

Leading Business by Design: Automotive sector

About Design Council

Design Council is an enterprising charity which improves people's lives through the use of design. Our work places design at the heart of stimulating business growth, helps to transform our public services and enhances places and cities to ensure a sustainable future for everyone. We advance new design thinking, encourage debate and inform government policy. Our vision is to create a better world by design.

Contact us at: info@designcouncil.org.uk

About Warwick Business School

Located at the centre of an outstanding university, Warwick Business School (WBS) is one of the world's elite business schools, providing top-class programmes for ambitious people. WBS is led by innovation, creativity and change, and engages with the big debates in business and public policy. Its vision is to be the leading university-based business school in Europe. Its mission is to produce cutting-edge research and world-class, socially responsible leaders capable of shaping the way organisations operate and businesses are managed.

About the Warwick Business School – Design Council partnership

In 2011, WBS and Design Council formed a new collaboration to explore the intersection between design, business and behavioural science. Its mission is to place design at the heart of business education and research, and transform the science of behaviour into real-world solutions.

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Executive summary

*“ Design is organisation.
Design is image, absolutely.
Design is the story, design
is the material that you end
up with, design is the object
that you then are selling,
promoting or making
someone look at. ”*

Design Director, Aston Martin

The automobile is arguably the most iconic product of the twentieth century and hugely important to the UK economy as it is responsible for nearly 7% of UK turnover and employs around 730,000 people. Design's role in the automotive industry has progressively moved from sculpting pure form ('styling') to connecting technology to consumers' needs and desires. More recently, the appearance, use and significance of cars has begun to be profoundly affected by changes in the wider automotive ecosystem, including: the introduction of increasingly intelligent vehicles, decreasing car ownership in urban areas, rising environmental standards and the entry of new companies.

To better understand the current and future roles of design in the automotive sector, Warwick Business School has conducted a research project on behalf of Design Council, building on evidence produced in our 2014 report *Leading Business by Design*.

Four themes have emerged:

- 1 Design is one of the most important drivers of innovation and competitive advantage
- 2 Good design is the result of effective collaborations and partnerships within and between organisations
- 3 Changes in the broader automotive ecosystem increasingly require designers to develop a wider skillset
- 4 In the future, design will play a more fundamental role in integrating products and services and enhancing customer experience.

Main themes

Innovation and growth

Several companies are using design to propose and introduce new ideas. Avoiding the trap of 'designing by committee', some car manufacturers (known as original equipment manufacturers or OEMs¹), in collaboration with key suppliers, have been able to experiment with and test new 'languages' through concept cars, prototyping successful models with novel exterior and interior designs and interfaces. Here, design has played a fundamental role in:

- exploiting opportunities arising from innovations in new materials
- reinforcing existing brands and giving them greater relevance
- communicating and facilitating adoption of new technology.

Collaboration

Effective collaboration within and between organisations is fundamental for successful products and services. Examples in this report show the benefits of cross-functional collaborations, strategic partnerships between automotive firms and new collaborations with traditionally non-automotive companies. In the context of collaboration, design is able to help:

- provide alternative viewpoints and challenge existing offerings
- convert ideas into objects through visualisation and interpretation
- enhance brand complementarity in buyer-supplier collaborations.

However, these benefits depend on designers' early involvement in development, collaborative work with buyers/suppliers, support from top management and the ability of the Design Director to act as design champion.



1. OEMs are companies which provide parts to other companies' end products. As many automotive companies use parts from various brands within the manufacturing process, a majority of car companies are in fact OEMs.

Designers' skills and competences

Traditionally, automotive industry designers have been able to bring together aesthetics, functionality, ease of use and product manufacturability. In line with current trends, however, they must develop a wider set of skills that go beyond traditional automotive design and be able to work across fields and collaborate with various functions and suppliers, particularly new ones. They will need to:

- be familiar with emerging market trends across an array of industries in addition to automotive, including the development of new materials and new technologies
- become more involved in organisational processes, stakeholder management and cultural change
- look beyond the present needs and capabilities of the vehicle
- consider products and services more holistically
- increasingly focus on user experience rather than the product per se.

This will create opportunities, especially for user experience and interaction designers.

Future trends

Increasing vehicle automation, pervasive digital technology, entry of non-automotive firms, environmental and safety concerns and changes in consumer habits – eg, the shift from car ownership to car as service – are considerably impacting the industry and affecting design. For example, fast-moving digital technology must be incorporated in models with much longer life cycles. Here, design could:

- help reconcile the physical and digital car by creating processes and models with high inbuilt flexibility
- use new technology to automate mundane, repetitive tasks and create new features which are valued by customers
- create appealing interiors and human-machine interfaces (HMI)² that meet emotional needs, as driving, even if autonomous, will still be experiential.



2. HMI manages how people interact with and use a car's features and capabilities (eg, the responsiveness, efficiency, sensations and intuitiveness); it is becoming very important, as vehicle users are increasingly expecting to interact with technology in cars, but this should not become a source of distraction for drivers.

Recommendations

This report makes eight recommendations for business leaders, designers and policymakers.

1. Use design strategically

Design in the automotive industry is not just ‘styling.’ It combines aesthetics, ergonomics, technology and understanding of the market to create products and services that create positive user experiences. To play this role, design must be able to influence strategic decisions. This is only possible if top management understands and appreciates design and the Chief Designer champions it inside and outside the firm. Moreover, top management should invest in design and protect designers’ work, particularly when developing novel products and visual languages.

2. Focus on user experience

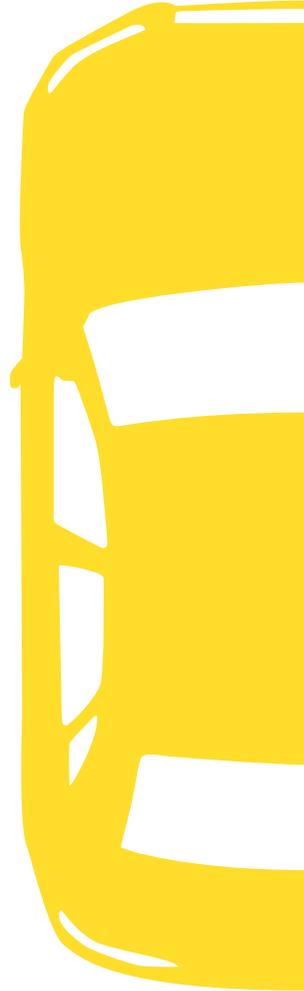
We are moving from product ownership to mobility services.³ Therefore, designers should focus more on the overall user experience than product creation, developing and exploiting technology with users’ functional, behavioural and emotional needs in mind.

3. Don’t just use design for premium products

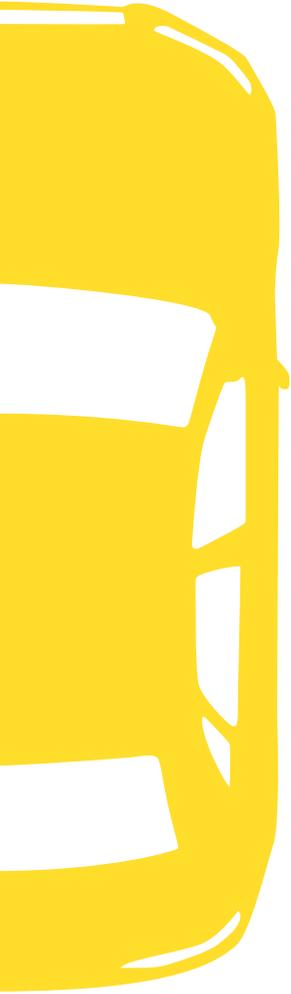
Good design can make a difference in all segments, from luxury to compact cars. It is highly appreciated by customers and differentiates from competition. It can also embody brand values and connect brand promises to customer experience – at any price level.

4. Promote cross-functional collaboration

Successful products and services are the result of clear processes in which every relevant stakeholder – internal and external – is involved from the start. This means continuous, collaborative relationships between functions such as design, engineering and marketing – as well as end users.



3. Mobility services are a variety of transportation service arrangements that enable people to travel smartly and efficiently without owning a vehicle.



5. Value different viewpoints

Every function brings a unique perspective. Rather than attempting to create one version of 'the truth', organisations should promote mutual understanding between groups through, for example, sharing space and regular meetings.

6. Create clear processes with few decision-makers

While processes must be highly collaborative, decisions should be made by few individuals at clear points in time. This avoids 'design by committee' and shortens time-to-market.

7. Establish partnerships with new suppliers

As digital technology revolutionises the image and use of cars, automotive firms must build open, honest and trustworthy relationships with traditionally non-automotive suppliers.

8. Provide a broader design education

In complex business environments, designers need a wider skillset. Automotive design education must broaden to include topics such as interaction design, general product design and service design. At work, designers must be able – and willing – to engage with other professional groups, developing stakeholder management skills and encouraging company colleagues to appreciate and, when appropriate, adopt design thinking and practices.

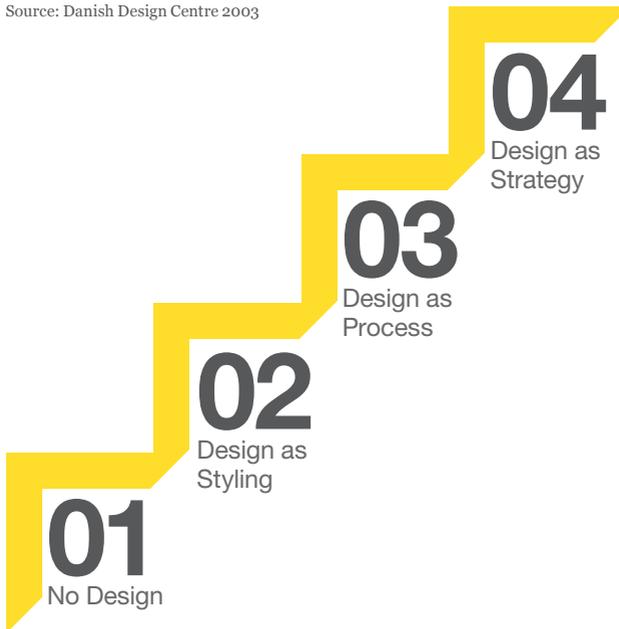
Introduction

Design can positively affect financial performance, but such impact is not unconditional. It depends on factors such as innovativeness, industrial sector, designers' roles and skills and, in particular, whether design is used strategically. Organisations benefit most from design – as a function, a set of skills, and a perspective – if it is embedded in organisational processes and informs strategic choices.

