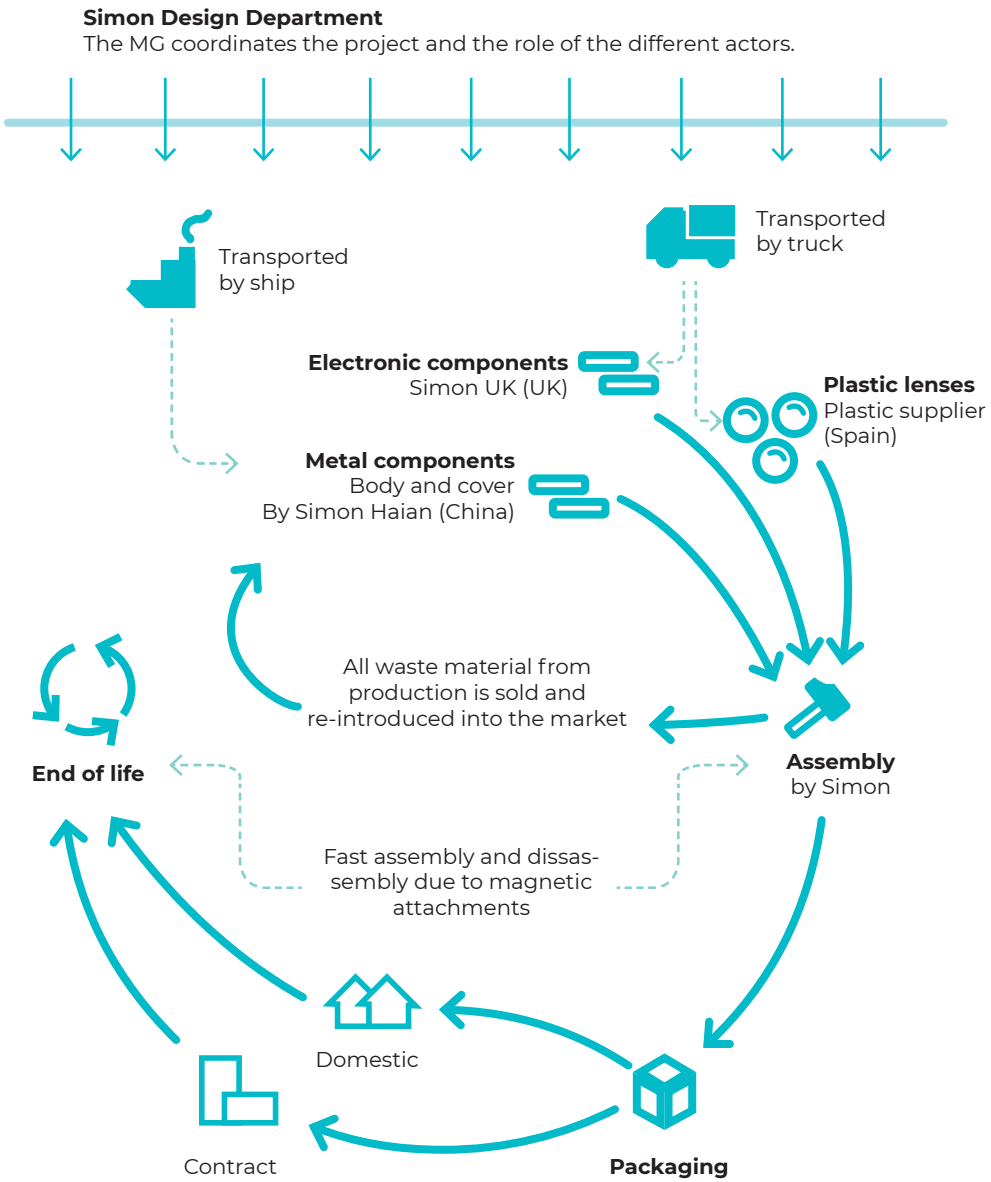
At the early stages, they made low-fidelity scale models of specific parts or of the whole design. This is done with tools that enable rapid prototyping and facilitate altering such as paper, foam or cardboard.

Later on in the process, the team developed functional models that may incorporate lighting or other systems. Often this prototyping technique was mixed with the previous one in order to explore all the variations of a design solution. As light is not scalable, these prototypes were usually real scale.

Once the design was mostly settled upon, final prototypes were made with the hope of minimal alteration. Once these prototypes fulfilled all the needs of the design, the product was ready for production.

KEYWORDS: Rapid prototyping, functional models.





6. Project

Simon has the necessary resources and facilities to bring a product from concept to final product. This is why they produce all the components in-house except for the reflectors. The reflectors were carefully designed for maximum performance and thus, need to undergo a very specialized manufacturing process which is therefore outsourced.

They design for minimum left-over material from production. The amount that does remain is sold and re-introduced into the market.

One of the main features of the Cool downlight are the magnetic attachments, which facilitate a really fast assembly and disassembly. By employing no adhesive or fasteners, the light can be easily repaired and recycled at the end of life of the product. This modularity also means individual parts can be easily replaced with minimal effort for the user.

The lights can be personalized by the consumer according to the needs of their space and their personal taste. The reflectors come in white and metallic, which apart from an aesthetic choice, can offer slight differences in the dispersion of light. The front face also comes in a variety of finishes to either make it stand out as an architectonical feature or disappear into the space. The latter can be achieved, for example, by employing a primed face which can be painted over with wall-paint which makes it blend into the ceiling.

The innovative and patented heat dissipation technology enabled the Cool downlight to eliminate the radiator and thus dramatically reduce its height. This innovation is especially useful when the space has bare ceilings as the body of the light cannot be fit into the dropped ceiling.

Another feature which was patented was the light distribution technology. The reflectors were carefully designed to maximise the light that was reflected and direct it very efficiently with no glare. The properties of the reflectors can be easily damaged by dust from construction or fingerprints. Therefore, their reflectors come with a protective cover to enable the light to be installed while the space is still being worked on.

Simon experienced harsh criticism over their choice of multi-optics. This approach consists on employing multiple small optics with lower performance to achieve a high performance of the overall lighting system within a space while allowing greater visual comfort to the user. Traditionally, this system used in other markets had resulted in bad diffusion and consequent multi-shadows. However, after Cool's high performance and success, other firms are starting to design with multi-optics, fact that demonstrates the right guess they followed at the company from the design, the commercial and the environmental points of view.

KEYWORDS: Design for dissassembly, material reduction, reversible joints, customisation, efficiency.