



You could change the colour of the material, enabling the product to appeal to different users

the 3D CAD files to Innovate's Chinese prototyping partner. With Chargem having the least amount of moving parts possible, it ensured that tooling could be kept simple and as a result cost effective if Strand wished to put it into mass production. "When it came to having the casings produced, we decided to run the project with our prototyping partner in the Far East as they offer good quality parts, quickly and at a price that gives our clients the opportunity to have their products prototyped. This procedure involves sending the 3D files to our partner and specifying all the relevant information. Such as materials, finishes, pantone references, pad printing requirements etc," says Sohi. To minimise problems, Innovate's Chinese prototyping partner would send photos of the finished prototype to Innovate to make sure that the

colour matches were correct, minimising any chance of parts arriving back that Innovate weren't happy with.

The prototyping partners used CNC and the reason for this was that the prototype would resemble an injection moulded product. If Chargem had to go into production this is the manufacturing process that would be used. "By doing CNC you actually get a more realistic representation of what you would get in production," explains Sohi. Additionally, a high quality gloss and soft touch paint finish was used not only for aesthetic purposes but also as it offered a slight grip to the underside.

Three years after Strand had the first flash of inspiration for Chargem, Sohi handed the prototype over to her. "I now have a fully working proof of concept prototype that is sleek and modern looking and is capable of

charging up to six mobile products at once from one plug socket," she says. "It works and it looks fabulous!" In order for Strand to be awarded a government grant, she is in the process of obtaining intent to order from retailers. As the grant only covers some of her costs to date, she is now looking for investors to invest in her product ([www.logicalgadgets.com](http://www.logicalgadgets.com)). "Since completing the Chargem prototype we have kept in contact with Delia Strand to see how things have been progressing. We have helped her with contacts details for a number of suppliers, including PCB manufacturers and toolmakers, and have also obtained some quotes for a soft tool to be produced for Chargem. Our aim is to help her in whatever way we can, to ensure she is successful in getting the product to market," concludes Sohi. ■

# Taking charge

From a flash of inspiration to a fully working prototype, Tanya Weaver tracks the design and development process behind Chargem

One drawback of our technology driven world is although we can carry our gadgets with us wherever we go, at the end of the day they still need to be charged and often all at the same time. This was exactly the frustration that Delia Strand was experiencing. "I came home from work and had four gadgets to charge - mobile phone, MP3 player, Nintendo DS and hands

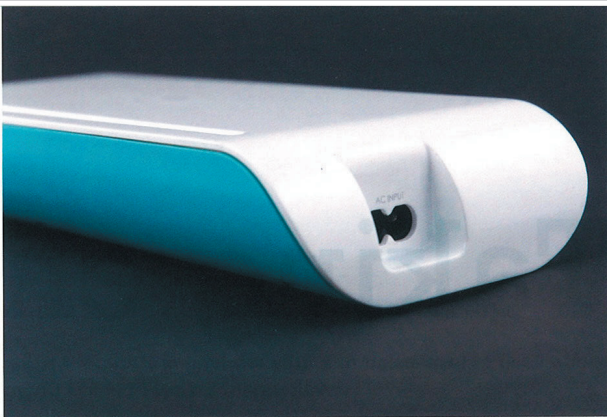
free. All gadgets needed a lead and a socket, which meant that they were dotted all around the house where sockets were available. I thought, there must be another way," she explains. This then led her to the 'Eureka' moment in which she came up with the idea for one product that could charge all these different gadgets. Having briefly researched the viability of her idea and having scribbled

down a short description and rough sketch of what she had in mind, she approached Innovate Product Design, a design consultancy specialising in turning ideas and inventions into viable, marketable products.

Before Innovate's product design team actually started creating any designs for Strand the first step was to discover if such an idea had already been patented. This worldwide



## prototyping



patent search revealed that although there are similar products currently on the market, none actually charge both gadgets and laptops simultaneously. From here concept sketches were created and then using SolidWorks CAD software, the chosen concept was created. "The design process was painless, I provided a rough sketch of my idea and description of what I wanted it to do and Innovate created the first set of designs, which exceeded my expectations," comments Strand. After receiving patent drawings and registered design images from Innovate, Strand was able to submit her UK and European patent filings. Once that was done, she could then use the concept presentation boards to generate some interest in her product. She also devised a business plan as well as securing a business loan to enable her to take the project to the next stage.