The Danish Design Ladder maps the different levels of design use within organisations.

At steps 3 and 4 design is used not as an add-on but to structure development and strategy.⁴ Danish companies adopting a comprehensive and systematic approach to design saw a clear difference in their bottom line.⁵

Source: Danish Design Centre 2003



4. Chiva and Alegre, 2009; Design Council, 2007; Micheli et al., 2012; Perks et al., 2005.

5. Danish Design Centre, 2003

Nevertheless, more research in this area is still needed. Therefore, in 2013 Warwick Business School and Design Council undertook a joint research project – *Leading Business by Design* – to address the following three main questions:

- What triggers the strategic use of design?
- How is design used and integrated into organisational processes?
- How does design contribute to an organisation's success?

A total of 53 interviews in 12 companies (large and SMEs, manufacturing and service-based) operating in different sectors were undertaken. These involved relevant personnel in design, marketing and finance, as well as CEOs and Chairmen. The final report highlighted design's role and impact in a variety of organisations.

However, the research also found that particular dynamics in certain sectors can strongly affect design's use and impact. Therefore, we have conducted this second, more focused project on automotive, because of its importance to turnover, exports, employment, consumer habits and society.

The automotive industry

The automotive industry encompasses virtually every aspect of the value chain; from raw materials, design and production to sales, service and disposal. It is one of the world's most important sectors by revenue and one of the most research-intensive. Its history encompasses innovations such as the internal combustion engine, electric and hybrid vehicles, safety advances, emission controls and use of advanced materials. It is also one of great emotional attachment and symbolism. From the Model T to the Beetle, the Mini or the Prius, cars have captured the spirit of the times and been part of the way people express themselves for generations.

The industry is also, of course, a major contributor to national economies, employment and international trade figures, and one of the largest categories of personal expenditure. Its importance is such that it is often used as a barometer for economic prosperity. In the UK, auto manufacturing has reached £60bn annual turnover and is responsible for approximately 3% of Gross Domestic Product.⁶ In 2012, the sector represented approximately 6.7% of UK turnover

and 2.6% of gross value added. It directly employs around 730,000 people, with 146,000 employed in manufacturing, and accounts for around 10% of UK exports. In 2011, 77% of cars and 61% of commercial vehicles produced in the UK were exported. 2.26m new vehicles were registered, making a total of 35m vehicles on UK roads. In 2013, car production worldwide totalled 65m (commercial vehicles were about 22m) – the highest to date.



6. Statistics from: The Society of Motor Manufacturers and Traders, *Motor Industry Facts 2014*. Retrieved at: http://www.smmmt.co.uk/wp-content/uploads/sites/2/SMMT_Facts-Guide_May.pdf

In the UK, automotive manufacturing ...

£60bn



has reached £60bn annual turnover and is responsible for approximately 3% of Gross Domestic Product



146k

directly employs around 730,000 people, with 146,000 employed in automotive manufacturing

10%

accounts for around 10% of UK exports



Research findings

Theme 1: Innovation and growth

Design is a car's first point of contact. Appealing interior and exterior designs can be very effective in promoting new vehicles, especially now that first contact is often virtual.

The realisation that design is key to innovation and growth has led to considerable investment, especially by car manufacturers. Tata Motors has created a design unit spread over three countries and expanded from 14 staff to 200. Volvo has gone from one human-machine interaction specialist to 12. Until a few years ago, Aston Martin had no design house. It now has a state-of-the-art design studio at its headquarters.

Design as a means to innovate and differentiate

Several companies are using design to prototype and introduce new ideas, often using concept cars. At Volvo, three were recently developed by the new design team, testing ideas both in the market and the firm. The successful Range Rover Evoque is essentially

a highly praised concept car that was put into production with only minor alterations. The Evoque demonstrates the importance of not diluting design ideas too much. Unsuccessful cars are often 'designed by committee'.

"No one is left in the design studio to be creative ... even at the beginning [of the process] every single manager has a look at [the initial design] and says: 'I don't like that bit, I don't like that bit'; by the time 15 managers have taken off every bit they don't like, they've taken off every exciting part of the design. It becomes design by committee and it becomes totally risk-free. They can't afford to launch a car that someone doesn't like, so they just launch a car."

Director of Design, Wipac

Well-designed cars can become aspirational goods that bring together functional and emotional aspects and stand out. Such differentiation is evident in new collaborations between OEMs and traditionally non-automotive suppliers.

Bolloré Group was tasked with developing an electric car to grow the Paris carsharing market. Instead of a basic, functional vehicle, they partnered with famous automotive design house Pininfarina to develop a stylish, environmentally friendly model. Pininfarina infused the car with its highly identifiable design elements – pure-form exterior, intuitive interior and technologically advanced power – dramatically differentiating it from other electric cars. The result, Bluecar, a fast-selling, widely popular, 100% electric compact, has seen carsharing expand in three French cities and America.

Design and technology

“Tradition and precedent are very powerful informers of design ... the upside of that is that ... you let people into a new technology quite gently, because they become familiar with it first.”

Director and Head, Tata, TMETC

Design and technology are related in important ways as technological innovations can come alive through aesthetics, usability and functionality.

Or, technological innovations, such as electric engines, can enable the creation of radically new designs:

“ [Consumers] are seeing a car in a digital visual form, much before they come anywhere near the car. 20-30 years ago it was different – you know, you heard about a car, then you went to the dealership and that’s where you first saw the car and this has completely changed. ”

Head of Design, Tata Motors

“With electric engines you can start really fundamentally changing the shape of a car ... I think the whole shape can change, at least, if we had the opportunity to.”

Senior Manager, OEM, expert sample

Furthermore, designers can identify opportunities arising from technological advances:

“Sometimes innovative suppliers can’t spot opportunities, which, instead, designers can see, as they can imagine different shapes, different possible applications. This is an aspect that we should promote.”

Owner, Trilix

For example, every two years, first-tier supplier Johnson Controls develops a demonstrator car to present its latest design technologies and production capabilities at prestige automotive shows. This helps OEMs incorporate these advances into products.

Design and branding

Design and branding can work together to enable successful innovation and growth.

Brand values act as a reference point for designing new models. Good design embodies and connects a brand promise to customer experience. This is particularly salient in automotive.

“It’s an industry that’s incredibly brand dependent... It’s one of the biggest purchases and it’s a very emotional purchase also because it’s a status symbol, it plays a very important role in people’s lives.”

Chief Financial Officer,
Aston Martin

Branding also works to communicate the value of new or innovative products to customers. For example, Tata Motors is a relatively new player on the passenger vehicle scene, but Tata Group already has a strong brand legacy of trustworthiness and great value across numerous products. Its objective of improving quality of life in the communities it serves expresses itself in the design of its cars.

Novel designs, often created through new collaborations, can reposition a brand.

Bowers and Wilkins recently partnered with Volvo as the manufacturer wished to push for higher brand positioning. However, if both OEM and supplier brand identities are not respected, partnerships will struggle to achieve value. Some OEMs “might treat us like a supplier of a component, unbranded. But they don’t get the fact that we are branded ... we have a quality control we must police.” (Automotive Business Manager, Bowers & Wilkins)

“ There’s definitely a trend towards high-performance branded audio, because it’s a differentiation. In our design process we need to make sure that where there are different levels of audio systems, our system looks the best, because it is the best. ”

**Automotive Business Manager,
Bowers & Wilkins**

Theme 2: Collaboration

Effective collaboration within and between organisations is fundamental in creating successful products and services.

Cross-functional collaboration

For design to play a strategic role, influencing top management decisions, design departments must nurture relationships within the company and be embedded within the right 'design discourse' – the network of related experts and industries where design conversations and developments are occurring.

"[Good design] isn't just about whizzy-looking clay and a fantastic-looking sketch; it's about getting people on board and making them share a vision – you know, the accountants and the engineers and the decision-making – and I think if you can produce a sketch, or a design, or a theory, or whatever it is, that is compelling enough to move that mountain, then you're doing a pretty good job."

Design Manager, OEM, expert sample

A design studio built in 2007 at Aston Martin headquarters greatly enhanced collaboration across functions. Design now sits prominently beside engineering and manufacturing. Its input is sought on most endeavours and it encourages functions to work together. The gallery space in its studio allows all teams to jointly inspect models in development and collectively agree next steps.

For new product development success, our analysis of many projects carried out by sample companies reveals some key principles:

- Clear visions of both product type/platform and target customer group are essential from the start
- Development processes must be structured and collaborative, with a few key people in charge of decisions
- Different views must be valued and, at the same time, reconciled.

Leadership support and role of the Chief Designer

For product development to be truly collaborative, and for design to play a strategic role, senior management must be aware of and appreciate design. This is important on every project, but especially when designers require freedom to experiment without overly tight constraints, as when developing concept cars that express a new visual language. Volvo is a recent example of this.

Echoing findings from *Leading Business by Design*, the Design Director / Chief Design Officer can be vital in elevating design as a strategic perspective. As Chris Bangle, former Chief of Design at BMW Group recalls: “I was privileged to have my relationship with the CEO grow into one of professional and personal trust. We could communicate directly with each other and that in turn

reinforced both our roles. He could use me to strengthen his vision with the company and the product and the resultant changes in the organisation and I could clarify with him what it was we were trying to do in design and tune the message so that it just didn’t all come to a sad ending – killed by the folks upstairs. Without that very personal relationship many things wouldn’t have happened.”

