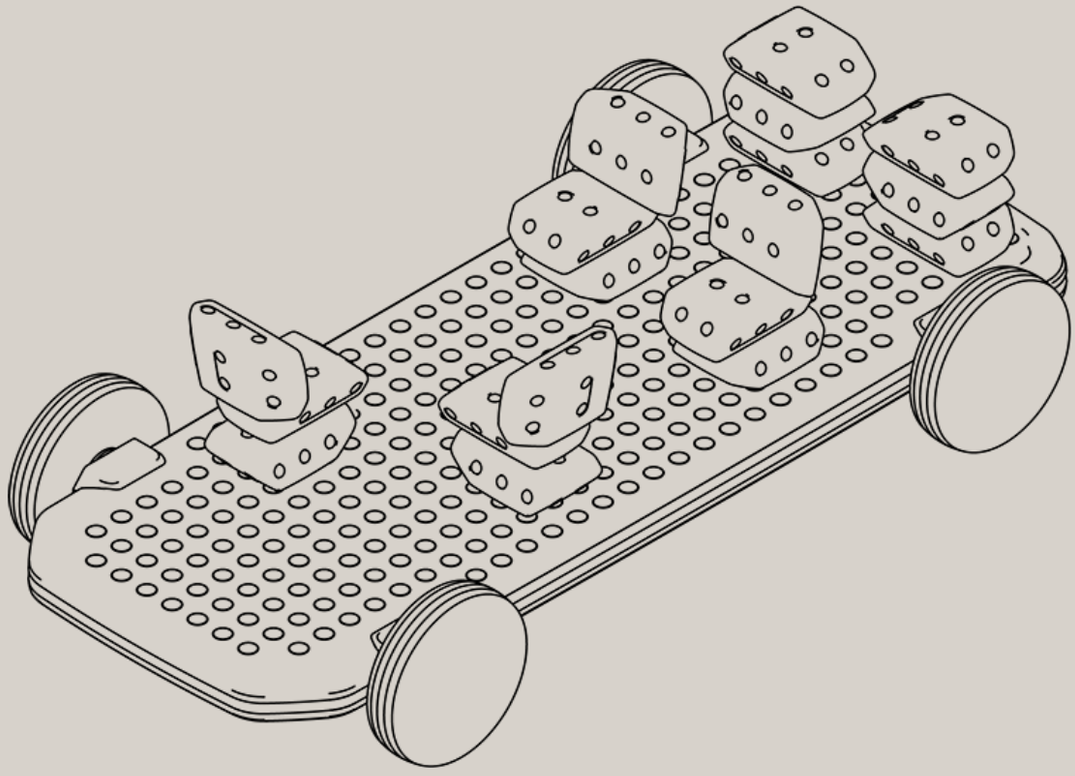
Designing for flexible vehicle interiors through discrete architectural methods:

Reframing the role of the designer in an automated and computational age



Designing for Flexible Vehicle Interiors through Discrete Architectural Methods: Reframing the Role of the Designer in an Automated and Computational Age

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A Thesis submitted in partial fulfilment of the requirements for the degree of PhD at the University of the Arts London

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You say I am repeating
Something I have said before. I shall say it again,
Shall I say it again? In order to arrive there,
To arrive where you are, to get from where you are not,
You must go by a way wherein there is no ecstasy.
In order to arrive at what you do not know
You must go by a way which is the way of ignorance.
In order to possess what you do not possess
You must go by the way of dispossession.
In order to arrive at what you are not
You must go through the way in which you are not.
And what you do not know is the only thing you know
And what you own is what you do not own
And where you are is where you are not.

East Coker, Section III, 141-153
From Four Quartets by T.S. Eliot

Abstract

This Practice as Research (PaR) PhD investigates how automated design and construction methods developed within architectural academia can be adapted to the context of automotive interiors to address flexibility and utilisation challenges associated with Connected, Autonomous, Shared and Electric (CASE) mobility. The aim of the project was to formulate a novel prototype design practice capable of enabling more adaptable, reconfigurable vehicle interiors - interiors better suited to the dynamic demands of shared and service-based mobility models.

The research engages deeply with the critical limitations of current automotive design practice, arguing that its entanglement with legacy production models undermines its ability to address pressing sustainability, flexibility, and utilisation challenges associated with CASE. The research introduces 'Discrete Automobility', a design methodology that translates discrete construction logics - typically used to enable mass customisation, localised production, and component reusability in architecture - into the automotive domain. Through physical prototyping and computational workflows, it demonstrates how these logics can support new forms of vehicle interior design that respond to evolving user needs, while reducing material waste and increasing utilisation rates.

This research questions the role of the designer as we enter a new epoch defined by automation and mass computation. Drawing on Mario Carpo's Second Digital Turn, the thesis argues that creativity in the computational age shifts from the direct manipulation of form to the indirect authorship of systems, rules, and workflows.

The 'Education Brick' prototype serves as a working demonstration of how vehicle interiors can be designed using modular, rule-based construction, allowing layouts to be reconfigured according to context, user group, or time of day. The proposed methodology leverages automated design-to-construction workflows and robotically fabricated modular components to produce interiors that are not fixed, but reconfigurable in response to varied user needs. In this model, the designer becomes a systems architect - crafting rule sets, spatial grammars, and manufacturing frameworks rather than singular forms. The 'Education Brick' prototype and 'Discrete Automobility' concept has been presented to OEM design teams and their responses, along with critical reflection on the research process, form part of the evaluation and point to future pathways for development.

By situating itself within both design theory and technical practice, this research contributes a new methodology for flexible vehicle interiors and a critical perspective on the future of design authorship. The thesis makes an epistemological contribution by articulating a mode of automotive design that is *indirect*, and concludes that far from being undermined by automation, designers are uniquely placed to shape the systems and platforms through which design operates; becoming relevant by embracing a more indirect, systemic, and adaptive mode of practice. This thesis argues that *indirectness* is not a diminishment of creativity, but a reconceptualisation of it, aligned with broader cultural shifts in computation, automation, and shared authorship. By building, testing, and communicating 'Discrete Automobility' the research embodies its knowledge claim and invites a critical rethinking of design practice in the automotive field and beyond.

Automotive Design, Future Mobility, Second Digital Turn, Discrete

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Introduction

Introduction

Knowledge Claim summary

This thesis introduces 'Discrete Automobility', a novel circular design and construction method for automotive design, influenced by computational design and automated construction from 'discrete architecture'. It proposes a platform-based approach to interior spaces for CASE vehicles, allowing for infinitely adaptable configurations. 'Discrete Automobility' addresses low utilisation rates in Mobility as a Service systems using Shared Autonomous Vehicles (SAVs) and contributes towards more sustainable forms of transportation. It challenges traditional notions of automotive design practice and by shifting focus from physical material manipulation to controlling system parameters redefines the role of the designer for the computational age.

The full Knowledge Claim is in Chapter 2.1.1.

Research Questions and Aims and Objectives summary

The research questions are structured around understanding macro trends influencing automotive design, evaluating the current state of automotive design practice, exploring alternative design models, envisioning a revised design approach, and assessing practitioner responses. These questions guide the research process and frame the aims and objectives, which involve developing theoretical underpinnings for a new vehicle interior design process, demonstrating key stages of this process through prototyping, creating a toolkit for sharing principles of the new process, presenting the research to professionals for feedback, and reflecting critically on the transition of the designer's role.

The full five Research Questions and project Aims and Objectives are in Chapters 2.1.2. and 2.1.3. respectively.

Methodology and Methods summary

The research adopts a Practice as Research (PaR) approach, acknowledging the dynamic relationship between research, practice, and models of production within the automotive design field. The research is structured around the Design Council's Double Diamond methodology, adapted to fit the research aims. Recognising the need for flexibility in design frameworks, the thesis argues for the freedom to purpose the methodology relative to the research aims.

The research methods include literature reviews (Chapters 2.4.1.a. and 2.4.1.d.), practice and artefact reviews (Chapters 2.4.1.b. and 2.4.1.e.) and expert interviews (Chapter 2.4.1.c). Later methods include computational learning, prototypical practice, and dissemination of the practice (Chapter 2.4.2.a. 2.4.2.b. and 2.4.2.c.). These methods inform the Discover, Define, Develop, and Deliver phases of the Double Diamond methodology.

The full Framework and methodology is available in Chapter 2.2., the Practice and epistemology in 2.3. and the Research methods in Chapter 2.4.

Chapter Summary

Chapters 1.1., 1.2. and 1.3. establish the importance of this research and why it should be examined now, and through an academic research project. 1.1. sets out the need for more sustainable forms of transportation – including fewer privately driven vehicles – and the need for automotive design practice to engage with the issue of sustainability in a more meaningful and impactful manner. 1.2. Introduces the topic of Connected, Autonomous, Shared and Electric mobility – perhaps the four macro trends most impacting automotive design practice in the coming decades – and examines the way Shared Autonomous Vehicles delivered through a Mobility as a Service (MaaS) system might change the way customers access and perceive private forms of mobility, and associated the need for these MaaS systems to be highly utilised to be profitable and realise their promise of more sustainable transportation systems. 1.3. examines the growing use of computational design software in automotive practice through the use of Generative AI systems, concluding that these tools are making design processes quicker and more efficient, but identifying a disconnect between design and construction that mean the benefits of the digital – the ability to constantly change and develop a design – are not realisable in the manufactured 'post-rationalised form.

Chapter 2 details the Knowledge Claim, Research Questions and Aims and Objectives. It explains the frameworks and methodologies used to structure the project and the relationship between practice and epistemology in this PaR thesis. Chapter 2 sets out the methods that have been used to complete the research.

Chapter 3.1. argues that the lack of critical discourse in automotive design practice is in part a result of the power structures imposed by the models of production and uses a comparison with the architectural practice to establish how a form of critically engaged automotive designer might be realised. It concludes that without this, automotive design might not be able to adapt to future

challenges. Chapter 3.2. introduces the concept of 'discrete architecture' through theoretical and practice perspectives and concludes with thoughts on how the methods might be adapted to automotive design.

Chapter 4 sets out the fundamentals of the Discrete Automobility system. It is in this chapter that much of the knowledge claim is realised thorough 'Education Brick', a conceptual and prototype discrete construction system and the first to apply principles of the discrete to an automotive context. This chapter tells the story of a 'Discrete Automobility' system from the perspective of a family unit, and describes the methods used to communicate the concept also.

Chapter 5 concludes the thesis summarising the feedback given when the research was presented to automotive design professionals and speculates on future research work on this topic and wider field.

About the author

I am an automotive designer specialising in strategy and research. I work for the Cambridge, UK based Car Design Research, a unique automotive design and strategy firm that works with the design leadership (Design Directors and Senior Designers) of major automakers including Volvo, Polestar, Ford, Toyota, Honda, Stellantis, and consumer technology brands moving into the automotive space to help them realise commercially more successful design.

I trained as an automotive designer at the Royal College of Art (MA Vehicle Design, Distinction, 2016-2018) having previously trained as an industrial designer at Falmouth University (BA Sustainable Product Design, First Class, 2012-2015). My practice centres around the use of Computer Numerically Controlled enabled manufacturing to use physical design artefacts to communicate strategy and tell design stories.

My full CV and a list of key achievements during my time at Car Design Research is attached, Appendix iii.

Chapter 1.1 – Why we need a world with fewer cars

Chapter 1.1 – Why we need a world with fewer cars

1.1.1. Introduction

The climate crisis eclipses any recession, war, or even pandemic, as the greatest existential threat to humanity. Global heating caused by human activity is already having a profound and potentially irreversible impact on ecosystems, economies, and societies worldwide. The negative impacts of environmental change will accelerate and be felt by a greater proportion of the global population with the world's poorest communities facing the worst effects.

It is perhaps stating the obvious to say that the automotive industry has and will continue to contribute significantly to global emissions. 'Diesel-gate' was less than a decade ago and the initial group litigation in the UK continued until a settlement was reached in 2022, so whilst trust in the automotive industry may be low, and it is clear too many risk adverse and automakers have been slow to embrace the capital intensive transition to Battery Electric Vehicle (BEV) powertrains, the industry is starting to change attitudes towards sustainability issues and play a more positive role in tackling the climate crisis.

This chapter suggests that the automotive design department is not contributing as fully as it could to shape vehicles that are less emitting over their lifecycle, and that a lack of leadership on sustainability issues is failing to inspire the broader industry to imagine new models of vehicle ownership and construction and manufacturing techniques that could radically reduce the emissions and environmental impact of the automobile.

1.1.1.a. Aims and Objectives

This chapter addresses research question one; What are the macro trends (political, social, economic, cultural and technical) that will influence the automotive design practice in the 21st century?