Six months later she returned to Innovate and commissioned a proof of concept prototype of 'Chargem'. Industrial designer Daniel Sohi was tasked with turning the concept into a working prototype, which combined both form and function in the smallest possible footprint given the components being used. "I wanted the product to be sleek and modern with clean lines. I didn't want to complicate it with too many features," says Sohi. "My aim was to keep the product very intuitive for the user so that it was obvious how the product should be used. We worked through a number of different ideas to make sure that we came up with an elegant solution." He



also wanted to design a product that would appeal to users of all ages whether they were male or female. So, with these aims and factors in mind he started concept sketching and made one or two iterations before reaching a style and form that he was happy with.

With the design established Sohi then worked very closely with Innovate's electronic partners to cost effectively prototype the charging product by adapting existing components where possible. "Working with the electronics company we found out the size of the PCB and made sure that the casings were as close to it as possible," explains Sohi. He also worked with them to ensure that the product's charging facility worked properly. As it was going to charge USB devices as well

as laptops the solution was to have four USB ports and two DC inputs. However, one challenge emerged when they discovered that Apple products charge differently to other devices. An Apple device has four connection pins and although two are used to charge the device and the other two are used for data transfer, all four pins need to be present in order to allow the product to be charged. "So, it was down to a lot of testing from our electronics partner to find this out and then make the amendments to ensure that all the USB ports had the four pins necessary to charge up the product," comments Sohi. Additionally, as different devices require more or less current than others, Sohi included a multi voltage switch in order to set the cor-

## prototyping



**"I wanted the product to be sleek and modern with clean lines"**



rect voltage. "Due to the fact that Chargem had to accommodate a wide range of laptop brands, which have different voltages, a variable switch was included to meet this requirement," he adds.

Another important design consideration was to make the product simple and intuitive to use. So, although Sohi wanted the top surface of the product to have an unspoilt finish with no breaks in the moulding for LEDs, he realised that users would need some form of visual feedback in terms of what devices were plugged in and drawing power. The solution he came up with was to place LEDs underneath the top surface of the product that would illuminate to show what was charging. "Once you connect a device

to Chargem, an LED will illuminate from underneath the top casing, through thin wall sections in the moulding. When nothing is plugged in, the top casing goes back to being a beautiful, unspoilt white surface," says Sohi. Additionally, the LED under the top casing will also demonstrate what voltage the charging product is set to.

With up to six devices charging simultaneously heat dissipation and passive cooling of transformers was also a big consideration. "The problem with laptops is that they need a lot of current in order to charge the battery and the heat generated from the power transmission was quite high so we had to do quite a lot of work with heat sinks and ventilation to ensure that the product didn't

overheat when you were charging two laptops at the same time," says Sohi. Additionally, the advantage of selecting ABS plastic is that it had suitable high resistant properties. "When we started to think about ventilation and cooling we made sure these were built in and would not just serve one purpose of merely cooling the electronics, but would also be part of the product's styling," adds Sohi.

However, ABS was not only chosen because of its heat resistance, it also had other advantages. As Sohi explains, "ABS was used because it has good properties for tooling and finishing, it isn't too expensive whilst offering good material strength." He also knew that ABS would finish well giving him that sleek look he was after and it wouldn't be a problem to change the colour of the material, enabling the product to appeal to different users.

As the unit would most likely be placed on the floor in the living space where it could easily be trodden on, another huge design consideration was that it had to be extremely robust. According to Sohi, a lot of the strength was down to the internal structure. "Screw bosses were used to both hold the product together and give the product structural support. The screw bosses were strategically positioned, to spread support evenly across the whole product. Interlocking ribs were used to stop the product coming apart, as well as additional ribbing to increase the products rigidity," says Sohi.

Once the design was finalised Sohi sent