At Tata Motors, support for design began with the founder, Mr Tata and his successor CEO’s continued support allows the company to quickly and creatively put new designs in motion. A good example of this is the forthcoming 2016 Nexon release. The design team sketched it in 2014, and then it was speedily granted permission to move directly from concept stage to model development with the board’s full support.



Collaborations with suppliers

Relationships between firms in the automotive industry are very important, especially because sometimes “innovations and technology are not borne by the car companies by themselves, they are borne by the supplier.” (Global Marketing Manager, Aston Martin)

For example, Wipac, a prestige automotive lighting company, researches and develops advanced LED technologies that car companies then use on new models. It has succeeded in developing many bespoke headlamps for elite cars collaboratively.

The role of the supplier will vary depending on the project. “There are [features that] are more brand-specific; you want the engine to behave in a certain way or you want the infotainment system to look and feel a certain way. That’s where I think you can be the unequal partner ... you can dictate. There are some areas where I think [some] suppliers can have the upper hand purely because of the technological advantage.” (Head of Design, Tata Motors)

Over time, tighter collaborations can help suppliers play a more proactive role:

“The best projects for us have probably happened with clients ... with whom, over time, we have developed a good relationship and have been more open; we have tried to enter their internal mechanisms to anticipate their problems and tried to have solutions ready even before they realised they needed them.”

R&D Director, first-tier supplier, expert sample



Collaborating strategically

New products are designed and developed through internal and external collaborations along the supply chain. This arena and its dynamics have shifted considerably over the years, with increased use of digital technology and emphasis on infotainment and human-machine interactions. These changes are challenging existing power structures, especially the dominance of large OEMs:

“The ability to integrate quickly what’s happening in the consumer world [means that large OEMs] cannot be arrogant anymore.”

Head of Design, Tata Motors

The need for a different attitude was reinforced by a design manager from our expert sample: “You shake all that [novel technology] out ... through a lot of experimentation ... through doing something the car industry has not always been great at: getting comfortable with the idea of getting it wrong and making mistakes.”

Furthermore, many traditionally non-automotive suppliers are entering a previously quite stable ecosystem. OEMs must increasingly branch out into new industries and establish new collaborations.

“We cannot develop everything here, so globally ... we are looking to find the best players who can give us competent technology ... in some cases we would buy it outright ... in some we would partner and develop.”

Chief Technology Officer, Tata Group

“Large OEMs are trying to develop new partnerships with large electronics, IT groups, to share a bit better the responsibility, to preserve their areas of intervention and to find ways to be as flexible as possible, to have the most advanced technologies.”

Chief Creative Officer,
Pininfarina

Though sometimes destabilising,
entry of a new firm is often
welcome.

For example:

“If you look at a mainstream supplier for in-car infotainment, that’s all they’ve done for all their history... for them everything is around how to fit that box into a car. Whereas if you look at a non-mainstream like an Apple or a Samsung, where they’ve come from sitting inside people’s pockets, their approach to connectivity is very different. I really like that, the fact that today a non-traditional automotive supplier can come and get into the game.”

Head of Design, OEM,
expert sample



“ I’m always working with marketing and I realise we’re doing the same thing. [But] we’re doing it differently. I think the value of design is always still ... the manifestation of the idea into something real – visualisation skills and the interpretation skills. ... invention, where you take all of those inputs and ... make something truly new ... I still feel is design. ”

Senior Designer, OEM,
expert sample

Theme 3: Designers' skills and competences

“Design provides an educated prediction of what we believe may happen by following trends, through the designers’ knowledge of any given industry or society because that’s effectively what design is. It’s a study of anthropology, of economics, of manufacturing, therefore of industry, of technologies, IT in ... the designer’s brain, trying to figure out and predict what may happen.”

Chief Designer, Aston Martin

Designers in the automotive industry are able to bring together aesthetics, functionality, ease of use and manufacturability. They are gaining greater authority, as attested by the appointment of Chief Design Officers at Board level and by creation of larger internal design units, especially in OEMs.

Various research participants agreed that designers will increasingly add value through visualisation and interpretation skills (future trends, consumer needs, etc). A senior designer interviewed as part of our expert sample stated: “I feel like the industry is evolving, so I’m kind of assuming that

education will evolve too so that more and more of these degrees are about the holistic nature of design ... [3D design] is sculptural, it’s like an art and some people just love it and they will do it forever, [but] that’s not going to grow.” Instead, the role of design will become increasingly about interaction and user experience, for example, how people move through a dealership or how an existing portfolio of products could evolve. “I just think there’s going to be so many more designers in the process than there are right now.” (Senior designer, OEM, expert sample)

Creating the new capabilities inside automotive firms is not easy, especially as talent is in demand:

“Every industry right now wants people in interaction design and data analysis and even just data aggregation. ... Frankly we can’t get good people. ... The reality is that [innovation] is going to come from Google and Apple and Amazon and Facebook, even if we don’t want it to. They’re where people are going anyway.”

Senior Designer, OEM, expert sample

Another concern expressed by various study participants is that, as designers, “we all want to be recognised for having designed vehicle X, but what really we want to do is we just want to make change happen and I think that the design schools could probably do a better job of educating that.” (Design manager, OEM, expert sample). But a key question is whether designers have the appetite for “convincing people... A lot of designers, I think, are into design and not stakeholder management and change culture.” (Head of Design, OEM, expert sample)

In the future, designers must be able to look beyond the present needs and capabilities of the vehicle, consider products and services more holistically and focus on user experience, rather than the product per se.

Moreover, they will have to be able to work across different fields: product design, service design, graphics, interaction design, etc; and collaborate with various functions: engineering, marketing, finance, etc; and suppliers, particularly new ones, such as IT firms. “You’ve got your designers which are always, in some ways... the arbiter for all of these different aspects: the financial and the visual and marketing, the

technical; you know, all of these things have to centre themselves around an actual object, and design seems to play the part quite often of that centre point of arbitration.” (Chief Designer Research Projects, JLR)

For example, Pininfarina designers now work on numerous automotive and non-automotive products, including wind tunnels, architecture and sustainable transportation. This requires them to understand market trends across multiple industries, resulting in a rich and diverse design language they can apply to various projects interchangeably.

These findings have been further corroborated by the research on design skills in the automotive industry currently being conducted by Coventry University in collaboration with Design Council. Commissioned by the UK Automotive Council Technology Group, emerging findings from the research indicate a shortfall in young design graduates and craftsmen with the broad range of skills necessary to succeed in this environment. One particular shortcoming is clay modelling. As many clay modellers are coming up for retirement, replacing them with young, well-qualified graduates will be important.

Theme 4: Future trends

“The one thing you can be absolutely certain about in the next sort of 20 years is that we’re going to have multiple solutions ... You need to have platforms that are flexible enough to adapt.”

Director and Head, Tata Motors,
TMETC

During the 20th century, the automotive industry evolved from a disparate set of firms and competing technologies to a fairly stable ecosystem dominated by OEMs and specialised suppliers. Recently, increasing vehicle automation and pervasiveness of digital technology (eg, for safety and infotainment), entry of non-automotive firms (eg, Google’s driverless car) and changes in society and consumer habits have started to destabilise things. Long-term, increasingly intelligent vehicles will lead to much improved road safety, lower emissions and substantial productivity gains.

The time required for such benefits to reach fruition will depend not only on technological advancements, but:

- coordinated effort between automotive and non-automotive firms
- governments and regulators playing active roles
- firms’ and governments’ capacity to overcome barriers to adoption in the market.

There are many publications examining the automotive industry’s future. It is predicted that four trends will specifically affect – and be affected by – design:

- the ‘internet of things’
- driverless vehicles
- the move from car ownership to car services
- the move from designing products to designing experiences.

The internet of things⁷

As digital technology increasingly permeates vehicles and the driving experience, each product being sold is becoming, in addition to its primary function, a computer. This shift is increasingly requiring car manufacturers to separate the evolution of the physical car design from that of the digital car so that it is able to accommodate frequent updates in the digital design.

At Tata Motors manufacturing and assembly now have high flexibility designed in, allowing the introduction of new infotainment technologies at any stage of a model's lifespan, so the company can quickly implement emerging technologies.

However, allowing technology changes to be incorporated in models with much longer life cycles will be a challenge. From a design point of view, it will dramatically alter the appearance of car interiors and exteriors.

“I think that the rules we develop today are not going to be the rules we develop in ten, 15 years’ time, so one eye has to be on what might happen in the future. So, not just making our technology or our interfaces better for the next three or four years, but making them compatible beyond that point.”

HMI Technical Specialist, JLR

According to IT research and advisory firm Gartner, two potentially co-existing paradigms will develop in the future: digital machinism and digital humanism. Gartner's Research VP for information innovation, says digital machinists will aim to “automate as much as they can. So, get rid of all the tasks that are tedious, mundane, repetitive. If you automate all of that away, if you take the human out of the equation, that is the best thing you can do from an engineering perspective.” Digital humanists, on the other hand, are more concerned with creating things that help people achieve their goals or allow them to do something that they had not even imagined.



7. The internet of things refers to a scenario in which objects have the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Design plays an important role in both paradigms, but it especially provides a unique digital humanist contribution: by focusing on user experience to uncover latent needs car companies are able to propose technological advancements people do not know they want – until they see them. The work undertaken on HMI by most OEMs is a clear example of blending both approaches, but with a strong humanist perspective.

Driverless vehicles

“Lots of nations are investing so much in this that we cannot afford to miss out. If we miss out on introducing driverless vehicles in the UK then we’re missing out on a global change in years to come.”

Project Manager, Transport Systems Catapult

Consumer preferences and expectations when purchasing cars are increasingly moving from a decision based on power and capability to functionality, connectivity and environmental sustainability.

The autonomous vehicle is a radical innovation. It will cause a shift in current use of transportation, ultimately delivering numerous benefits for the environment, safety and productivity. However, its development calls into question design’s importance: if we will not drive the car will we pay attention to aesthetics and usability?

“I absolutely do not believe that the emotional connection will become less ... It will be partly you driving, partly you letting go with the freedom to choose ... so it will be much more of an integrated solution and you will still have [highly emotional aspects] in the autonomous situation.”