And question two; Is automotive design practice in its current form successfully responding to these changes, or is it equipped to do so in the future?

This chapter begins with a summary of the threat the climate crisis poses to the human and natural world (1.1.2.) and quantifies the contribution of the automotive industry to this condition (1.1.3.). 1.1.4. evidences the actions automakers are undertaking to tackle the climate crisis including the transition away from Internal Combustion Engine (1.1.4.a.), the adoption of 'Net-Zero' targets (1.1.4.b.), alignment to the United Nation (UN) Sustainable Development Goals (SDGs) (1.1.4.c.) and their statements on being more 'purposeful' (having a reason to be other than for profit) (1.1.4.d.). 1.1.5. suggests the impact design can have on reducing emissions and 1.1.6. outlines four examples of leading recent designs with meaningful claims of engagement with sustainability issues. In concluding (1.1.7) this chapter suggests ways that automotive design could make a more positive contribution to lowering the industry's emissions.

1.1.1.b. Methods

This chapter was written from knowledge generated through Literature Review A (Automotive) (Chapter 2.4.1.) and the Write-up process (Chapter 2.4.8.).

Figure 1.1.4.b.i. benchmarks the Net Zero commitments of twenty eight automakers and includes representation from key American, European and Asian manufacturers. The logos represent the manufacturers' publicly stated aim to reach Net-Zero.

Figure 1.1.4.c.i. takes Figure 1.1.4.b.i. adding 'Y' access that tracks the brands' public statements or commitments to align their business strategy and/or operations to the UN SDGs. This value judgement was made based upon if the brand's website, Corporate Social Responsibility (CSR) reporting, or press releases made mention to how they were responding to the SDG's, with brands that gave more public detailed rated higher. For example, Volvo and Toyota are top rated and both have dedicated sub-webpages that explain in detail their engagement with the SDGs, provide accountability and are communicated with a high degree of design quality. The investment of design resources into the communications of their SDG efforts into online corporate communications suggests it is something these brands perceive will add value to their corporate identity.

1.1.2. The climate crisis

The Intergovernmental Panel on Climate Change (IPCC), in its Sixth Assessment Report, has emphasised the unequivocal influence of human activities on the climate system, with carbon dioxide (CO_2) concentrations reaching levels not seen in at least 2 million years, and the past decade (2011-2020) being the warmest on record (IPCC 2023).

Global temperatures have soared, with the Earth's surface temperature rising by an average of 1.09°C above pre-industrial levels. This warming trend is primarily attributed to the increased emissions of greenhouse gases (GHGs) from human activities, notably from the burning of fossil fuels, deforestation, and industrial processes. The World Meteorological Organization (WMO) highlights that CO2 levels in the atmosphere have now exceeded 410 parts per million (ppm), up from about 280 ppm in the pre-industrial era, pushing climate models into uncharted territory (WMO 2022).

Climate change due to human activity has intensified the frequency and severity of extreme weather events, including hurricanes, droughts, heatwaves, and wildfires, these causing widespread destruction and loss of life. The United Nations Office for Disaster Risk Reduction (UNDRR) reports a significant increase in weather-related disasters over the past several decades, with economic damages soaring into the billions. The melting of polar ice caps and the thermal expansion of seawater means that sea levels are rising and the IPCC projects that under high-emission scenarios, sea levels could rise by up to 1 meter by 2100, threatening coastal communities, economies, and ecosystems (UNDRR 2020). Loss in biodiversity is another significant consequence of the climate crisis. The World Wildlife Fund (WWF) has documented a catastrophic decline in global wildlife populations, attributing this loss to habitat destruction, pollution, and climate change. As ecosystems unravel, the services they provide to humanity – from food security to disease regulation - are at risk; the climate crisis is interconnected with many other global challenges (WWF 2020). The climate crisis also has huge economic implications; the Economist Intelligence Unit (EIU) estimating that the global economy could suffer losses totalling $7.9 trillion by 2050 due to climate-related impacts (Galey 2019).

Mitigating the climate crisis hinges on dramatically reducing GHG emissions and transitioning to a low-carbon economy. The 2015 Paris Agreement, signed by 196 countries, aimed to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. Achieving this target requires the decarbonisation of energy systems, the enhancing of energy efficiency, and the introduction of new innovative sustainable technologies. The climate crisis will not be stopped by technological solutions alone and the global community must address the political, social and economic factors that are at the root and origin of this crisis. It is only through significant changes in human behaviour to use less natural resources and emit fewer GHGs that the 1.5 or 2 targets will be met (United Nations 2015).

1.1.3. The contribution of the automotive industry to the climate crisis

In 2009 Sperling and Gordon estimated there to be approximately one billion motor vehicles on earth, that this number that would be doubled by 2030, and attributed this growth to demand from the leading emergent economies of China and India (Sperling and Gordon 2009). In 2015, the International Organization of Motor Vehicle Manufacturers estimated an average global 'motorisation rate' of 182 vehicles per 1000 inhabitants; and details global sales of passenger vehicles of ~64 million in 2019, dipping to just below 54 million in 2020 and a slight recovery to ~56 million in 2021 (OICA 2015).

36 billion tonnes of human-made CO2 is emitted annually, and the UN states that this needs to be reduced by 45% by 2030, and to net zero by 2050 in order to avert irreversible climate disaster (IEA 2020). The transportation sector is responsibile for approximately 24% of these global CO2 emissions and in turn road passenger vehicles represent near 45% of this total; just behind construction (nearly 50%), and far ahead of aviation at just below 12% of global CO2 (Ritchie and Roser 2020). The automotive industry has, and will continue to, make a significant contribution to global heating and so the climate crisis.

The CO2 emissions of a product take two forms:

1. Embedded (also known as embodied carbon or energy) – the amount of CO2 produced in the production (and disposal) of a product – mostly from the energy created by fossil fuel generation used in the material extraction and processing, and in the manufacture and distribution of the product. More thorough analysis would include the impact of Research and Development (R&D), marketing and other business operations that can be directly attributed to this specific product (Gruenig 2023).

2. Operational carbon is the amount that is used when the product is in use (Engel 2021). Either this is described as a rate (e.g grams of CO2 per kilometre — gCO2km), or as an absolute total for the expected lifetime of the product, which for cars tends to be measures in mileage (125,000m / 200,000km) and not time.

The CO2 footprint of any product is thus a combination of both embedded and operational, even if historically the car CO2 emissions data has focused solely on operational use (hence the term, zero-emission-vehicles).

Whilst CO_2 is the primary focus when discussing the environmental impact of the automobile and the automotive industry at large, it must be acknowledged that the car has a multitude of other negative impacts on the natural environment; the extraction and processing of raw materials, end of life disposal, tyre wear particulates are but a few examples of how the car is responsible for other pollutants or geological harm. The vehicle has negative impacts on other species (e.g. roadkill) and of course on other humans – the World Health Organisation estimates 1.19 million people die each year because of road traffic accidents (WHO 2023). These negative impacts are in addition to the operational consequences of CO_2 emissions and will continue to exist as the Internal Combustion Engine (ICE) is phased out in favour of Connected, Autonomous, Shared, Electric (CASE) vehicle designs.

1.1.4. What automakers are doing to mitigate the climate crisis

The climate crisis eclipses any recession, war, or even pandemic, as the greatest existential threat to humanity. Global heating caused by human activity is already having a profound and potentially irreversible impact on ecosystems, economies, and societies worldwide. The negative impacts of environmental change will accelerate and be felt by a greater proportion of the global population with the world's poorest communities facing the worst effects.

1.1.4.a. End of the ICE era

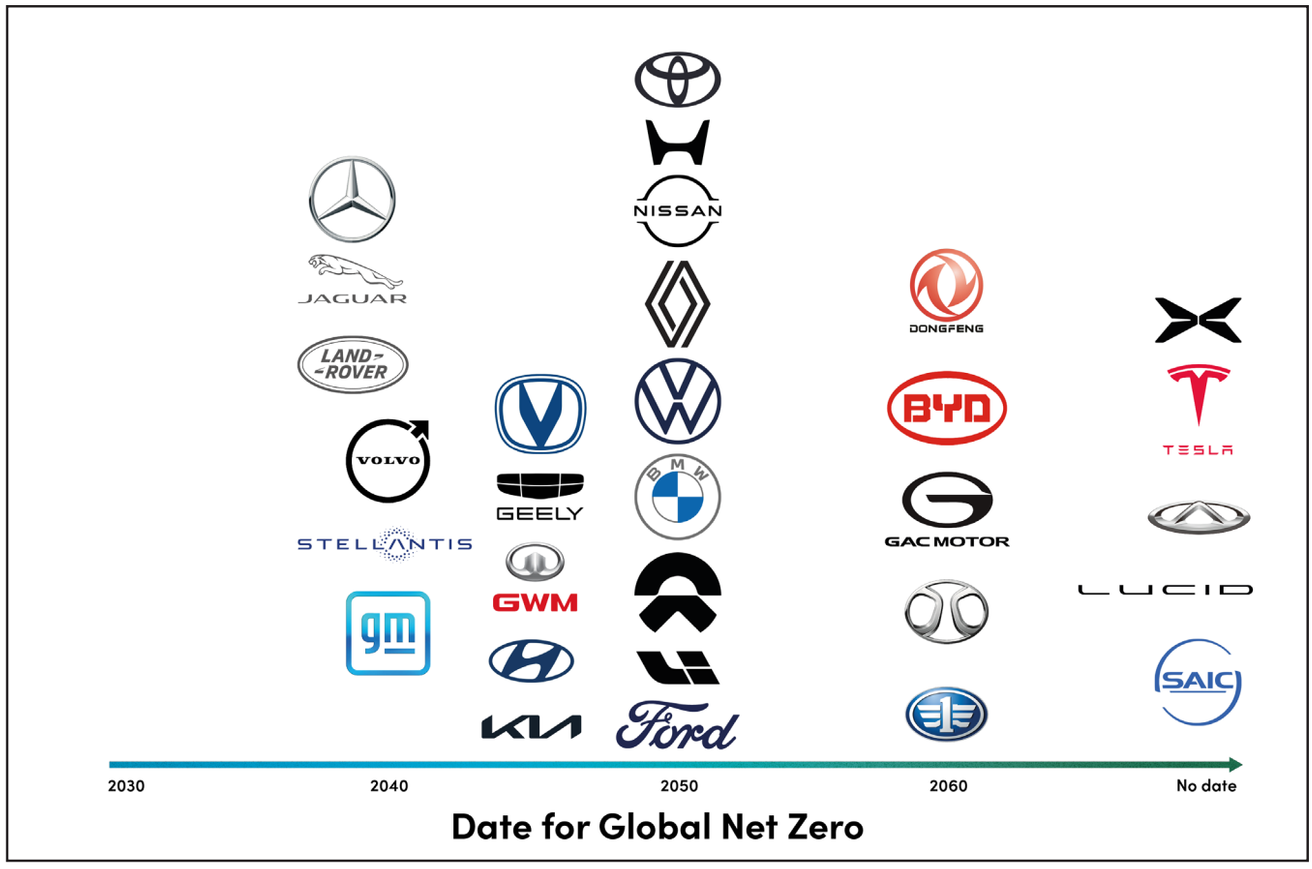
The ICE has powered the automobile for over a century and despite initially saving some cities from the pollution of horse manure and replacing coal powered transportation, the ICE is in large part responsible for the exponential growth in human generated CO_2 emissions during the 20th Century.