Chief Designer, Volvo

To accommodate the introduction of progressively autonomous vehicles, Jaguar Land Rover’s HMI department is studying the interplay between people and self-driving cars, tackling issues such as how people will react when it is time to take control of the car again and what features could support





this. “There’s more to take into account. There’s more things to control. And it’s really quite a tricky business because... the more information and sets of control you have, the more likely you are to take your eyes off the road”. (Chief Designer Research Projects, JLR)

Most interviewees believed that consumers will still emotionally connect with cars. For example:

“For all the technologies in the world, the car is about freedom. It should be about convenience and it should be about comfort and warmth and security as well and I don’t think we’re going to lose that. I think that’s a magnet for human beings, it’s just the manner by which we do it.”

Design Manager, OEM, expert sample

For fully driverless vehicles, aesthetic design and ease of use will be important as differentiators, possibly even more than now. Interior design will be less constrained, seats could swivel and both the driver and the passenger experience would be very different. Distributed power will mean smaller engines, which could be placed in different parts of a car, again lifting design constraints, both inside and out.

However, consumers may prefer the pleasure and control of driving and be resistant to increasing automation. Design might then be used to ease the passage of radical innovations. The Transport Systems Catapult in Milton Keynes is currently using design to introduce autonomous vehicle technologies. This is a highly controlled trial of purposefully designed self-driving pods within city limits, allowing people to become gradually acquainted with them.

From owning cars to using cars as a service

“We are moving from a vehicle ownership model to a mobility service fulfilment, which is a huge change and I think it’s a generational change.”

Director and Head, Tata Motors, TMETC

Over the past decade, there has been an increase of car-sharing and wider provision of ‘mobility services’. This term refers to a variety of transportation services that allow people to travel smartly and efficiently without owning a vehicle. Prominent examples are companies such as Liftshare, Uber and ZipCar. The shift is due to decreasing car affordability, changes in consumer habits, and easier access to such services. While this has mainly happened in large cities, new business models are emerging across the industry and we may soon start to appreciate the ‘value-in-use’ of vehicles, rather than the value in owning them.

“I feel the ownership model will have a huge impact: the partial ownership or shared ownership will change things and companies who ... tap into that first will survive better than others.”

Head of Design, Tata Motors

How can design serve and enhance the new business model? On the one hand, competition on service provision rather than on product specifications could undermine existing offerings and brands:

“What you start selling as a car manufacturer is not just a car, but uninterrupted transport from A to B ... It’s not the colour of the car, or the specific make of the car, it is the predictive services that come with it that will make the people [select] one car over the other.”

Research Vice President, IT consultancy, expert sample

On the other hand, as we have already noted, vehicle use will still be experiential, even without ownership, so good aesthetics, usability and functionality will remain important.

From designing products to designing experiences

“In this new world we very much look at the mobility experience [of] customers ... and design is massive in terms of that ... I think people will want choice and people will choose. I think design will differentiate.”

Chief Technical Officer, Transport Systems Catapult

Although car status may shift from being aspirational, owned goods, travelling by car will still be an experiential process deeply affected by design. Drivers will still “extend themselves” through cars and this will still be “a whole emotional kind of thing; because we’re going into an experience economy. What happens now is that function is a given and more and more emphasis goes on experience.” (Head of Design, IT R&D firm, expert sample)

“Car companies are going to have to think about that broader experience of how we socialise through their vessels of transport in more nuanced ways ... I think as a result you’re going to have stronger relationships like we do today with high-end bespoke offerings ... It’s going to require vehicle manufacturers to think about a lot more service points that are kind of more than going from A to B.”

Partner, Design consultancy, expert sample

The experience will not just be the driver’s, but also the passenger’s:

“Does [the car] come with apps that are fun for the children? ... Can the car help the children in the back [enjoy the ride]? ... In general, car driving is largely going to be a digital experience.”

Research Vice President, IT consultancy, expert sample

OEMs such as Volvo, Tata Motors and Jaguar Land Rover have all dedicated resources to HMI expertise and research to focus on these important developments.

“Recently [there have been developments such as] ... satellite navigation and a whole plethora of features that all require an interface ... We’re seeing exponential growth in that case and hence we’re... investing in new interface technology and techniques to allow people to interface better with those features.”

HMI Technical Specialist, JLR

At Tata Motors, HMI is currently a strategic priority under the Connect Next initiative, focusing on development of advanced, high-tech interfaces that allow users to stay constantly connected.

As highlighted throughout the four themes, design is playing an important and enhanced role within the automotive industry. With the numerous advancements in automotive technology and emerging trends upon the horizon, the potential for and role of design will continue to expand. The next section features ten cases of how companies are using design strategically.

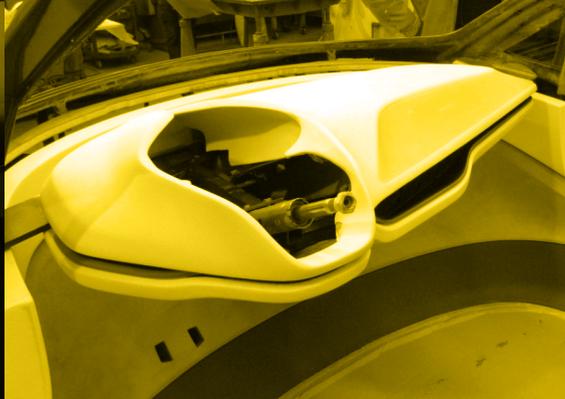


“ We’ve got this whole thing focusing on the consumer, because whereas it used to be businesses leading the innovation, it’s now consumer-led. ”

CEO, Liftshare

Case studies

Section 1: Innovation and growth



Section 1: Innovation and growth

Case study: Aston Martin

Aston Martin Lagonda Ltd is an iconic British sports car manufacturer headquartered in Gaydon, Warwickshire. It is privately held, with a supplier and distribution network of 145 locations across 44 countries.

Founded in 1913 and made famous in the 1960s as James Bond's car brand of choice, it is synonymous with beauty, sophistication and power. Its cars are almost entirely handcrafted by professional technicians, artisans, craftsmen and painters at their production and manufacturing facilities in Gaydon, allowing it to produce cars of the highest quality with great attention to detail. It has been owned as a whole by Ford Group since 1987, but in 2007 a majority stake in the company was sold to a consortium of investors.

The design team actively collaborates on projects across the organisation, from marketing, to product development, corporate partnerships, human resources and strategy. Backed by nearly £1bn of investment, the company has major plans for new launches by 2020.

Investing in design

Over the past decade, Aston Martin has made considerable investment in design. Starting mainly from externally developed designs, it first developed an internal design capability, then created its own design studio. Though a relatively small organisation (1,400 people), it usually employs about 50-70 designers, including automotive and product designers, clay sculptors and colour and trim specialists.

Not only has design grown as a function, it has also become a critical success factor, working across departments to create consistent and clear strategy: "Design here is very strong: we go into all the meetings... we make sure that the design intent is met." Design Operations Manager



ASTON MARTIN

Design to attract customers

Design is the main criterion of choice for Aston Martin's customers. "If you ask [them]... Why did they go for an Aston? The first mention you get in 80% of the cases is design; so really the whole purchase decision [is design]." (Chief Financial Officer)

Similarly, the Design Operations Manager argues that design "is the first point of contact to the customer. So they are looking at, what they see on a film, or in the press, or at a dealership, that is the first sight they're going to have of the car."

Design and branding

Design is being used to strengthen the Aston Martin marque. The Global Marketing Manager says: "There is a lot of admiration and respect when you drive an Aston Martin versus other cars. And that's driven largely from design ... The look of the car, the appeal of it, has a very strong effect." Similarly, the CFO states that, unlike other luxury vehicles, Aston Martin's style has wide appeal: "I drive an Aston every day ... Bicycle couriers go by and give me thumbs up and people let you in. The design is sporting but it's not in your face, there is a certain elegance ... it drives the perception of the brand, it drives the purchase decision ... it is really terribly important to us. You know, I'd hate to say that if the designers were here, but it really is something that we need to invest in."

“ We are regarded very highly within Aston Martin and form part of decision making at a senior level. ”

Chief Designer

A cathedral for design

Shortly after acquiring their majority stake in 2007, the incoming shareholders invested in a new design studio. From ideations to strategic decisions on new ranges and stakeholder engagement, the award-winning facility supports Aston Martin's design aspirations, making them integral to operations and allowing design intelligence to come alive.

The studio structure is built and run entirely from environmentally friendly materials and energy, while the high-quality interior uses stainless steel, artwork, travertine marble and designer workspaces:

"You've got the smells, colours and sensations of Aston Martin all around you." (Design Director)

The studio's entryway gallery and external garden are spaces where different departments can view the cars in natural light from all angles, informing final adjustments. The space is also used to host VIP guests, product launches and private viewings. It has greatly enhanced design's role throughout the entire company.



“ Within design now, we are outreaching to other parts of the business ... we are working with HR and designing graduate brochures ... we’re working with marketing ... because design is such an integral part of Aston Martin and it’s very highly regarded, we get a lot of requests from other elements of the business. ”

Design Operations Manager



Section 1: Innovation and growth

Case study: Tata Motors

Tata Motors is India's largest automobile manufacturer and among the top five commercial vehicle manufacturers in the world. It is owned by Tata Group, which comprises more than 100 companies operating in over 150 countries.

The group employs approximately 581,000 people worldwide and had revenues of \$103.27bn in 2013. Tata Motors encompasses 60,000 of those employees and \$38.9bn of 2013 revenues.

The Tata brand was named 34th in the world in the BrandFinance Global 500 2014. 66% of the group's holdings are held by charities.

Innovation is core at Tata Motors. The company started making passenger cars in 1998, launching India's first locally developed passenger car, the Tata Indica. They have since won awards in the compact, midsize and utility passenger segments. In 2011, the company brought together three of their R&D centres to form Tata Motors Design, a three-studio unit located in India, the UK (part of Tata Motors European Technical Centre – TMETC) and Italy (Trilix). All design activities were brought in-house and design was made a pillar of strategy, with design growing phenomenally, from 14 to 200 employees.

Structure of the design unit and role of design

The genesis and organisation of Tata Motors Design is very important to the enhancement of internal design capabilities. As the Trilix owner recalls: "It was necessary to integrate these three companies, while at the same time leaving them in three different locations with different cultures and environments. This ... gives the opportunity to have diverse points of view, experiences and stimuli ... Also, we had to develop a system which could leave freedom to design, while keeping control of the feasibility of projects."



In this process, Tata Motors found it crucial to ensure that design was understood as a discipline and was intrinsic to new product introduction.

“Our designers are our industrial, sort of, sci-fi writers ... if you think about [it] quite a lot of the stuff we have around us now is what we saw in the 1960s imagined in science fiction ... true designers can really serve in that way.”

Director and Head, Tata Motors, TMETC

Support from the CEO

For design to play a strategic role, the Director and Head of TMETC argues: “The absolute imperative has to be leadership from the top and ... Tata has a longstanding advantage in that Mr Tata has always been very design-focused ... Under Mr Mistry there’s been continuity and protection from the top and that’s absolutely fundamental.”

The Head of Design agrees: “When I started working at Tata Motors, Mr Tata was still the group chairman and one of the big enablers was the fact that he is an architect by training. So he was extremely well-versed with all the metaphors and language of design.”

Design and brand heritage

In contrast to most OEMs, Tata is a relatively young carmaker – and as such, lacks a more established brand heritage. However, it may also be an advantage because, as the Head of Design argues: “If there’s a new way to do it, the company can be much more open to it than in a legacy company.”

Also, though Tata Motors has operated for less than two decades, the overarching Tata brand is well-known and can be leveraged to connect with customers. In India, “a Tata product touches every single person at least once a day ... you have a huge corporate legacy of trust, of great value. You will not be cheated; what you see is exactly what you’re going to get. So we build on that as a brand in the automotive.” (Head of Design)

Furthermore, being part of such a large group means that Tata Motors can easily collaborate and build on capabilities developed, for example, in telecommunications, “so maybe we can be the disrupter.” (Director and Head, TMETC)

Nexon – Design. Drive. Connect.

Nexon is the third in a series of concept cars developed by Tata Motors to showcase advances in design, connectivity and driving capability, consistent with its three strategic pillars: Design Next, Connect Next and Drive Next. Design Next, led by Tata Motors Design, aims to develop advanced, high-functioning products that reflect brand values. For the initial Nexon concept sketches, the Head

of Design gave the design unit just two constraints: meet India's size and efficiency regulations for the lowest tax bracket and imagine a car that made customers feel safe and confident on varied road conditions. That the car looks friendly is reflective of Tata's ethical values, a very important component of the company's brand.

“ We created this car, we showed it to the board and I think we got a decision within ten minutes that we are going ... into production ... If you can create a proposition which is compelling enough you don't need a lot of research and numbers and figures. ”

Head of Design

From sketch to concept model, the new design took nine months to make. The concept car was then presented to the wider public to show “the whole world the direction the company is heading.” (Head of Design)

The Nexon moves away from traditional “driver-centric” or “driver-oriented” views of cars. The control panel is a screen that “the co-driver can also use... it’s a shared instrument panel,” says the Head of Design. This gives the co-driver access to the car’s features and use of the advanced connectivity options. The concept version also included a removable rear mirror camera that would allow customers to stay connected to their online worlds.

Production processes for Nexon are also inbuilt with design features enabling the company to be flexible while cars move from purely physical to digital objects.

“Today we are designing with a certain screen size ... in a few years ... it will become something else. We don’t know what ... [but] the way we are designing our displays in the dashboard ... we will be able to do that very quickly.”

Head of Design



Section 1: Innovation and growth

Case study: Volvo Cars

Volvo first rolled onto Swedish streets in 1927, aiming to make cars safer. Right away, it demonstrated its innovative capabilities, with the multi-award winning 3-point safety belt and the first rollover protection system.

With safety still a touchstone, the company has since expanded to over 100 countries, producing and distributing more than 400,000 vehicles worldwide annually. The original Swedish Volvo Group was sold to Ford Motor Group in 1999, then to current owner Geely Holdings Group in China in 2010. With a new Chief Executive and a new Design Leadership team in 2012, the company is now introducing a new design language, while remaining true to its Scandinavian heritage.

The strategic role of design

To execute a new strategy, Volvo appointed a new Chief Designer and four new Vice Presidents for design. There was board level recognition that “there is absolutely no existence for a car which is not aiming to be leading in design. Otherwise we would have cars that no one would be interested in.” (Vice-President, Line 90). As the Chief Designer recalls: “[a] new era for Volvo ... would need expression within the design and support through design and the Board was searching for somebody who provided that.” All of the new hires were respected automotive design experts.

Importantly, investment in a new design team and the design function came down to “a lot of experience and self-confidence within the Board of Directors.” (Vice President of Interior Design)

Their trust allowed designers to create concept cars to raise brand awareness and discover user needs. The public test the cars throughout development, providing useful feedback on usability, functionality and aesthetics.

“What has happened to the perception of Volvo Cars in the last two years is what design can do for a brand. The design department has to challenge, explore and show possible future visions for the brand.”

Chief Designer



“Through the concept cars... we wanted to really communicate Scandinavian design [and to] build up that confidence and understanding of the new design language.”

VP of Interior Design

Design and branding

Design had three main touchstones for revitalising the brand: Volvo’s heritage, Scandinavian lifestyle and Scandinavian product design. Although Volvo has a heritage of safe, reliable cars designed for people, they also, as the Interior Design VP says: “... probably got a reputation for the old box cars that they used to produce.” Design is helping the company build a new brand image.

This is not limited to exterior design, but very much present in interior design and human-machine interface (HMI).

“Each HMI will be very connected to the brand’s story in the future.”

Design Manager, Interaction

Expanding the scope of design

In addition to the brand work, design is also starting to support discussions on product strategy and product portfolio. HMI has risen as a key attribute, moving over the past decade from “being a non-design issue at all to having a very design-driven interaction approach within the company.” (Design Manager, Interaction)

This has resulted in an increase of interaction designers from 1 to 12 in recent years. The HMI team participates at all stages of product development.

“When you go into a new platform... you deal with the big questions about what information should be and where and how ... in later phases you’re dealing more with... how do we treat these different interfaces: the design of buttons, for example, design of many structures... graphic designs and motion effects ... in the very later phases... you’re dealing with performance issues and harmonisation.”

Design Manager, Interaction

Looking at future trends and innovation in the industry, designers at Volvo seemed confident that design will play an even bigger role:

“The role of design is incredibly interesting at the moment within the car industry ... it is expanding since the digital age brings modern interaction into the car ... That is exactly where the opportunities are to discover something new, try new business models, have new partners; that is where progress is.”

Chief Designer



XC90

The new XC90 is important for Volvo as it will redefine the brand and present the company's new design language. It is the first model to be built on Volvo's new Scalable Product Architecture (SPA) platform – a highly flexible modular chassis technology, greatly increasing possible component configurations and improving overall driveability. Also, while standardised platforms often limit exterior and interior design's creative potential, with SPA a customisable, lighter and safer platform can be built and some constraints lifted.

SPA's flexibility enabled design to participate from the very beginning in XC90 development, working alongside engineering to propose component configurations and specifications for ultimate comfort and versatility. For instance, back seats can slide to make room for passengers and the third row has space to sit an adult comfortably.

A car brand's first point of communication is the exterior. To refresh Volvo's brand message, designers adapted traditional Volvo exteriors, while preserving the past with inspiration from the beautifully contoured 1800 series. For example, 'Thor's hammer' T-shaped headlights are a brand identifier.

Inside, design stays close to Volvo's Scandinavian heritage: minimalist with high-quality, native materials. The interior is the result of many hours of human interaction design and research, thus experiential elements are strongest here, making it easy for consumers to connect to the car. There are almost no buttons or knobs and users should not need manuals to understand feature functions. It is a mix of: "Scandinavian design, intelligent thinking, good solutions, nice feeling of light and space and comfort, as well as good functionality." (Head of Interior Design)

The new XC90 has already won Connected Car of the Year (France, 2014) and is set to be a strategic game changer for Volvo.



Case studies

Section 2: Collaboration



Section 2: Collaboration

Case study: Bowers and Wilkins

Founded in 1966, Bowers & Wilkins (B&W) is a privately held global premium audio manufacturer based in Worthing, West Sussex and is the UK's leading manufacturer of speakers, sound systems, headphones and car audio. Distributed in over 60 countries, in 2011 it had revenues of £133m.

Founder John Bowers always believed and invested heavily in R&D. The company has launched multiple innovations every decade since founding, including the 801, the Nautilus and the Zeppelin, and patented Kevlar as a cone material for speakers. Its technologies are used in world-famous recording studios such as EMI Abbey Road Studios and Skywalker Sound Studios. Brands such as Maserati and Volvo's high-end options now feature bespoke B&W audio systems.

Company ethos

B&W's relatively recent collaborations in the automotive sector are "not about covering lots of different brands; it's about a limited, strategically selected number ... and doing a really great job with them." (Automotive Business Manager). As the Brand Director puts it: "The interest for us is (a) being able to do something exceptional and (b) being featured in the car."

Effective collaborations

Given B&W's values and aims, establishing effective and trustworthy collaborations with automotive firms - connected through first-tier supplier Harman - is crucial. Since 2007, B&W has been working with automobile manufacturers to develop high-quality in-car audio systems in mutually beneficial partnerships.

Automobile companies, continuously seeking the next-level of excellent experiences for customers, trust B&W's wealth of in-depth audio technology knowledge.

"All the technologies we develop, we develop because they are proven to have a tangible benefit to the listening experience."