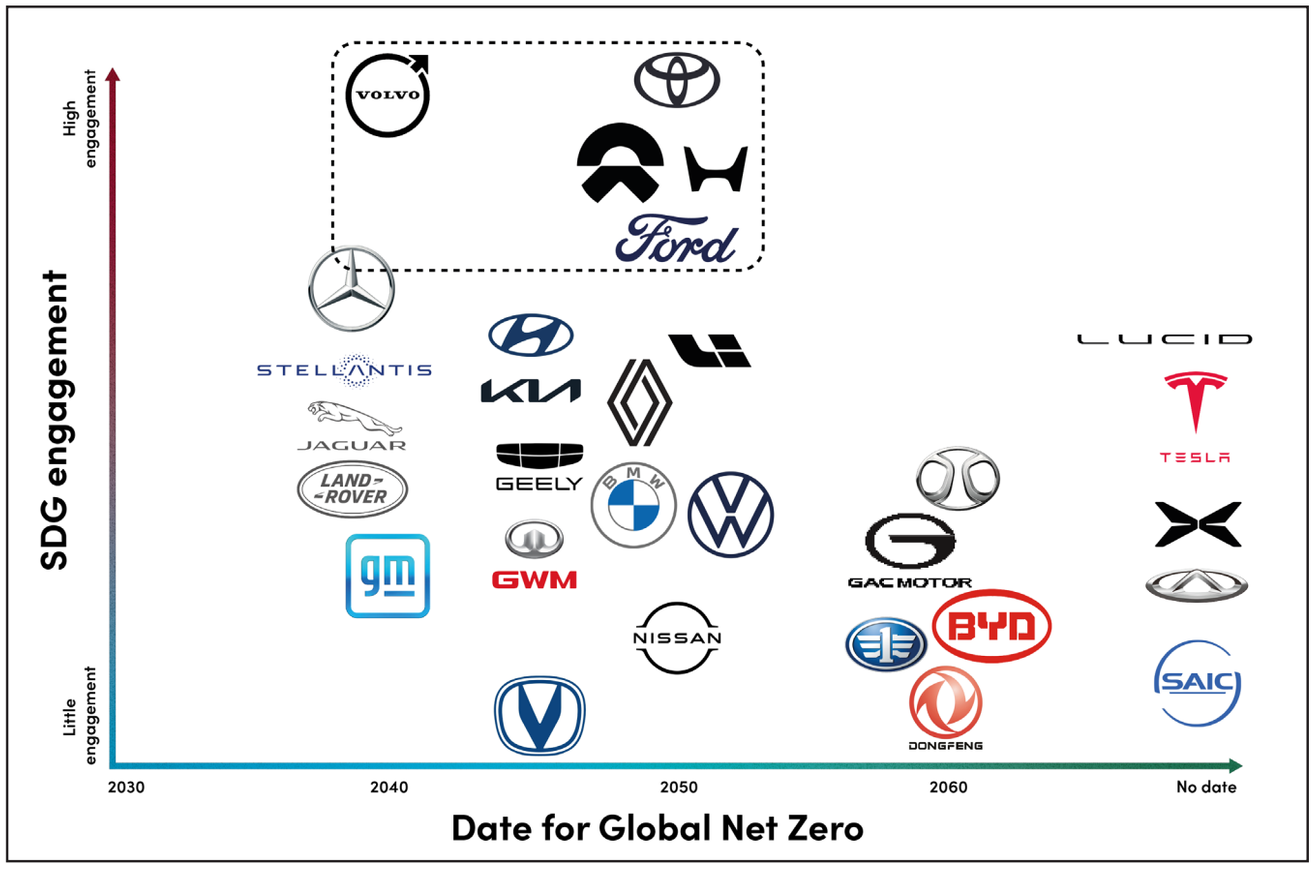
As of early 2024 all the major automotive Original Equipment Manufacturers (OEMs) have committed to phasing out the ICE and replacing it with less polluting drive train technologies – the umbrella term New Energy Vehicles (NEV) being popular with brands originating from China and including hybrid technologies that combine ICE with electric assistance (Mild, Full, Plug-in and Electric Range Extender the most common four types), Battery Electric Vehicles (BEV or just EV) and some brands also continue to experiment with hydrogen fuel sources (IEA 2023). Early 2020s EV designs have higher embedded CO_2, but lower operational CO_2 compared to ICE cars, so there is a 'breakeven' point in detriment between EV and ICE technologies at which the total CO_2 emissions are the same, and after which the EV has less (Volvo 2020).
Today, manufacturing the EV battery alone (its embedded emissions) will generate 3-10 tonnes of CO_2 (key factors being size of the vehicle, battery capacity and location of manufacture - approximately a tonne of CO_2 is produced in the making of a 14kWh (Kilo-watt per hour) battery / manufacturing 1kWh of battery produces about 75kg of CO_2) (Hall and Lutsey 2018). This adds between 5 – 20 tonnes of CO_2 produced in the manufacture of the rest of the car, so an EV today has 50-100% higher embedded emissions than that of a similar sized ICE design (Qiao et al. 2017).

Benchmarking EV embedded emissions is difficult – if not impossible - as CO_2 emissions in battery manufacture vary hugely between sources. MIT estimates that the CO_2 emissions for an 80kWh Tesla Model 3 battery "range between 2.4 tonnes and 16 tonnes" – a variance of more than 600%. (MIT 2022). Depending on type of battery, and the source of its raw ingredients, and (most importantly of all) the energy used in the extraction and processing

Right, top
Fig. 1.1.4.b.i.: Plotting OEM net zero commitment dates. 2024. Image by the author.

Right, bottom
Fig. 1.1.4.c.i.: OEM net zero commitment dates against alignment with UN Sustainable Development Goals. 2024. Image by the author.


2030
2040
2050
2060
No date
Date for Global Net Zero


SDG engagement
High engagement
Little engagement
2030
2040
2050
2060
No date
Date for Global Net Zero

of its ingredient materials. Most car batteries are lithium, made in China and use electricity generated by coal power. These combined characteristics mean that embedded CO2 emissions are high (Oxley 2023).

Over the lifetime of a car — typically taken to be 180,000 - 200,000 kilometres / 125,000 miles (and with no battery replacement) — CO2 operational emissions vary hugely: from about 18 tonnes for a fuel efficient ICE car to 70 tonnes for a large powerful ICE car; from near-zero emissions for an EV (where electricity is generated by solar or other renewables) to about 45 tonnes for a large powerful EV charged from a US/Global coal-heavy power generation mix — with the European mix (EU28) between (Ellingsen et al. 2016)

Alongside their efforts to electrify, OEMs are also investing in manufacturing and supply chain innovations that reduce the embodied emissions of the vehicle, and a few are already, or have signalled plans to, run their own electric charging infrastructure. Western origin brands most loudly communicate their efforts to achieve sustainable and ethical material supply also.

Despite (currently) having higher embodied emissions relative to ICE, the significantly lower operational emissions of an EV (even charging with today's most polluting energy mix, operational emissions of an EV are still ~65% that of an equivalent sized ICE) means that over their lifetime EVs are lower emission than a comparable ICE design (Buberger et al. 2022). Electrification offers a path to reducing the auto industry's CO2 emissions and both the embedded and operational emissions gap will only improve in EVs favour but electrification alone is not enough to reduce the automotive industry's emissions in line with aforementioned global heating targets (Osaka 2023).

1.1.4.b. Targets to reach net zero

'Net zero' aims to the balance the amount of GHG emissions produced and the amount removed from the atmosphere. Achieving net zero means that a country, company, or individual's emissions are effectively nullified by absorbing an equivalent amount from the atmosphere, through natural processes like afforestation or technological solutions like carbon capture and storage (CCS). The concept has gained prominence as a critical goal in the fight against climate change, aligning with the Paris Agreement's objective to limit global warming to well below 2°C above pre-industrial levels, aiming for 1.5°C (IPCC 2022).

Net zero is central to addressing the climate crisis because it offers a concrete target for reducing emissions and compels countries and corporations to overhaul their energy systems, transition to renewable sources, and invest in sustainable practices and technologies. By setting net zero targets, entities commit to reducing their carbon footprint, encouraging innovation in low-carbon technologies, and promoting a shift towards a more sustainable global economy.

The net zero concept is not without criticism (Anderson and Peters 2016). Setting net zero targets set for the mid 21st century is arguably delaying immediate action and undermining action to make the urgent reductions needed in the next decade, as per IPCC recommendations. Net Zero can further encourage "business as usual" attitudes by relying too heavily on unproven carbon removal technologies or offsets that may not be sustainable in the long term. Entities aiming for net zero are making use of carbon offset markets – these are often unreliable – and may not make a genuine contribute to additional emission reductions (Carton et al. 2021).

Net Zero has become the central focus point for OEMs to reduce their emissions as evidenced in Figure 1.1.4.b.i. This is due to both legislative push, and growing market pull – these forces strongest in Europe, with Chinese and American brands notably setting later, or no (public) net zero targets at all. The framework provides a relatively clear aim for companies to target (albeit at different time scales depending upon region) and provides a degree of accountability also, with organisations such as 'Transition Pathway Initiative' tracking individual automotive OEMs progress and benchmarking them relative to one another, and to other industries.

1.1.4.c. Aligning to UN sustainability goals

The ICE has powered the automobile for over a century and despite initially saving some cities from the pollution of horse manure and replacing coal powered transportation, the ICE is in large part responsible for the exponential growth in human generated CO2 emissions during the 20th Century.

In 2015 the United Nations General Assembly set out 17 Sustainable Development Goals (SDGs) as part of a universal call to action to end poverty, protect the planet, and deliver peace and prosperity to all peoples by 2030. These goals cover a broad range of social and economic development issues, including poverty, health, education, global warming, gender equality, water, sanitation, energy, urbanisation, environment and social justice. The SDG's provide a framework for government and businesses

to engage with the macro challenges humanity faces, and automotive companies are increasingly aligning their business strategies with the SDGs, recognizing the importance of sustainability for long-term profitability and corporate responsibility (UN DESA 2023).

Lukin et al. (2022) suggest that automotive OEMs are successfully aligning their corporate strategies with the SDGs:

"The results of the analysis showed that the observed companies in the automotive sector meet most of the goals of sustainable development of the UN with their sustainability strategies, which indicates that they are successfully adapting their business operations to modern business requirements. This also makes their brands green, hence the application of the principle of sustainability also affects the strength of their brands, adding "extended customer value"."

Figure 1.1.4.c.i. demonstrates that OEMs benchmarked in Figure 1.1.4.b.i. as having more ambitious net zero targets tend to integrate SDGs into their corporate strategies more tightly than those brands who have later net zero goals (or are more prepared to publicly communicate this integration). As with net zero goals, European brands are more enthusiastic in their adoption of SDGs than American or Chinese OEMs (Chinese brands who have not articulated Net-Zero dates are likely to be targeting 2060, in-line with China's goal to be Net-Zero before this date (IEA 2021)).

1.1.4.d. Becoming more purposeful

A few Automotive OEMs are following in the footsteps of other Business-to-Consumer (B2C) brands and making strong statements about their environmentally centric purpose (contributing to looking after the planet as their reason to be, other than for profit), and to address other ethical factors including workers' rights and sourcing of materials. The British Standards Institute (BSI) have published PAS 808:2022, a standard for purpose driven organisations (BSI 2023). PWC defines purpose as:

"Purpose is an organisation's reason for existing beyond just the financial. It sets out why the organisation matters, building on its core, differentiating capabilities, and articulates the value of the organisation to wider societal stakeholders. A corporate purpose should create value for both shareholders and stakeholders, and be the means by which a business generates profit. It is core to what an organisation does, and key to the business' strategy and operating model." (PWC 2023).

Outdoor lifestyle clothing brand Patagonia are one of the most enthusiastic adopters of 'purpose' in 2022 the Founder gifted ownership of the company to a trust, which will invest all profits not reinvested back into the business into efforts to tackle the climate crisis:

"Instead of 'going public', you could say we're 'going purpose'. Instead of extracting value from nature and transforming it into wealth for investors, we'll use the wealth Patagonia creates to protect the source of all wealth" (Chouinard 2022).

There are few (if any) businesses adopting 'purpose' as the radical reimagination of their broader societal and economic role, or structure in the same way as Patagonia. Citroën are one European OEM adopting the strategy and language or purpose led business, their CEO Vincent Cobée stating:

"Citroën believes the time is right to say 'enough' to the trend for excess and expense and to focus instead on creating pure, honest vehicles that are lighter, less complicated and truly affordable, as well as inventive and joyful." (Citroën 2022).

Other European brands making purpose-led statements include Mobilize (part of Renault Group), their tagline *"Together towards 0 carbon"* centres on the imperative to attain zero-carbon emissions (Mobilize 2022) and their very small shared EV product offer Mobilize Duo (Figure 1.1.4.d.i). Similarly, Dacia described their 2022 Manifesto concept (Figure 1.1.4.d.ii) as an: *". . . unrivalled vision for an essential, cool, robust, affordable and environmentally efficient car"* (Dacia 2022).

1.1.5. What impact can design have?

This chapter has laid out the deleterious contribution to climate change made by the automotive industry, and how at the corporate strategic level OEMs are engaging with the need to reduce their environmental and climate impact to a sustainable level in line with global targets. These cover all facets of business operations – now to be addressed is what design specifically can do to contribute to these efforts.

Recognising the limits of design praxis – rejecting the 'design thinking' mantra that suggests through design practice, designers are uniquely able to engage with any form of problem solving task, including the social and political – is a recurring theme of this thesis, and explored further in Chapter 3.1 - From Fordist to Neo-Fordist, which also describes the evolution of the design department and its role, responsibilities and status within an automotive OEM.