Automotive Business Manager

Effective collaborations require mutual trust, clear processes and supplier involvement early in development. B&W aims to work with automotive companies "from the very beginning ... as soon as they can show us the conceptual work, we're engaged right down to tooling kick-off, making sure those parts are ... perfectly engineered." (Automotive Business Manager)

“*The best loudspeaker isn't the one that gives the most, it's the one that loses the least.***”**

John Bowers, 1966

Although quality control and brand recognition are important for both B&W and the OEMs, collaborations are interesting for them. As the Brand Director says: “You see the [OEM] designers’ interpretation of our design principles applied in their own way.” Furthermore, “to be too prescriptive, you know, can be quite dangerous. So it’s much better to be more flexible with how we integrate with them.” (Automotive Business Manager)

Educating customers and being trusted

Since B&W brings specific competences and technology that automotive firms do not own, “the education of what we do, why we do it and having that understood by the design teams is really critical.” (Automotive Business Manager)

However, such understanding must be developed not solely by OEMs’

interior designers, but by functions such as engineering, marketing and the sales force in dealerships. This ensures the quality of products does not get diminished, for example, by engineering using interior materials that reduce speaker sound quality.

Successful collaborations happen when “there is some really great buy-in from senior management – where you have senior management ... product managers, the head of the vehicle line, the Head of Design, the Head of Marketing, where they know Bowers & Wilkins offer a particular value to the car. Where that is accepted, well known and supported, that bleeds down to a working level where their engineers go, ‘Okay, this is a really important element to the vehicle. How do we make sure that’s prioritised in what we do?’” (Automotive Business Manager)



“ It’s very much a collaborative development exercise, where our engineers work with their engineers to develop the technologies we have in our home speaker range, but for automotive use ... We have technologies, which we have refined over 20 years and which we’re applying to automotive... for the very first time. ”

Automotive Business Manager

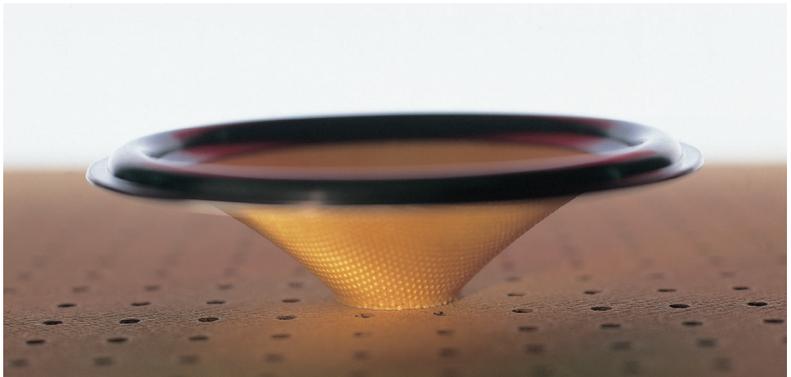
Kevlar speaker technology

The introduction of B&W's patented Kevlar technology into automobiles is a good example of how companies can complement each other through design. When introducing the technology into a range of vehicles it had to be "quite subtle, which is important. It can't be loud because that's not who we are and that's not who the luxury brands might be. But it's still apparent. You... can say, 'Oh, I've seen the Bowers & Wilkins, Kevlar mid-range speaker there, it is in the door.' If you look closely you can see it's a bit yellow and that's quite exciting. So that's our technology being represented, which reaffirms our brand as well." (Automotive Business Manager)

The ultimate decisions on materials and positioning of technologies happen collaboratively, but within design guidelines:

"So you've got the aesthetic lines of the car interior and you can take the hole pattern of [our] etching process and customise it however you like, because it's a digital process. [OEMs] have got to use the etched stainless steel grilles with our branding and we give them the photo etched hole pattern, but within that they can do what they like, as long as it fits within our guidelines. So there's that flexibility, which is important for them."

Automotive Business Manager





Section 2: Collaboration

Case study: Johnson Controls

Johnson Controls is a world-leading supplier of automotive seat foam, metal structures and mechanisms, trim, fabric and complete seat systems. It is a first-tier supplier of bespoke automotive interiors and seats for OEMs worldwide, including Ford, GM, BMW and Jaguar Land Rover. Each year it supplies more than 50 million cars. Johnson Controls Automotive Experience division employs 80,000 people in some 220 locations across 34 countries.

Through their fourteen global development centres, Johnson Controls research, test, design and engineer advances in interior vehicle ergonomics, aesthetics, usability and manufacturing technologies. They have won multiple awards for their designs and products, including Most Innovative Supplier of Automotive Interiors 2013.

The role of design in an automotive supplier

Seats are fundamental vehicle components. Increasing demands for fuel efficiency and reductions in weight and cost have triggered several changes in the design and production of seats over the past decade. The role of a first-tier supplier such as Johnson Controls is to anticipate future needs, provide related offers and to put design innovative applications of what is initially conceived by the OEMs.

OEMs “will give us a ... general 3D CAD model of a seat design that would be their intent. As a partner we have to industrialise that to make it feasible, enhance its functionality where appropriate and to make it work as a product that exceeds all requirements and delights the end consumers ... The whole design development process is very much a collaborative approach between the tier one supplier and the OEM ... Our job is to make it all work – it’s to design and engineer seats for mass production while assuring that they still match the sketch or the design intent that was set out in the beginning ... that they match craftsmanship expectations and all other product requirements.”
(Principal Designer)



Showcasing design

Every two years, Johnson Controls develops a demonstrator car and participates in prestigious automotive shows. It's "all about demonstrating to the automotive world our latest technologies and putting it into a showpiece that targets future business and consumer needs." (Principal Designer)

Previous designs in the demonstrator cars that are now being fitted into automobiles include anti-whiplash headrests, extremely flexible and versatile seat arrangements as well as seat trim and personalisation technologies.

The global design studios have together designed a whole new conceptual set of seats for the new demonstrator vehicle. In January 2015, the SD15 seating demonstrator concept was unveiled at the North American International Auto Show. As stated

by the president of Johnson Controls Automotive Experience, "based on our research, the driver side demonstrates superior comfort and the passenger side showcases features that maximise cargo capacity and interior flexibility."

The production of biennial concept cars is a way for the company to "envisage with the OEMs [what could] get into production maybe in the next five years". By "making sure that our show car is demonstrating our capabilities", the activity cultivates aspirations and is an expressive outlet for the strong innovation component of the company.

"Technology is evolving so fast... our design, innovation and technology departments continue to work on developing the future of seating design."

Principal Designer



Section 2: Collaboration

Case study: Pininfarina

Pininfarina is a prestigious, internationally acclaimed Italian design house that has been a leading source of automotive design innovation since it began in 1930. It is behind some of the most beautiful car designs in the world, including 200 Ferrari models and the 2003 Maserati brand rebirth. In 2013, the company had revenues of €69m and employed 780 people.

Founder Battista ('Pinin') Farina inspired the creation and growth of the car body manufacturing industry with his desire to develop novel designs, attention to aesthetic detail and dedication to innovation. His 1946 Cisitalia 202 was the first car to be permanently displayed in the Museum of Modern Art, designated 'one of the eight outstanding cars of our time.' He and his son Sergio have both won the esteemed Compasso D'Oro design award, among the company's hundreds of design accolades.

Guided by the values of purity, elegance and innovation, the company continues to be at the forefront of automotive design. Its designers realise visions in

close collaboration with clients, using innovative technologies and historical craftsmanship. Its activities now include both automotive and non-automotive design, engineering services and conception and production of unique cars or very small series. It also now provides various services: "market analysis, from the point of view of trends, taste, evolution of kinds of vehicles, as well as strategic planning and branding ... in the medium to long term. Then, we can offer a service of creation, research, innovation – like when we make show cars – both for us and our customers. Then, we can work on predefined projects, agreed within the company." (Chief Creative Officer)



Rediscovering craft

Over its long history, Pininfarina has had to adapt to changes in its environment and partner with a number of different OEMs. Now, big changes are on the way:

“...the new emerging markets ... are really asking for or are ready to make a quantic leap towards new technologies, new methods – a leap ... beyond what we are ready for in Europe or America, where the car is following a rather linear trajectory. Such a situation creates, in my opinion, terrific opportunities that are more or less underway at the moment and create at the same time a lot of expectations, fear, uncertainty.”

Chief Creative Officer

In such a dynamic scenario, what is the future of a premium design agency? Somewhat unexpectedly, it is returning to its origins and rediscovering craft, supported by contemporary technology:

“The car, as expression of savoir faire, of aesthetic and physical values and also of specific competences in using certain materials, almost at a level of handicraft ... will have, contrary to common thoughts, an even more specific future.”

Chief Creative Officer

Designing beautiful experiences

The Chief Creative Officer rejects the idea that design in automotive will become less relevant. Though more and more drivers may choose not to own vehicles and cars may lose some of their more aggressive traits, the sense of beauty that design can give will not disappear:

“The individual freedom to choose a route ... the experience of a journey, the beauty of form. If you are filled with ecstasy in front of a modern art sculpture ... of Henry Moore or Rodin, [this is because] of volumes, proportions, sensuality of forms and surfaces. All that happens in a car too ... an object that makes you live an experience, whether you buy it or not.”

Chief Creative Officer

Bluecar

Bluecar is the result of a publicly funded collaboration between Pininfarina and the French company, Bolloré Group, aimed at designing an electric car to encourage the growth of car-sharing in Paris. Blending Pininfarina's legacy of style and elegance with environmentally responsible features, it has exceeded expectations for the technology's capabilities and attractiveness. It is redefining the perception of electric cars and car-sharing, making them appeal to a broader audience and growing environmentally sustainable commuting.

A 100% electric, compact five-door hatchback, it is only 3.65m long, 1.72m wide and 1.6m high. It has an automatic transmission and is powered by the Bolloré Group's Lithium Metal Polymer battery – an advanced technology that has the same weight as other batteries, but five times more energy capacity and recharges completely within a couple of hours. It can travel 130 miles on a full charge, requires no maintenance and has a lifespan as long as the car.



The car's exterior and interior clearly position it within the Pininfarina family. The outside features pure, harmonious angles with a strong and confident front. The interior is precise and manually fitted, with original traction control instead of gearshift. A superior touchscreen control panel makes communications between car and driver simple. The materials, including artificial leather derived from vegetable sources, have low environmental impact and are recyclable or reusable. Solar panels on the roof and bonnet support the electrical equipment.

Starting in Paris and surrounding municipalities with 399 cars in 2011, the Autolib Bluecar sharing service offered customers quick, easy rental of stylish, environmentally friendly cars. Autolib grew to 2,000 units in 2014, now operating in Lyon, Bordeaux and Indianapolis, USA. Bluecar became available for private sales in 2012 and accounted for 27% of registered electric vehicles in France that year. There are plans to launch a similar scheme in London in 2015.





Section 2: Collaboration

Case study: Wipac

Wipac is a first-tier automotive supplier specialising in prestige vehicle lighting. With a history of supplying vehicle lighting since 1948 and origins dating back to the advent of automobiles, it is one of the world's most experienced and innovative car suppliers. Operating under the umbrella of the publicly traded company Carclo, it employs 250 people and is UK-based, with a state-of-the-art facility in Buckingham and an aftermarket retailer in Aylesbury.

Wipac has around 50 automotive lighting systems in production for many elite OEMs, including: Aston Martin, Bentley, Bugatti, Lamborghini and Rolls Royce. Currently, it is developing innovative optic solutions with LED lighting technologies. It was one of the first companies to introduce multifunction LED tail lamps. As part of its growth strategy, it recently increased investment in design and innovation and expanded its factory's technological capabilities and production capacity.

Collaboration in the supply chain

According to both the Managing Director and the Director of Design, successful projects are those where OEMs involve suppliers, such as Wipac, from the beginning, making processes smoother and more effective. Since Wipac works with high-end firms, rather than focusing on existing products, projects often start by imagining the best design:

“At that early stage you don’t get into costing. We always have an idea of something sensible ... and try and control it ... I always say to them, ‘what’s your dream lamp?’ ... You can always work back to the

cost, you know and I think that’s how we work. What do the stylists want? What would be the most amazing set of lamps that could ever be made?”

Director of Design

Such dynamics seem to be appreciated by OEMs:

“[Our client] was absolutely over the moon to have a supplier who tries to deliver anything they ask for ... we’d go away and try and find a way.”

Director of Design

Trusted relationships

Establishing trust between supplier and customer is vital.

“Some companies take you completely on trust from the start. And we will spend time in the styling studio, in detail, modelling solutions and reviewing with the stylists exactly what the options are. Other companies will stand off a bit more. They won’t give you access to the styling studio and do things by exchange of PowerPoint documents and those kind of things and not give you freedom.”

Managing Director



Such relationships are particularly important for design:

“Design has got an element of creativity and subjectivity to it. It’s much easier to do if you’re engaging people person-to-person.”

Managing Director

Such engagement may also help the supplier more proactively propose solutions to the customer. Looking at one product, the Director of Design described how the high beam wouldn’t have been possible if they had not already tested prototypes of their own high beam system: “I don’t even think that [the customer] at the time of the project would have known it was possible to produce ... This was still very new then. But we built, demonstrated and modelled a very compact LED high beam.”

Trust in relationships and appreciation of design depend on organisational culture and on companies’ risk appetite:

“The more confident and happy companies get [design], the companies without the blame culture, the companies that are happy to let the studio go a bit mad and say: ‘We’ll find a way to sort it,’ rather than saying afterwards ‘We’ll find someone to blame.’ I mean, if you’re all in it together then you’re like: ‘We’ll find a way to make this affordable, we’ll find a way to build it.”

Director of Design

Design and technology

In lighting, technology and design are intertwined, to the point that, according to the Director of Design: “The technology is the design, it’s not that one’s led by the other or vice versa, they’re just the same thing.” This makes technological innovation particularly interesting, as it can give more freedom to design.

“We don’t do anything that isn’t LED-based now. And the LEDs have facilitated so much freedom in design and styling that you can almost have a lamp that looks like anything ... No longer do you have to have this big round circle for a bulb. ... And really it’s up to us to get all the car company stylists to come up with really different looking lamps.”

Managing Director

This is even more significant, as design can reflect and communicate the brand:

“OEMs believe that you should be able to recognise a car by its lights even at night. They want it to be a brand identity, so they’ll come up with shapes, illuminated shapes that are the brand.”

Director of Design

One-77 headlamps

Wipac's small size and niche expertise offers OEMs something larger first-tier suppliers cannot: the capability and facilities to design and develop bespoke headlamps for low-volume and special car ranges. In the case of Aston Martin's limited edition One-77, the Managing Director explains:

"... because it was such low volume, 77 cars only, the higher-volume suppliers could only offer standard solutions for this type of project."

Aston Martin needed bespoke lighting for their most exclusive model and Wipac were able to find an effective way to deliver this.



Case studies

Section 3: Future trends



Section 3: Future trends

Case study: Jaguar Land Rover

Jaguar and Land Rover have existed as a single entity since 2008, under the direction of Tata Motors. Jaguar Land Rover (JLR) is the UK's largest automotive business, employing over 25,000 people, investing the most in R&D and with the highest exports by value.

It has six R&D, manufacturing and assembly facilities around the UK and one in India. Plants are opening in China and Brazil.

In 2014 it sold more than 430,000 vehicles across 158 countries, achieving growth in all sales regions and breaking records in 38 markets. Revenues rose by 23% to £19.4 billion. JLR was named Responsible Company of the Year 2013 by Business in Community.

Leading by design, JLR has launched a multiple award-winning product portfolio, with more than 220 awards in 2014 alone. It enhanced vehicle safety by pioneering aluminium construction technologies and introduced the first diesel hybrid SUVs to the market, reducing fuel consumption by up to 11.4% and carbon emissions by 9.5%.

It has recently invested in the founding of the National Automotive Innovation Centre UK.

Designing the customer experience – Human-Machine Interface technology

At JLR, the Human-Machine Interface (HMI) team comprises around 25 people, including psychologists, engineers and human-factor specialists.

Collectively and collaboratively with the design unit they consider and shape the current and future range's customer experience: how people interact with, navigate and sense the models.

“It’s much more about intrinsically pulling together a total product... the desirability of the whole, holistic product is vital to that... you design ambience and experience. There’s the whole aspect now of services which are probably going to be at least 50% of what the company is going to have to provide... the proportion that’s just physical, kind of, touch and feel, materials and physical surfaces... is getting smaller and smaller.”

Chief Designer Research Projects

The HMI system design is an important brand identifier and differentiator and is tightly connected with the overall design of the car:

“Our HMI research group has a very close connection to design because, you know, if you look at the touch-points of the product, it’s the design and it’s the HMI and so they almost come hand in hand.”

HMI Technical Specialist



HMI innovations

HMI innovations such as a rotary gear selector and a dual view display enable consumers to interact with and benefit from their cars in new ways: “One display in the centre of the car where the passenger can see one image and the driver can see another one, so the passenger can watch a movie whilst the driver’s watching the navigation.” (HMI Technical Specialist). Heads-Up Display provides information to the driver while his eyes remain on the road. Examples of the latter include a 360 windshield with transparent side pillars, so the driver can better see pedestrians, cyclists and a projected ghost car on the road that the driver can follow for easy navigation in busy areas.

As cars become an integral part of the ‘internet of things’, the HMI

team needs to consider a wide array of factors, from safety to functionality, to intuitiveness.

To address the growing number of automated driving technologies, the HMI team is beginning to investigate the “half-way house, which is what happens when you... don’t have to do the driving task, but you may at some point be asked to take over control of the vehicle. And there are varying levels in between there, so we’re having to now consider those as part of our design and test procedure, because a lot of things that people might want to do whilst they’re being autonomously driven will affect how the system... how ready they are to engage in a driving-based activity.” (HMI Technical Specialist)



“ People are connected 100% of their lives now and they want to be able to get access to information, so we’re not going to stop people from doing it ... What we have to do is enable these functions in a safe manner. ”

HMI Technical Specialist

Section 3: Future trends

Case study: Liftshare

From humble beginnings in 1998, Liftshare has become the UK's largest car-sharing community with over 600,000 individual members and 650 corporate clients.

“The efficiency of cars is just phenomenal, but the only thing that makes them inefficient is that there are five seats ... and only one person in them.”

CEO

Driven by pioneering software, Liftshare is designed to provide an alternative to traditional travel options: access to one-off lifts and car-sharing schemes for individuals and corporate customers, as well as bespoke coaching packages and applications for aiding in the transformation of consumer sharing behaviours.

The overall design of the service and the interface has been very important to encourage use of the system – this is particularly critical when implementing a service that is about changing behaviour.

“The look, design, of online systems can have a great impact on generating a sense of branding ... So, the look is very important, [as well as] the actual functionality and the simplicity of it.”

CEO

The company continuously applies design to help individuals share cars and save money. It also generates commercial solutions to transportation problems and helps businesses reduce their environmental impact. Generally, 90% of people who try Liftshare services continue to use them. Every day it removes an estimated 78,000 car journeys from the British roads.

The sharing economy

Liftshare are keen to make car-sharing a mainstream solution. On the business-to-consumer side, “We create simple travel and amazing connections”, while on the business-to-business side, “We help organisations reduce parking congestion and help behaviour change.” (Marketing Manager)

The ultimate goal of the company is to make sharing cars normal:

“It’s raising the positive feeling that people get from sharing cars. I mean, a lot of people share cars now, they just don’t realise they are doing a good thing for the world... so it’s about celebrating what already happens and trying to get much more of it.”

CEO

My Personal Travel Plan

My Personal Travel Plan (myPTP) is a service designed to overcome barriers to behavioural change. It helps people to become open-minded about sharing their cars or being driven in someone else's. This applies to individuals, but also companies struggling with parking and congestion. Organisations “have these great plans ... in theory they are brilliant, but getting staff and employees and even customers to change their behaviours is a real challenge.” (Marketing Manager)

Enticing behavioural change has three main components:

- Addressing the knowledge gap between existing travel options and proposed lift-sharing options
- Providing opportunities for individuals to learn about and access the new options
- Encouraging desired behaviours.