Design activities can target three key areas to contribute to lowering the emissions of a vehicle design:

1. Reduce Embedded - reducing material quantity (the amount of material that makes up a car); reducing use of energy dense materials (using materials and parts made from materials that require less energy to extract and/or process) (Song and Lee 2010: 547–56); reducing batteries (not something design can directly dictate, but design can enable the vehicle to have less batteries); designing for repairability (enabling the extension of the car lifespan) and for disassembly (ensuring the car can be disassembled responsibly and resources reused at the ultimate end of life) are key ways design can aid the reduction of embedded emissions within a car – which will become of fast increasing importance, as it both becomes an increasing proportion of the total CO2 emissions of a car, and as customer awareness of this area elevates.

2. Reduce Operational – reducing drag (The forces exerted on a car by aerodynamic drag is what most of the car's drivetrain energy is used to overcome. It is also the biggest area where car design can reduce operational CO2 emissions) (Szodrai 2020); reducing weight (reduces the energy needed to accelerate the vehicle (and its rolling resistance) (Cimprich, Sadayappan and Young 2023). This is the second biggest way car design can reduce operational CO2 emissions); Lessen secondary energy use (reducing energy not used for propulsion from powered elements of the car separate to its drive-train — HVAC being the principal one) are the three ways design can contribute to lowering operational emissions, which will remain a priority even when electricity is generated fossil free (Romero et al. 2024).

3. Behavioural change - Reducing CO2 emissions by changing user behaviour (Casper and Zachrisson Daae 2017: 316–34) — designing a car that in different ways engenders new ways of using and interacting with the vehicle that reduces CO2 (and other forms of pollution, or environmental harm). This is perhaps an area design (physical, digital and service disciplines) has the most unique contribution to reducing the environmental impact of the car.

1.1.6. Examples of leading recent designs with meaningful claims of engagement with sustainability issues

In automotive design, a 'production' design is one that is manufacturable and is on sale to consumers. An 'Advanced' design is a concept – it is not ready for manufacture and is not on sale to consumers, but are used by brands to indicate future design directions, including new production model previews, to showcase future design themes and to demonstrate new manufacturing processes and in-car technologies the OEM is developing.

There are very few production designs today that have a meaningful engagement with sustainability, apart from including a small component of recycled materials in the interior design. Instead a turn to recent (2021-present) advanced designs is needed to find evidence of how automotive design might make a positive contribution to lowering the impact of a vehicle design.

1.1.6.a. Polestar 0 project

Not a specific concept design, but a design led initiative from the Swedish all electric manufacturer Polestar (the only OEM with a CEO from a design background) to design and manufacture a net zero production car by 2030;

Right, top
Fig.1.1.4.d.i. Mobilize. 2022. Mobilize Duo. [photograph].

Far right, top
Fig. 1.1.4.d.ii. Dacia. Dacia Manifesto concept. [digital render].

Right, bottom
Fig. 1.1.6.a.i. Polestar. A badge of honour: Polestar 3 seat labels. [photograph].


Polestar 3
—
100% traced Nappa leather
8.1 kg CO_2e / m^2 material
Animal welfare secured

"The Polestar 0 Project aims to eliminate all greenhouse gas emissions from every aspect of the supply chain and production. From conception all the way to customer delivery, our goal is to meet our target without resorting to offsetting until there are solutions with proven results in place. This is how we define 0 CO_2e." (Polestar 2021)

This initiative is focused on achieving the net zero framework and is constituted of three dated phases; 2021-2025 Research, 2025-2027 Applied Sciences and 2027-2030 Product development. This project is a companywide endeavour but originating from the design department circular design and materiality is a core focus, and progress on these areas has been captured in design concepts including the 2020 Precept and 2022 Polestar O2 concepts – even if these are somewhat undermined by being generic executive saloon and sports convertible typologies. Tangible, if small, advancements in production designs in lowering CO2 are integrated into the brand identity and communicated consistently[1] (Figure 1.1.6.a.i.).

[1]Polestar is a long-term client of my employer Car Design Research Ltd (CDR), with CDR making the recommendation to Polestar to use labelling as a strategy to help customers realise greater value from Polestar's designs.

1.1.6.b. BMW I Vision Circular concept

Released at IAA Munich in 2021, this 4000m long concept is the first from a major OEM that demonstrated (if not wholly convincingly) circular systems design thinking, and BMW indicated that the design was a figurehead for their new 'Circular Design' approach compromised of four pillars (RE:THINK, RE:DUCE, RE:USE, RE:CYCLE) (BMW 2021).

The I Vision Circular championed its exterior (Figure 1.1.6.b.i.), interior (Figure 1.1.6.b.ii.) and Human Machine Interface (HMI) (Figure 1.1.6.b.iii.) as designed for disassembly, replete with 'Joyful Fusion' fasteners (significant design attention has been paid to connector mechanisms that secure the design without using glue and mean it is easier to disassemble at point of repair or end of life), it is compromised mostly of naturally derived or mono-materials (so is less intensive to manufacture and easier to recycle), and the exterior design showcases a 'no paint' finish – the paint shop accounting for ~80% of a car factory's Volatile Organic Compound (VOCs) emissions (Kim 2011: 1–9). The I Vision Circular concept was one of the first automotive concepts to bring circular design principles to design practice, if with some way to go to evidence this robustly.

1.1.6.c. Renault Scenic Vision concept

Released in Q2 2022 this concept (Figure 1.1.6.c.i) previewed the 2024 Scenic production design released in Q3 2023 and is tied to Renault's strategic sustainably aims and described by the OEM as: ". . . embodies the three pillars of Renault Group's sustainable development strategy: carbon neutrality, safety and inclusion" (Renault 2022).

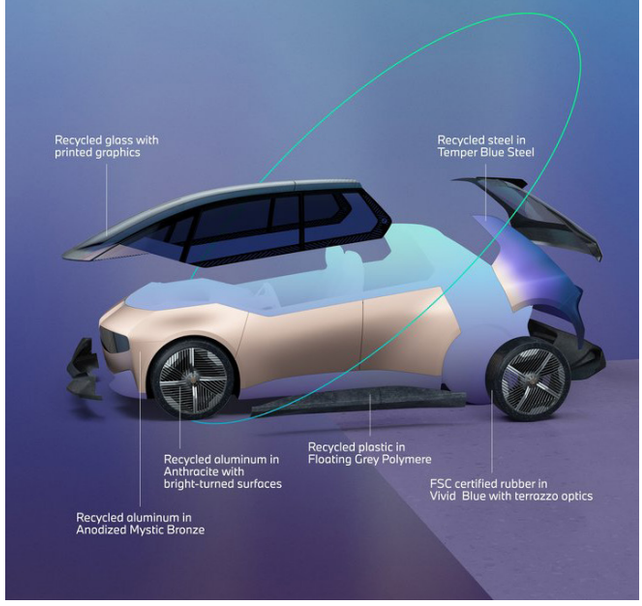
Right, top
Fig. 1.1.6.b.i. BMW. RE:THINK Sustainability and modern aesthetics. [digital render].

Far right, top
Fig. 1.1.6.b.ii. BMW. RE:THINK Luxurious, aesthetic and 100 % reusable. [digital render].

Right, bottom
Fig. 1.1.6.b.iii. BMW. RE:THINK The art of making high-tech tangible. [digital render].

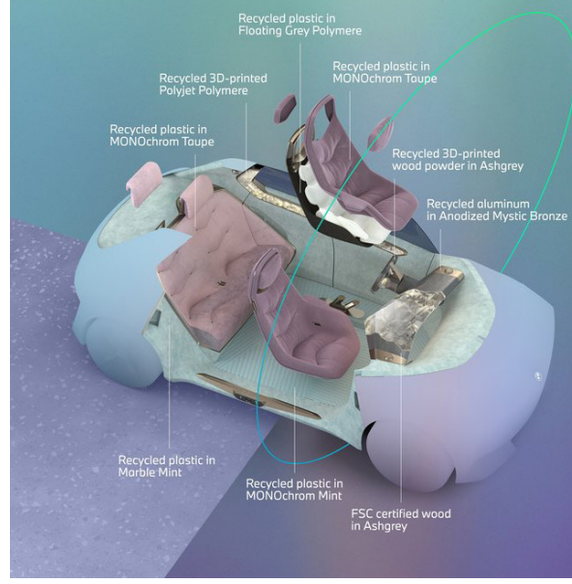
RE:THINK

SUSTAINABILITY AND MODERN AESTHETICS.
The exterior of the BMW i Vision Circular consists of nearly 100 % recycled monomaterials such as aluminum, steel, plastic and glass. The intrinsic behavior of the materials and gentle surface finishing create an engaging aesthetic of sustainability. The high-quality materials can be returned directly to the material cycle with little effort.



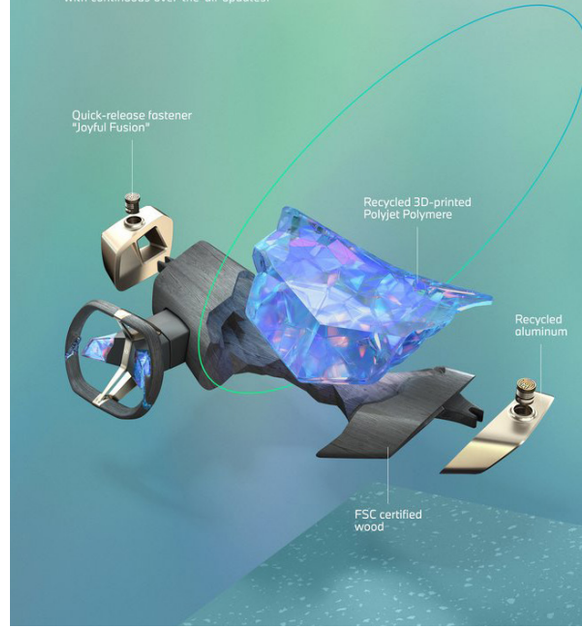
RE:THINK

LUXURIOUS, AESTHETIC AND 100 % REUSABLE.
The BMW i Vision Circular offers a luxurious interior experience on a small mobile footprint. Monomaterials, i.e. pure materials and no composites, are the basis of closed material cycles. Therefore, the high-quality interior is made of materials that have already been recycled and can later be 100 % reused.



RE:THINK

THE ART OF MAKING HIGH-TECH TANGIBLE.
The instrument panel of the BMW i Vision Circular has been completely rethought. Its' stripped back elements are made of wood and recycled materials with a high-quality aesthetic. Quick-release fasteners ensure easy disassembly and uncomplicated return of the components to the material cycle. At the same time, the vehicle's digital intelligence is which keeps it up to date with continuous over-the-air updates.



This plug-in hydrogen fuel-cell range extended EV is made from 70% recycled and 95% recyclable materials and low-carbon batteries. The design ties sustainability with customer health and wellness also, with driver and passenger safety features including HMI biometric monitoring features such as the steering wheel mounted heart rate monitor that displays a read out on the steering wheel.

This design arguably positioned Renault as a leader in net zero car design – sustainability innovations were central to the formulation of a strong theme that ties HMI with interior and CMF (Figure 1.1.6.c.ii) for a storied, logical and holistic design proposal - though it perhaps set the bar too high for the 2024 Scenic production design to feasibly meet.

1.1.6.d. Citroën Oli concept

This design came after the production Citreon Ami, a very small production EV designed for cities. The Oli was announced as Citroën made a commitment to being purpose-led and declaring that there was a need for less consumption in the automotive industry. Oli realises a spectrum of different approaches for more sustainable design, using these to aesthetically differentiate in a way that few other brands have.

The vehicle footprint is smaller than other designs in the segment, and the exterior design contributes to reducing the operational energy use – the side windows aim downwards ("inverse tumblehome") to reduce solar gain (Figure 1.1.6.d.i). The interior is reduced in part count, features, and form — BASF Elastollan® - a recyclable 3D-printed Thermoplastic Polyurethane (TPU) is used to produce a light weight chair design and the car and phone information projected into windscreen base to reduce the need for screen components (Figure 1.1.6.d.ii).

1.1.7. Conclusions

The automotive industry has and will continue – even with the adoption of non-ICE powertrains – to have a significant impact on the climate through embedded and operational emissions. Going electric is not enough (Hill et al. 2019), and the transition to sustainable transportation emissions will be achieved by replacing journeys made by the private vehicle (car) with lower carbon forms of transport (public transport, walking, cycling) (Banister 2008).

In the medium term (mid 21st century) there will continue to be strong demand for private vehicles, particularly from consumers in developing economies (Dargay, Gately and Sommer 2007). There will also be those with genuine need for a vehicle – often those in non-urban, overlooked rural areas are most reliant on the vehicle due to poor public transport provision (Bosworth et al. 2020).

Producing and operating fewer private vehicles globally will be critical to achieving sustainable transportation, but much of the automotive industry (except for the luxury sector) is based upon high volume, low margin (Correa and Stricker 2023), (Guan et al. 2022). In a world with fewer cars that are designed and manufactured as they are today, many established automakers would be out of business. If the private vehicle is to continue the industry will need to find new business models (Wells 2013) and with them alternative forms of manufacturing that are profitable at lower volumes, and tentative steps are being made by automakers and in academia to establish a framework for the adoption of circular business and manufacturing principles by the automotive industry (Aguilar Esteva et al. 2021), (Garcia 2023).

Right, top
Fig. 1.1.6.c.i. Renault. Renault Scenic Vision Concept. [photograph].

Right, bottom
Fig. 1.1.6.c.ii. Renault. Renault Scenic Vision Concept - Labelled sustainable materials. [photograph].


RENAULT


FLOOR
45% MILK BOTTLES
55% PLASTIC PIPES
100% RECYCLED

At a corporate level the automotive industry is now engaging with sustainability issues and most major OEMs recognise the need to reduce their climate impact in line with Net Zero goals and play a better role as a global citizen also (evidenced in 1.1.4.). This engagement is less evident in the design department (1.1.5.). Most automotive design OEMs do not place sustainability as a core focal point for their design, which remains subservient to brand. Design has limited scope to effect embedded and operational emissions relative to engineering but could be playing a greater role in both areas. Design is uniquely able to influence customer behaviour towards more sustainable action and could be taking so much more of a leadership position.

Some brands are explicitly engaging with Net Zero in their advanced design activities. No brand has sought to design a vehicle that responds to the UN Sustainable Development Goals. Design might most directly engage with Goals 8, 9, 11 and 12 and there is opportunity for brands to use these goals as part of their design strategy, and for design (advanced and production) to tangibly evidence their engagement with Net Zero and UN SDGs initiatives.

Other design disciplines (architecture, fashion, consumer technology) have an active discourses on sustainability issues, evidenced by the number of cross industry initiatives these sectors have; Architecture has 'Breeam', 'USGBC Leed' and 'WELL Building Standard'; Fashion has the 'Ethical Fashion Initiative', 'Unfashion Alliance' and 'The Butterfly Mark'; and Consumer technology can be 'C2C Certified', 'EcoRating' and 'TCO Certified' – yet automotive design has none.

Designers are perhaps the 'canaries' of the industry – and by designing concepts that champion more extreme ways to reduce carbon footprints (if with still a very long way to go, in a very short time) – designers do have the power to inspire other parts of the business and bring them with them. Automotive design today is largely engaged in window dressing, using small amounts of lower impact materials. There is no cross-industry effort to establish and share best practice and too few are challenging the aspects of existing business models and related construction and manufacturing techniques that are driving the automotive sectors contribution to the climate crisis, or proposing new ones that would have a positive impact in reducing this contribution.

Right, top
Fig. 1.1.6.d.i. Citroën. Citroën Oli Concept exterior design. [photograph].

Right, bottom
Fig. 1.1.6.d.ii. Citroën. Citroën Oli Concept interior design. [photograph].


AH-080-MX

Chapter 1.2 – The new challenges of Connected, Autonomous, Shared and Electric (CASE) mobility

Chapter 1.2 – The new challenges of Connected, Autonomous, Shared and Electric (CASE) mobility

1.2.1 Introduction

Chapters 1.1 and 1.3 consider factors external to automotive design that point to a future where vehicle designs might need to become more flexible or adaptable in their design. This chapter centres around the term 'CASE' (Connected, Autonomous, Shared and Electric, sometimes also abbreviated ECAS) that is used to describe four macro technological and social trends that have a closer point of origin to the automotive industry and are already instrumental in shaping its future.

1.2.1.a. Aims and Objectives

This chapter addresses research question one; *What are the macro trends (political, social, economic, cultural and technical) that will influence the automotive design practice in the 21st century?*

And question two; *Is automotive design practice in its current form successfully responding to these changes, or is it equipped to do so in the future?*

This chapter provides a brief history of automotive design (1.2.2.) and introduces the four factors that constitute the CASE acronym (1.2.3.). A summary analysis of the discourse around CASE mobility suggests that increasing the utilisation rate of a vehicle will be a key factor in future designs (1.2.4). 1.2.5. examines the influence utilisation is having on contemporary automotive design practice and 1.2.6. predicts that under current trajectories the methods of vehicle design and construction used today are unlikely to offer mobility products or services with the flexibility to accommodate the broad range of use cases increased utilisation will demand.

1.2.1.b. Methods

This chapter was written from knowledge generated through Literature Review A (Automotive) (Chapter 2.4.1.a.), Practice and Artefact Review A (Automotive) (Chapter 2.4.1.b.) and Expert Interview (Automotive) (Chapter 2.4.1.c.).

1.2.2. is written from key texts (see Chapter 2.4.1.a.) and author's knowledge as a practicing design strategist (the described structures, roles and responsibilities of designer are typical of the industry and are common knowledge to any automotive design professional, or student).

1.2.2. A summary of the automotive design department today

Chapter 3.1. examines the evolution of automotive design practice and the politics that shape it.
This section is a short introduction to automotive design practice to provide a historical context for the analysis of CASE influence today and into the future.

The private vehicle (car) is a distinctly 20th century object. It was introduced at the turn of the century to move a person from one place to another, offering them a convenient form of mobility. As the century progressed, the design of the vehicle was indelibly shaped by the introduction of mass manufacturing techniques: the production line, then just-in-time manufacturing and then the introduction of platform-based manufacturing. By the end, the car was the zenith of mass-production; it was the most complex consumer product.

The role of the automotive design department has been to deliver exterior and interior designs suitable for mass manufacture, whilst increasing the value offer of the vehicle to the customer beyond the basic movement from one place to another.

Car designs in the 20th century were oriented on the American and European customer and designed for private ownership by the nuclear family (evidenced by the standard four or five seat layout). Throughout the century automotive design demonstrated a responsiveness in greater or lesser degrees to changes in political, social and economic factors: the 1970s hatchback was a response to the oil crisis, the 1980s brought sports and performance infused designs to the rising number of newly wealthy single customers and the 1990s SUV and SUV-like designs that offered customers a design that enabled, or projected, and active outdoor lifestyle.

In the early 21st century the automotive design group can be summarised as constituted of four key departments: Exterior (the overall volume of the vehicle, the proportion of key elements (derived from the wheelbase), the form of sheet metal surfaces and any other design details on the outside of the vehicle); Interior (the internal volume,

positioning of the seats relative to the Instrument Panel (IP)); Colour, Material and Finish (CMF, also termed to as Colour and Material Design or CMD) responsible for these elements of design across exterior and interior; and Human Machine Interface (increasingly referred to by the broader terms User Experience (UX) and User Interface (UI) design) traditionally responsible for the driver interface, but now including all elements of digital design across the interior, and connected services the customer might also use when external to the vehicle.

All major automakers (also referred to as Original Equipment Manufacturers (OEMs) have their own design departments under a design director. The primary output of OEM design departments are 'production' designs – those ready for mass manufacture, but also includes 'concept' or 'advanced' designs. Advanced design activities are used to preview future production designs, design themes, new technologies or production techniques and can be part of wider brand design initiatives that signal a new strategic direction the company plans to take. OEMs often rely on a 'tiered' supplier system, these external suppliers providing additional inputs to a vehicle's design, particularly technological solutions to facilitate production efficiency and additional features for product differentiation. These tiered suppliers have their own design departments who work with the OEM client design team to integrate their design and technology offering with the clients' design, and sometimes produce their own design concepts or technology showcases.

Most mainstream automakers work to tight profit margins and so the leading strategic use of design is to elevate the product (and increasingly the brand) offering to realise a more premium position, as premium and luxury automakers enjoy healthier margins – as evidenced by the popularity of the SUV and reluctance of OEMs to move away from this larger and therefore more profitable topology. Beyond vehicle topology (size) other key elements in realising more premium designs include driving performance, comfort, the level of technologically enabled features and the nature of their delivery, and more recently evidencing engagement with issues of sustainability, ethical provenance, and safety (the level of resonance and therefore impact in pushing premium these last three factors have vary greatly between markets and customer profile).

1.2.3. Connected Autonomous Shared Electric mobility

1.2.3.a. Connected

The vehicle was once a purely analogue machine. Today, vehicles are internet connected, offering customers new product and service features. Brands now compete on the level of connected services they directly offer the customer: as a mobile data hotspot; entertainment (e.g. media streaming via the infotainment system); or remote interactions with the vehicle, e.g. pre-loading route information based on data synced from the customer's digital calendar) (Macduffie and Keith 2020). Consumer technology brands are moving into the automotive space - Alphabet's Android Auto and Apple's Apple CarPlay offer 'skins' over the OEM's HMI design that connect the vehicle with the customer's smartphone - bringing the vehicle into these digital ecosystems and offering new features and services as part of the customer's 'digital lifestyle' (Strayer et al. 2019). Deeper integration is offered through Android Automotive OS, upon which OEMs are increasingly choosing to build their entire HMI system upon (Kessels 2024). Chinese smartphone brands Huawei and Xiaomi have gone further still and offer their own Battery Electric Vehicle (BEV) products that are even more tightly integrated with their digital ecosystems (Culpan 2023). The greatest value connected vehicles offer customers is perhaps through more in-direct functionality: Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I) and Vehicle-to-everything (V2X) communication enables real-time traffic management, enhancing safety by predicting and preventing collisions, and optimising route efficiency to reduce congestion (Wang et al. 2019). This new form of connected vehicle offers additional value to the customer and to the wider environment the vehicle is in – with profound implications for urban planning as traffic can theoretically flow more seamlessly – so the vehicle might become more considerate towards those external to it.

1.2.3.b. Autonomous

Autonomous driving (AD) systems automate elements of the driving system. The SAE's 'Levels of Driving Automation' defines six classifications of automation that run from L0 (No driving automation) to L5 (Full Driving Automation) (Society for Automotive Engineers 2021). By removing the need for a human driver Autonomous Vehicles (AVs) could radically improve road safety by eliminating human error, make travel more accessible to those who cannot drive and could lower the cost of transportation (Fagnant and Kockelman 2015). For automotive design the idea of giving 'the driver their

time back' unlocks an entirely new value proposition: the vehicle is no longer just a way to get from A to B, but space that can offer the customer additional value in the journey time between A and B.

The most leading production vehicles in 2024 are just achieving L3 (Conditional Driving Automation), and some technology demonstrators are approaching L4. AD has become somewhat controversial in recent years; OEMs over promised in the late 2010's that full self-driving systems were near production, but neither full (L5) or high (L4) autonomy are yet available. Developing safe, reliable and cost-effective AD systems is proving difficult. The challenges are technical (developing the right software and hardware), regulatory (developing vehicles that proven to be safe and reliable) and financial (developing business models around these vehicles that begins to recover investments, whilst being attractive to consumers). In response OEMs are scaling back their ambitions. Tesla have faced pressure over their so-called 'Full Self-Driving' capabilities and have had to rebrand it as 'Enhanced Autopilot', likely in response to regulatory and criminal investigations (Hawkins 2022). AD research company Argo AI, backed by brands including Ford, VW and Lyft, announced that it was shutting down in October 2022 (Korosec 2022) and Waymo, which has a test program in San Francisco has faced controversy over vehicle accidents and campaigners who are politically opposed to the automation of human labour. OEMs are continuing their AD research programmes – much of the technology is being used to enhance Advanced Driver Assistance Systems (ADAS) – and this research project maintains that full (L5) AD systems will one day replace the human driver but acknowledges that this technology will take much longer to arrive than expected.

1.2.3.c. Sharing

Sharing challenges the notion of car ownership. The 20th century car customer bought their vehicle as a private good: they might have lent it to another member of their household, family or friend but otherwise it was for their exclusive use. The private ownership model is being challenged by the concept of 'Mobility as a Service' (MaaS) that enables customers to access a car on demand (Jittrapirom 2017). Car sharing services like Zipcar have fleets of cars and vans dispersed across cities that customers can book to use for minutes, hours or days as they need. Turo and Getaround are peer-to-peer platforms that enable car owners to make money renting their car out to those temporarily needing a vehicle. Ride-sharing (ride-hailing a driver in their privately owned vehicle) is a MaaS model operated by brands including Uber, Lyft, Bolt. Some MaaS platforms integrate car or ride sharing with access to other forms of transportation (e.g. public transport, bike rentals) and travel planning, booking and payment to offer the customer multi-modal forms of transportation. MaaS models enable different customers to use the same vehicle, challenging automotive design to offer value and a positive brand experience to multiple people in one design. Cars designed for sharing might be more flexible in their construction (so easily adapted for different use cases) and they could be more durable (requiring less maintenance when being used more often). Adopted at scale, sharing vehicles and integrating them with other forms of transportation could reduce the total number of cars on the road, so lower emissions and reclaim urban space from parked cars.