“What PTP does is... it gives them the knowledge that they could actually car-share and also it gives them the opportunity by showing them who it is they could car-share with.”

Client Account Manager

myPTP functions as a simple online application that integrates data for all modes of transport, including walking, cycling, public transport, park and ride, car-sharing and single occupancy car journeys. Inputting a postcode generates a list of possible personalised travel plans emailed directly to the customer.

“It tells you all the different ways that you can get from A to B and it uses every ... form of transport apart from a pogo stick. And then there's walking, cycling, all public forms of transport – Liftshare options are in there – driving on your own and park and ride.”

Client Account Manager

Section 3: Future trends

Case study: Transport Systems Catapult

The Transport Systems Catapult (TSC) is one of seven innovation and technology centres set up in the UK by the Technology Strategy Board (now Innovate UK) to further economic growth. It brings scientists, entrepreneurs and engineers together to launch innovative research projects.

Based in the Intelligent Mobility Innovations Centre in Milton Keynes, TSC is focused on ‘driving economic growth through the efficient and cost-effective movement of people and goods’, primarily by developing and implementing technology in the intelligent mobility space, a market estimated to be worth £900bn by 2025.

TSC is using design to adopt a systems perspective on future travel and mobility needs, to foster new supply chain relationships, plan for necessary infrastructure adjustments, identify potential business opportunities and evolve human interfaces. Prototypes, visualisation and modelling techniques are key to the organisation’s cross-sector collaborations and research developments.

The future role of design

While TSC is not developing vehicles themselves, it could play a fundamental role in facilitating the creation and introduction of radically new technologies, products and services in the marketplace.

“Our job is to try and look into the future to see how do we make that into a customer driven, seamless service.”

Chief Operating Officer

Similarly, the Chief Technical Officer argues that, in the future, we will have “mobility service providers in the middle and what they [will] do is to understand and aggregate the needs of the customers ... It’s all about understanding ... what the customers need.”

Design could play a fundamental role in such a scenario, as it would connect technological advancements (for example, fully driverless vehicles) with users, while also lowering barriers to adoption. This is clear in the development of the Low-carbon Urban Transport Zone (LUTZ) Pathfinder.

LUTZ Pathfinder

The LUTZ Pathfinder driverless pod is a project designed to investigate the technical and social feasibility of autonomous driving technologies. The Automated Transport Systems Business Unit at TSC commissioned the design and construction of three driverless pods. The project is not only concerned with self-driving's technical feasibility, but how people react to it. Fears concerning self-driving technologies are common, so the project is being rolled out in a very controlled manner to introduce the technologies incrementally and safely, allowing people to provide feedback and adapt.

The pod's design was especially important in overcoming anxieties. Coventry based RDM was chosen to build the pods, based on their progressive and comprehensive design, which looked not just at functionality but appeal.

The Project Manager stressed the importance of this: "If you produced these three vehicles and put them onto the streets of Milton Keynes and they looked like a box, that's not particularly appealing ... we want people to be able to engage with them, look at them and say, 'Actually it's not the vehicle I'm frightened of, but at the same time I'm going to be respectful of it. But also, it's a vehicle I'd like to sit inside, it looks comfortable, it looks futuristic.' It needs to look futuristic because the technology is really advanced, you know, the navigation technology is cutting-edge." (Project Manager). The Chief Strategy Officer concurs: "It's a bold design deliberately to make it a conversation piece."

The pods are fitted with Oxford University's Mobile Robotics Group's autonomous control and sensor systems, which uses laser radar. They will do their initial trials on a pre-determined one-mile long footpath that runs from the

train station in Milton Keynes to the shopping centre. In the beginning they will always be manned to help people adjust. Through the trials and demonstrations in Milton Keynes, TSC aims to assess whether:

- the technology can be used in this type of environment
- there is public acceptance – among both pedestrians and vehicle occupants
- the urban laboratory can be used to demonstrate this type of trial.

The results will inform further work in other companies in the UK and globally that are developing these technologies, enabling them to move from research through to trials, demonstrations, testing and validation and commercialisation by “working closely with them, to help them understand and appreciate the other adjacent sectors that may help them deliver the vehicle of the future.” (Chief Strategy Officer)



Appendix

What we wanted to know

To better understand current and potential uses of design in the automotive industry, this project focuses on four main areas:

- Roles of design – eg, in the development of products, services and experiences; design management practices
- Collaboration (or lack of) between suppliers and manufacturers, internal functions (eg, design and engineering) and processes (eg, product design and manufacturing process design)
- Investment in design: the rationale and size of investments in design units and personnel
- Design's impact, both financial and non-financial.

What do we mean by design?

This project looks mainly at product, service and interaction design, considering them as processes and outcomes. Here, product design mostly relates to functionality, usability/ergonomics and aesthetics (appearance of interior and exterior of a vehicle). Service design principally relates to customer experience. We are not concerned here with engineering design, which would relate more to technology (engine design, electronics, etc), use of materials, production processes, etc. We consider three primary roles of design and designers:

- Understand customer desires and needs and convert them into product/service offerings
- Promote and achieve innovation, both incremental and radical
- Challenge existing limitations due to current technology, products, regulations, etc.

Project rationale and sampling strategy

When it comes to product and service design, while different sectors share many characteristics, the automotive industry has distinct attributes, which drove the way we constructed this study:

- Product development is a very substantial cost, greatly influencing choices around refreshing existing models rather than introducing new ones
- Vehicle manufacturers tend to source between 50% and 75% of their parts and assemblies from outside suppliers. Hence our interest in engaging with companies in the supply chain
- Traditionally, vehicle manufacturers tended to innovate through a ‘technology push’ approach. More recently, consumer demands and expectations have become increasingly relevant, requiring a stronger user-centred perspective and making service design and a focus on customer experience more important. Nonetheless, technological innovations (in electronics, powertrain, etc) are still very important and could either complement or challenge design innovations

- Standards and regulations (local and international) are determining forces, which can act as either enablers or barriers to design and innovation.

In terms of compiling the sample, then, we were aware of the fact that automotive industry OEMs are embedded in a complex network of suppliers on one side and an extensive distribution and service network on the other. To understand industry dynamics, it was important to involve both OEMs and other key organisations and stakeholders.

While motor vehicles can be passenger cars, commercial vehicles, buses, off-highway vehicles, motorcycles, etc, here we decided to focus on passenger cars. This enabled us to observe similar dynamics and processes in business-to-consumer relationships (and suppliers to those businesses) across the sample, which a broad investigation of the automotive industry would not allow.

Approach

This study is exploratory and qualitative. Its purpose is to examine phenomena, opinions and perceptions derived from interviews with a series of individuals from board members to middle managers. Although the interview protocol was set at the beginning, it evolved as data was being collected.

To better understand design's role, we conducted interviews in a variety of companies, deliberately including both established brands and relatively new ones, UK-based and non-UK-based firms. Firms were chosen from the following categories:

- OEMs: Aston Martin, Jaguar Land Rover, Tata Motors and Volvo
- First-tier suppliers: Johnson Controls and Wipac
- Non-automotive suppliers: Bowers & Wilkins
- Service firms: design consultancy Pininfarina, car-sharing company Liftshare and innovation centre Transport Systems Catapult.

A total of 48 semi-structured interviews were undertaken, lasting, on average, 60 minutes. 35 were conducted in the ten case companies, with senior personnel in design, marketing, engineering and finance. Given our focus on a specific sector, we also interviewed an 'expert sample' of 13 key informants: automotive designers, IT analysts and industry experts.

All data were collected between October 2014 and March 2015. All interviews were recorded, transcribed and analysed through content and thematic analyses. Two researchers were involved in data collection and analysis. Draft reports were sent to the participating companies for validation.

Interview questions

General information

1. What is your position within the company? Can you briefly describe your role and responsibilities?
2. One interviewee per company: age and size of unit (headcount and turnover)
3. In your company, do people look for new ideas and try to explore new technologies/ products or services?
4. Are design/designers involved in creating a vision for the organisation (prompt: what does product/service design mean to you)?
5. Why is the organisation investing (or not) in design?
6. At this point we will ask the interviewee to think of two specific projects, one successful, one less successful
7. Does design inform your organisation's strategic choices? (Examples from the two projects)
8. Are there specific barriers to the adoption of design at a strategic level (organisational culture, organisational structure, lack of executive sponsorship, etc.)? (Examples from the two projects)

Roles of design and designers

9. Can you describe the main steps in your product/service development process?
10. What are the roles of design and designers? When does design come into play? (Examples from the two projects)
11. Are there tensions between different areas / professional groups in this process? (Examples from the two projects)
12. Design thinking: Looking at the two projects, were there different ways of thinking/operating at play? (prompts: iterations, user-focus, etc.)

Impact of design

13. Is there evidence that (the strategic use of) design has led to improved business performance? (Probe: financial aspects (eg, profitability, sales growth) and non-financial ones (eg, raised brand awareness, improved strategic thinking))
14. Do you think design brings benefits to organisational development, skills and training?
15. What is the role of design and designers in improving operational efficiency?
16. Have your products/services received design awards (more than your competitors'?)

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About the authors

Pietro Micheli is Associate Professor of Organisational Performance at Warwick Business School, UK. He was awarded a PhD and a Master by Research in Management from Cranfield School of Management, and a Master in Management and Production Engineering from the Politecnico di Milano. Pietro is a founding member of the evidence-based management collaborative in the US, and worked as a Research Fellow for the Advanced Institute of Management (AIM) Research in London. He was the author of the *Leading Business by Design* report published in 2014.

pietro.micheli@wbs.ac.uk

Haley Beer is a Doctoral Candidate in the Operations Management Group at Warwick Business School. Her research is focused on the design and application of performance measurement for intangible resources and organisational benefits such as social value creation, environmentally sustainable practices and innovation.

haley.beer.12@mail.wbs.ac.uk

For enquiries related to Design Council's Leading Business by Design series please contact Yvonne Harris at: yvonne.harris@designcouncil.org.uk



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