1.2.3.d. Electric

The environmental imperative for mobility going electric is made in Chapter 1.1. Electrification is perhaps the most tangibly evident of the four CASE pillars in vehicles today. BEV drivetrains are influencing exterior proportions - the lack of Internal Combustion Engine to accommodate means these vehicles having longer wheelbases with shorter front and rear overhangs – and means that interior designs can offer more space than an ICE design (Barker 2023), (Scherr 2021). Electric vehicles are batteries on wheels that are being integrated into energy systems. Vehicle to Grid (V2G) describes the bi-directional energy flow that enables BEVs to draw power from the grid to charging and to return this when demand is high (Das, Rahman and Tan 2020). The customer might use the vehicle to power their home at certain times of the day, or when away from home (e.g. when camping) the vehicle can be used to power accessories and thus enabling new vehicle-based experiences. The larger interior envelope of Electric vehicles and their ability to quietly power onboard infotainment or other devices when parked up means they can be uniquely used as a 'Third space' - a place one chooses to spend time in that is not home, not work (Hawkins 2017). This trend is being adopted faster in China mainly for use by individual customers to take a break from '996' work culture. It is being adopted slower in America and Europe, but nevertheless represents a shift in the role the vehicle plays in the customer's life and opens new uses facilitating private/individual, and possibly more shared/social, experiences in the vehicle when it is static.

1.2.4. Summary analysis of the CASE discourse

Using the methods outlined in 1.2.1.b and in Chapter 2, a summary review of the published literature on CASE factors has been conducted. The body of published

material is overwhelmingly written by those from a non-automotive design perspective, reflected of the lack of critical discourse in automotive design and reflection on practice by leading design professionals as explored in Chapter 3.1.

1.2.4.a. The wider discourse

Researchers from transportation, civil infrastructure and urban design backgrounds consider customer perceptions of CASE enabled mobility: (Wu, Hua and Wang 2020), (Woldeamanuel and Nguyen 2018), (Saeed et al. 2020), (Wang et al. 2020) and the barriers to adoption of vehicles and services enabled by these factors: (Mahdavian et al. 2021), (Thomas et al 2020). An extensive body of work examines the impact CASE mobility will have on policy and sociology (Milakis, Van Arem and Van Wee 2017), (Aarhaug and Olsen 2018), road and transportation networks, the built environment and the role CASE mobility could play in reducing the CO_2 emissions and other environmental destructive aspects of personal mobility: (Zardini et al. 2022), (Othman 2022), (Harris et al. 2021), (Gawron et al. 2019), (Greenblatt and Saxena 2015). Research has been conducted through focus groups to interview planning practitioners and capture their perspective on CASE mobility futures (Habib and Lynn 2020), and workshops bring together multi stakeholders to consider the business model implications of CASE (Merkert, and Z. Wong 2020). The business model opportunities of CASE are a subject of much discussion (Athanasopoulou et al. 2019), (Coppola and Silvestri 2019).

CASE is addressed as a set of technical factors (Vermesan et al. 2021), though some push back against this which they see as an automobile centric paradigm; Oguri, Kawanaka and Ono (2021) propose "Another CASE... Comfortable, Accessible, Safety, and Enjoy/Exciting" as a human centric framework through which to consider future mobility scenarios.

1.2.4.b. Human factors, ergonomics and the design of AVs

With few practicing automotive designers engaging in formal published methods of critical engagement, research that reflects on future creative design processes and frameworks for approaches to design AVs tends to come from a human factors or ergonomic perspective. There is general consensus within this community that: "Vehicle automation is not technical innovation alone, but is a social as much as a technological revolution consisting of both attendant costs and concomitant benefits." (Hancock et al. 2020) and there is a discussion as to how effectively human factors research is keeping up with AV developments (Waterson 2019), (Salmon 2019).

A significant body of research examines how AVs can be designed to be safer for customers and all roads and methods for AV designs to build familiarity and trust with users: (Diels et al. 2023), (Diels et al. 2022) and (Halkias and Sadvandi 2019). Inclusivity is a major theme with proposals for AVs to be designed to better accommodate users with additional accessibility needs (Tabone et al. 2021), (Severs et al. 2022). Practice-based research centres around the design of simulators that can be used to test in-vehicle AV experiences (Amanatidis, Langdon and Clarkson 2020) and user interaction design with new forms of interfaces in automated vehicles (Stanton et al. 2021).

Consideration of user comfort is a growing area of AV design research with significant implications for creative automotive design practice. Diels et al. determine the need for new frameworks for comfort, to reflect the new opportunities in design and experience afforded by AV technology (2017). Wasser et al. argue that passenger comfort experience will become a key opportunity point for design to add greater value to the AV mobility experience, suggesting that not enough attention has been paid to this topic and: "introduce a conceptual comfort framework for the design of such future vehicles and analyse and compare the current concepts in the context of the passenger comfort experience." (2018).

Jackson and Salanitri (2020) state, writing as part of SUaaVE (SUpporting acceptance of automated Vehicle) a pan-European project intending to improve acceptance, trust and comfort in future AV designs through the ALFRED system concept:

"People want to be comfortable, and perception of what makes each user comfortable can vary greatly. This makes it important that vehicle products meet the different expectations of users through flexibility in their interior environment design."

They propose:

"...a theoretical framework for an adaptive model, with comfort componentised into attributes. Application of the model aims to drive a response to vehicle user's individual characteristics and preferences - such that their comfort can be optimised intelligently by manipulation of vehicle features and functions as part of the ALFRED concept."

1.2.4.c. The need for greater utilisation

In 2017, Masoud and Jayakrishnan noted:

"Although autonomous vehicles are believed to introduce many safety, mobility, and environmental benefits, they will be initially priced relatively highly..."

and propose:

"...a shared ownership program in which households form clusters that share the ownership and ridership of a set of autonomous vehicles. Such a program will increase the utilization rate of vehicles, making ownership of autonomous vehicles more economical."

Narayanan et al. (2020) conducted a comprehensive review of studies predicting the efficiency gains shared AV services could offer transportation systems and found:

"Most studies point towards an increase of mobility... and an increase of efficiency for the transportation system (vehicle replacement and utilization, as well as emission reduction)."

Nunes and Hernandez's 2019 study 'Autonomous taxis & public health: High cost or high opportunity cost?' found that:

"In a single ridership 'autonomous taxi' model, we find capacity utilization rates would need to improve from 52 percent to 100 percent and profits lowered by 37 percent (from 27 cents to 17 cents on a per-mile basis) for autonomous taxis to offer fares that are comparable with personally owned, conventional vehicles. In a multiple ridership model, the affordance of these fares requires a 30 percent increase in vehicle occupancy (from 1.67 to 2.2) and a 75 percent increase (1.67 to 2.92) were even lower fares offered to incentivize shared, autonomous taxi use over personally owned, conventional vehicles."

How Shared Autonomous Vehicle (SAV) systems are delivered influence their impact, Golbabaei, Yigitcanlar and Bunker (2021) suggesting that dynamic ridesharing services, delivering vehicles on demand could reduce the required SAV fleet size, congestion, travel cost and parking demand. Hyland and Mahmassani (2020) found that shared ride services with AVs result in lower user waiting times and lower operational costs for operators when compared to non-shared services, when the demand pool is sufficiently large. Liu, Li and Dai (2022) have used license plate recognition data from Langfang, China to vehicle travel demand information within the city and established that:

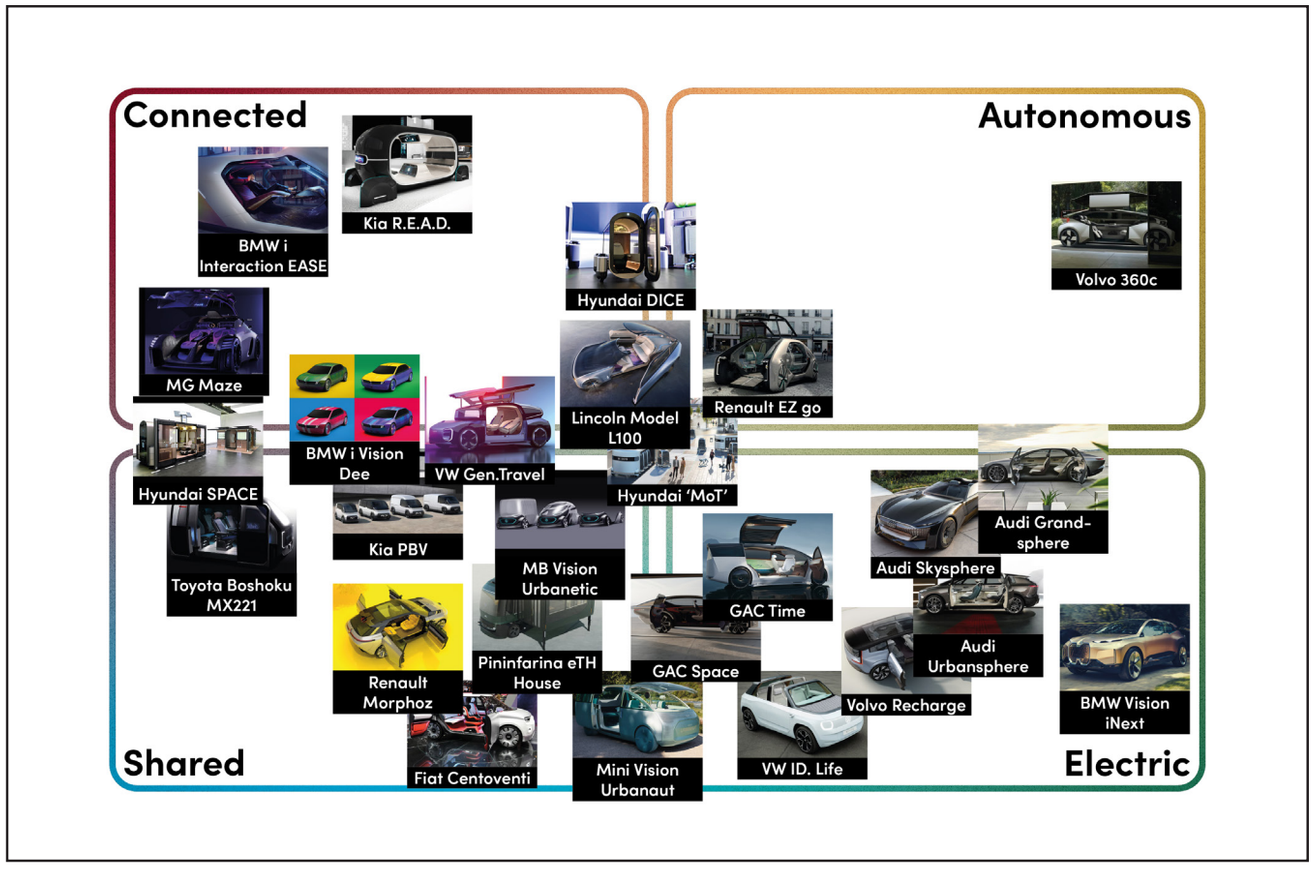
"Under the shared mobility scenario with 100% ride-sharing and car-sharing participation levels, one SAV can potentially replace 3.80 private conventional vehicles in the road network."

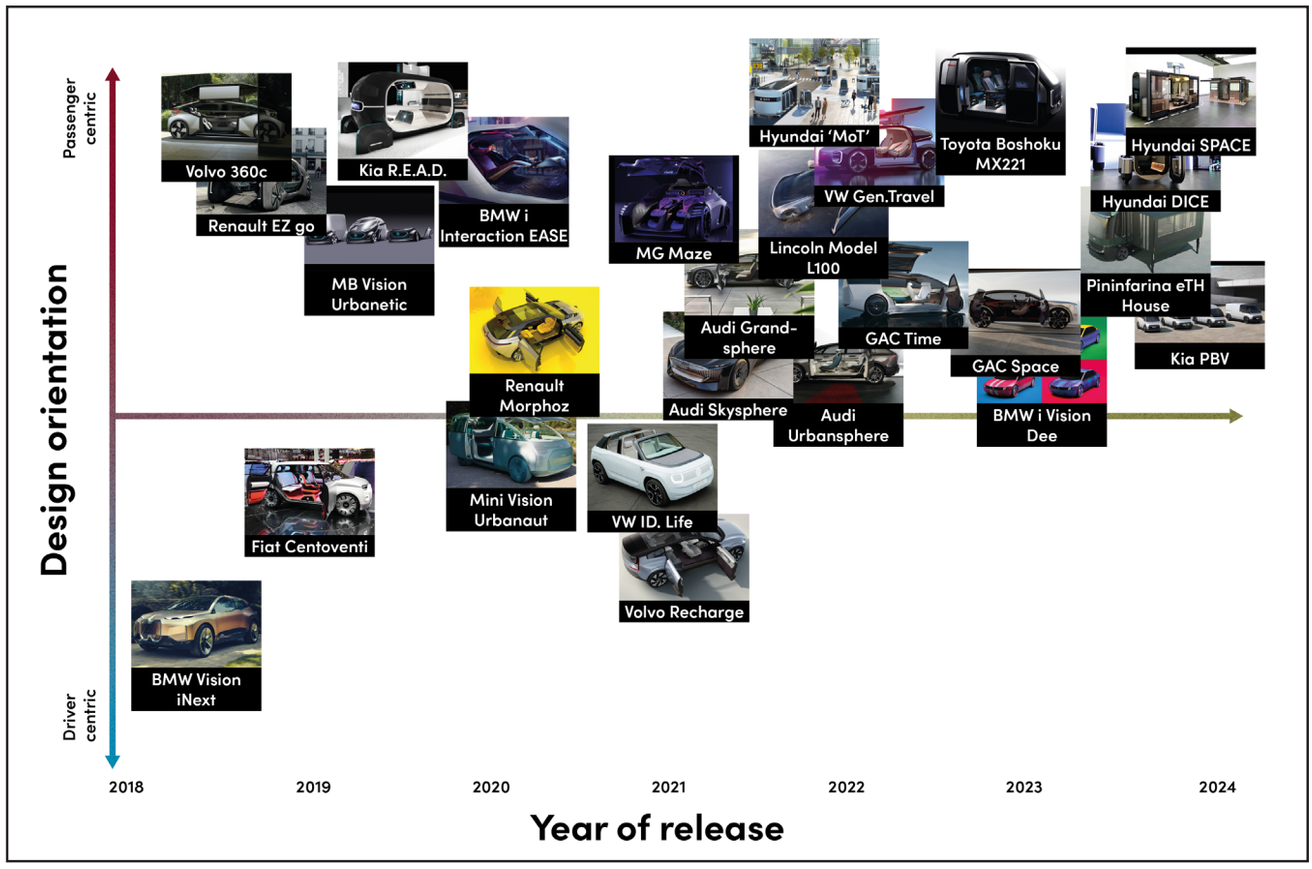
Counterpoints to these perspectives include Keith et al. (2022) who examine the impact shared vehicle services (and increased vehicle utilisation) could have on total vehicle sales and argue that this factor alone will not reduce new vehicle sales. This research is within the context of shared driver operated vehicles; the evidence suggests that SAV's will reduce the total number of new vehicles required through a more compelling value offer: travelling from A to B, but also giving the driver their time back during that journey. Mohammadzadeh critiques the 'positivist-empiricist' approach of research to questions of SAV and vehicle ownership. Based on Reflexive Thematic Analysis (RTA) analysis of questionnaire and focus group research conducted in Auckland they found:

"...there was considerable heterogeneity in participants' preferences for using AVs, but relatively less heterogeneity in sharing mobility services. The research reveals that the provision of alternative smart shared mobility options does not subsequently reduce pervasive car ownership."

Right, top
Fig. 1.2.5.i.: Plotting key concept designs 2018 – 2024 against CASE factors. 2024. Image by the author.

Right, bottom
Fig. 1.2.5.a.i.: Key concept designs 2018 – 2024 design orientation. 2024. Image by the author.


Connected
Autonomous
Shared
Electric
BMW i Interaction EASE
Kia R.E.A.D.
Hyundai DICE
Volvo 360c
MG Maze
Lincoln Model L100
Renault EZ go
BMW i Vision Dee
VW Gen.Travel
Hyundai 'MoT'
Hyundai SPACE
Audi Grand-sphere
Kia PBV
Audi Skysphere
Toyota Boshoku MX221
MB Vision Urbanetic
GAC Time
Audi Urbansphere
Renault Morphoz
Pininfarina eTH House
GAC Space
Volvo Recharge
BMW Vision iNext
Fiat Centoventi
Mini Vision Urbanaut
VW ID. Life


Design orientation
Passenger centric
Driver centric
Year of release
2018
2019
2020
2021
2022
2023
2024
Volvo 360c
Kia R.E.A.D.
Renault EZ go
BMW i Interaction EASE
MB Vision Urbanetic
Hyundai 'MoT'
Toyota Boshoku MX221
Hyundai SPACE
VW Gen.Travel
Hyundai DICE
MG Maze
Lincoln Model L100
Pininfarina eTH House
Audi Grand-sphere
GAC Time
Kia PBV
GAC Space
Renault Morphoz
Audi Skysphere
Audi Urbansphere
BMW i Vision Dee
Mini Vision Urbanaut
VW ID. Life
Fiat Centoventi
Volvo Recharge
BMW Vision iNext

Mohammadzadeh's critique of the attitude of many researchers in the field of SAV research is compelling – the certainty of faith placed in technology can be hard to escape – but their conclusion: "AVs should be considered as a technological transformation rather than a paradigm-shift towards shared mobility services" seems misplaced. This research is based on a relatively small sample size and from one location at one point in time so their assertion, far from the conclusions of the published body of knowledge, has little weight.

Mohammadzadeh places significant weight on the: *"ideological and symbolic functions of car ownership"* which they suggest: *"have often been neglected when discussing AVs of the future."* This perspective ignores a wide body of evidence that suggests for many customers, car ownership is neither a functional necessity or something they aspire to. In Europe, car use between 2000 and 2019 declined by about c.1,700 km/year (Odyssee-Mure 2023). Research by McKinsey suggests young Europeans are less likely to use private cars and increasingly use public transit and micro-mobility instead (McKinsey 2023), whilst the number of young people (17-25) in the UK with driving licenses fell from 3.32m in March 2020 to 2.97m in 2021 (Davies 2021). Because declining need and desire for vehicle ownership is evident in Europe does not mean this is true globally. Europe is the oldest vehicle market so other regions may follow it when they reach similar levels of maturity, and it is arguably one of the most complex evidenced by a strong divide between urban and rural. A highly utilized SAV system might seem the preserve of urban environments where the distance vehicles must travel between customer are shorter; however research in Switzerland by Imhof, Frölicher and Widar (2020) found that flexible and adaptable shared AV systems could be more cost efficient than a traditional public transport network in rural areas.

The published literature demonstrates that AVs used as part of a MaaS system could offer new forms of mass transit that are convenient and profitable if these systems are efficient with the vehicle asset and ensure a high rate of vehicle utilisation.

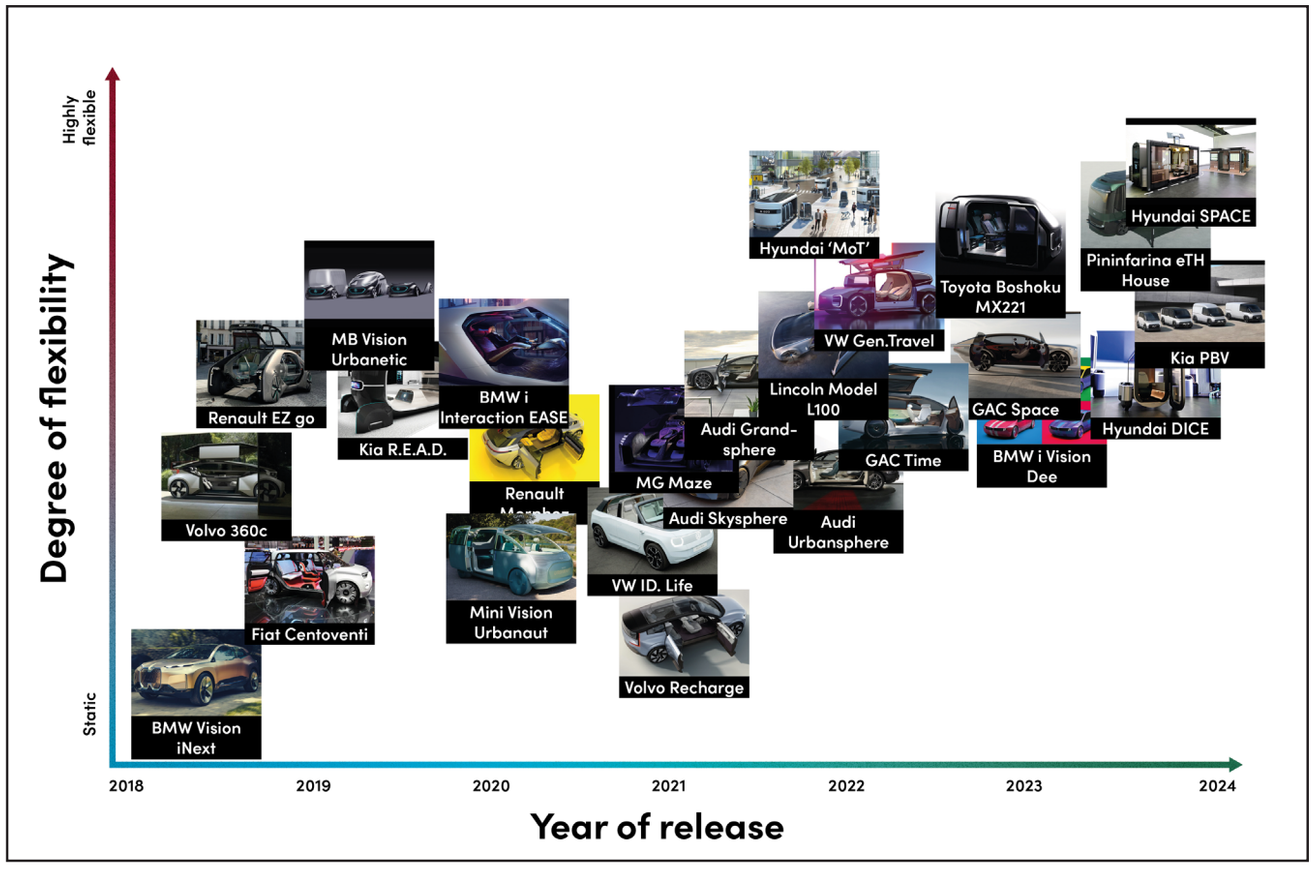
1.2.5. Evidence of CASE factors in automotive design practice

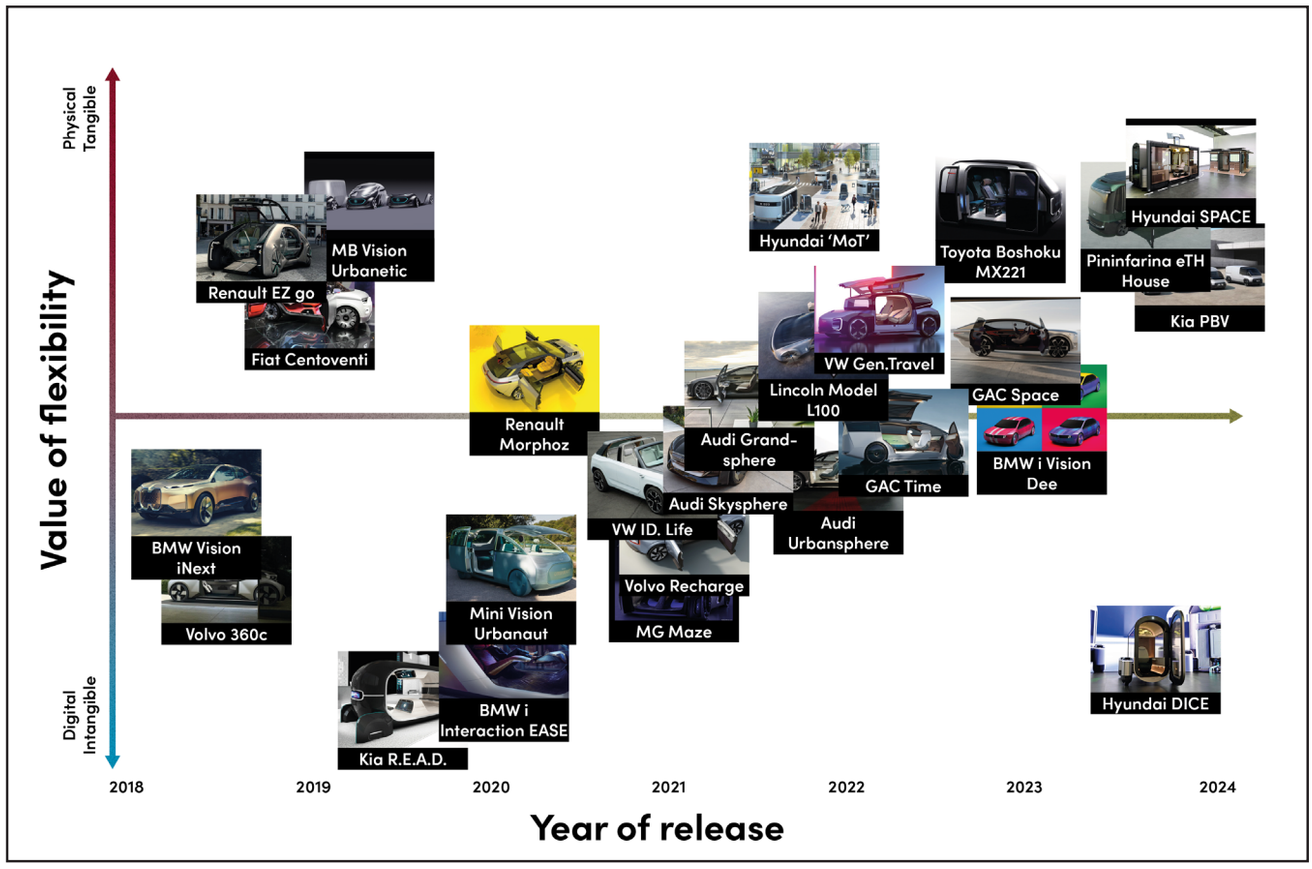
Automakers' 'production' and 'advanced' (concept) designs are responding to CASE factors. Throughout the period of this research a catalogue of designs judged as representing design best practice relative to CASE themes has been collected (dating 2018 – 2024). This list is available in Appendix i – CASE Best Practice Catalogue. Further explanation of the methods behind this collection is provided in Chapter 2.4.3.

Figure 1.2.5.i takes the key concept designs from Appendix i and plots them to describe how their core theme and value offer relates to CASE factors. Most designs are pulled between two or more factors and only a few sit in the extreme corners of each box. Those that do: BMW i Interaction Ease (2020), Kia R.E.A.D. (2019), Volvo 360C (2018) and BMW Vision iNext (2018) are amongst the older designs analysed suggesting that early CASE designs responded to a single factor. It could be that automotive brands are now forming more complex product narratives that leverage interconnectivity between CASE factors to deliver greater value to customers, and that by varying the level to which a design responds to a particular theme delivers a distinct product offer. Notably few designs centre their value offer around autonomy alone, suggesting that brands see the value of an AV as part of a broader product or service offer.

Right, top
Fig. 1.2.5.b.i.: Key concept designs 2018 – 2024 degree of flexibility. 2024. Image by the author.

Right, bottom
Fig. 1.2.5.b.ii. Key concept designs 2018 – 2024 evidencing of flexibility. 2024. Image by the author.


Highly flexible
Degree of flexibility
Static
Renault EZ go
MB Vision Urbanetic
Kia R.E.A.D.
BMW i Interaction EASE
Renault
Volvo 360c
Fiat Centoventi
BMW Vision iNext
Mini Vision Urbanaut
MG Maze
Audi Grand-sphere
Audi Skysphere
VW ID. Life
Volvo Recharge
Hyundai 'MoT'
Lincoln Model L100
VW Gen.Travel
Audi Urbansphere
GAC Time
Toyota Boshoku MX221
GAC Space
BMW i Vision Dee
Hyundai SPACE
Pininfarina eTH House
Kia PBV
Hyundai DICE
2018
2019
2020
2021
2022
2023
2024
Year of release


Physical Tangible
Value of flexibility
Digital Intangible
MB Vision Urbanetic
Renault EZ go
Fiat Centoventi
Renault Morphoz
BMW Vision iNext
Volvo 360c
Mini Vision Urbanaut
Kia R.E.A.D.
BMW i Interaction EASE
Audi Grand-sphere
Audi Skysphere
VW ID. Life
Volvo Recharge
MG Maze
Hyundai 'MoT'
Lincoln Model L100
VW Gen.Travel
Audi Urbansphere
GAC Time
Toyota Boshoku MX221
GAC Space
BMW i Vision Dee
Hyundai SPACE
Pininfarina eTH House
Kia PBV
Hyundai DICE
2018
2019
2020
2021
2022
2023
2024
Year of release

The designs weighted towards electrification tend to be more resolved and closer to production intent than those rooted in other boxes, reflecting that electrification continues to be the CASE factor most tangible or evidenced by design. Conversely, designs that sit in the connected or sharing box have the most variability and evidence the greatest departure from contemporary production design topologies. Designs that have connectivity as their dominant theme: (BMW i Interaction Ease (2020) and Kia R.E.A.D. (2019)) are technology demonstrators so do not need to tie to specific production intent topology. Sharing designs are more likely to have physical exterior or interior elements that adapt or change for different use cases and the scale of transformation is dependent upon their closeness to production intent. The Fiat Centoventi (2019) is quite close to production designs and features small-scale interior customisations via modular accessories. The Mercedes Vision Urbanetic (2019) is far from production and features full adaption of the exterior based on an BEV skateboard platform design).

1.2.5.a. Becoming more passenger centric

Figure 1.2.5.a.i. plots the key concept designs on their year of release, against whether they are driver or passenger centric in their orientation. The majority of concepts are passenger centric in their theme and demonstrates a direction of travel that sees advanced design activities paying greater attention to the passenger experience. This growth in passenger centricity does not suggest that driving experience is no longer of importance to automotive design practice but could suggest that the adoption of CASE factors (most obviously autonomy, but also sharing, connectivity and electrification) means that passenger experience is a new growth area for design to add value to the customer experience where it has previously been less able to do so.

More recent designs that are highly passenger centric: (Hyundai SPACE (2024), Hyundai DICE (2024), Kia PBV (2024) and Toyota Boshoku MX221 (2023)) deliver this through the physical vehicle product, but also service and system design. This suggests a broadening in the role of automotive design practice which increasingly must deliver value to the customer through both physical and digital design mediums.

1.2.5.b. Automakers are slowly embracing flexibility

Figure 1.2.5.b.i. demonstrates a significant shift in the degree of flexibility offered by key concept designs between 2018 and 2024. More brands are using their advanced design activities to explore new vehicle use cases, enabled by CASE factors, that can deliver value to the customer across different usage scenarios. These evidence new forms of vehicle ownership (many of them are designed for access other than via private ownership) and new roles for the vehicle including emphasis on journey experience (being passenger centric vs driver centric), tighter integration with the built environment and facilitation of better mobility experiences for customers with additional accessibility requirements.

The newest designs that are the most flexible: Hyundai SPACE (2024), Kia PBV strategy (2024), Toyota Boshoku (2023), Hyundai Mobility of Things (2022) and Volkswagen Gen. Travel (2022) are explicitly designed for use within a Maas system. This increase in use case flexibility could be seen as a response to the need for greater utilisation of vehicle designs used as part of MaaS systems as discussed in 1.2.4.c.

Figure 1.2.5.b.i.i. steps from Figure 1.2.5.b.i. and describes the primary medium through which key concept designs from 2018 – 2024 offer flexibility of experience to the customer. Earlier designs predominantly evidenced their flexibility through their digital design (HMI, UX or UI tailoring the experience to individual customers). More recent designs still use digital design to deliver a personalised experience, but the strongest or most literal evidencing of their flexibility offer is in their physical attributes. This could suggest that automakers see physical adaption as a key necessary feature in designs that are used as part of a MaaS system and need to deliver increased utilisation.

Some designs feature adapting exteriors, though these tend to be the furthest from production intent. More designs use interior adaptability to offer flexibility. This includes seats that can be moved into different positions depending on use case or removed entirely. Where earlier designs (e.g. Fiat Centoventi) let the customer adapt the design themselves, newer designs semi-automate this adaption process (the customer can use control switches to move interior elements to their preferred position, or the vehicle can predict their needs and use these mechatronic control systems to move elements on their behalf).

1.2.6. Conclusions

1.2.4.c. proposes that Mobility as a Service models that are enabled by CASE factors will require a high level of service utilisation to make them financially viable, to deliver the promise of convenient mobility to the customer and the desirable secondary outcomes that reducing the total number of vehicles on the road provide (reduced emissions, reduced congestion).

1.2.5.b. demonstrates the steps automotive design is making towards facilitating greater vehicle utilisation through designs that offer greater flexibility in their design – particularly the ability to physically reconfigure the design – and be adaptable to multiple use case scenarios, delivering a design that can be used more regularly and achieve higher utilisation rate.

The adaptability of some of these designs is limited by remaining within established models of production. In today's model, the design is developed to a point ready for manufacture, when it is 'fixed', as part of a process of post rationalisation that breaks the design down into constituent parts for manufacture. The designer cannot predict all possible future scenarios of use for the vehicle and so there will arrive a point in the vehicle's lifecycle that the level of flexibility if affords will drop off.

Some of these concepts utilise modular construction techniques: the Kia PBV strategy (2024) being the most developed example. This would extend the opportunities for design to respond to new use cases, so new modular parts could be designed, and the vehicle could be updated over time. This process would not be immediate and would likely require a significant level of demand (enough customers would need to want it) for its production to be justifiable. This demonstrates the limit of modular systems to offer highly personalised designs in or near real-time.

Chapter 1.1. argues that automotive design could be embracing circular methods of construction more fully, to offer vehicles with lower total environmental impact across their lifespan. This thesis suggests that there are new methodologies from outside current automotive design practice (Chapter 3.2) that could introduce even greater flexibility in their physical design and configuration, offer a higher level of on demand adaptability, and deliver more sustainable construction methods.

Chapter 1.3 – The threat of Artificial Intelligence (?)

Chapter 1.3 – The threat of Artificial Intelligence (?)

1.3.1. Introduction

At the beginning of this research I would have conversations with other automotive design professionals about the growing abilities of computational design tools, and informed by my research into the development of these tools in other fields (in architecture, see Chapter 3.2) I would propose that such methods could in future be capable of 'doing' much of the direct design work, specifically to create vehicle deigns more flexible and adaptable than current designs. Most disagreed, until in 2022 and the first consumer facing Generative Artificial Intelligence (GenAI) tools were released. Designers began to experiment with these tools and quickly realised the capability of these design tools to automate large parts of their design work. Almost overnight my research found a new relevance and urgency and those not immersed in my field of research understood the potential capabilities of computational design tools.

This thesis project is focused on the development of a computational design and manufacturing system, not a GenAI tool. GenAI is just one small subset of tools within the broader realm of computational design, but the topic of GenAI dominates the catalogue of published work on themes of Artificial Intelligence or computational design as they relate to Industrial Design practice.

1.3.1.a. Aims and Objectives

This chapter addresses research question one; *What are the macro trends (political, social, economic, cultural and technical) that will influence the automotive design practice in the 21st century?*

And question two; *Is automotive design practice in its current form successfully responding to these changes, or is it equipped to do so in the future?*

In this chapter the key developments in early computational design tools (in the form of GenAI) are introduced (1.3.2.); the response to these tools by the industrial design profession (within which automotive design sits), and design academia, is summarised (1.3.3.); and it is evidenced how leading automotive design brands and practitioners are engaging with these tools (1.3.4). The chapter concludes suggesting that the industrial design community is considering computational tools within the framework of existing theories of creativity, models of design knowledge or design process only. This imposes post-rationalisation – the process of 'translating' a design idea to manufacturable object' – on computational design outputs that can otherwise be in a constant state of iteration and change. Instead, the discourse around computational tools is preoccupied with questions of how the role of the human designer can be maintained as is, and ethical and legal concerns that arise using these tools within existing frameworks – and is missing the opportunity to define new models of design and manufacturing that take full advantage of the unique attributes of computational design tools.

1.3.1.b Methods

This chapter was written from knowledge generated through Literature Review A (Automotive) (Chapter 2.4.1.), Literature Review B (Discrete) (Chapter 2.4.4.) and the Write-up process (Chapter 2.4.8.).

1.3.2. Artificial Intelligence (AI) and creative design processes in the early 21st century

Artificial Intelligence (AI) encompasses the development of machines capable of tasks requiring human-like intelligence, including perception and decision-making. AI mostly divides into rule-based systems, expert systems utilising domain-specific knowledge, and machine learning, which improves through data over time.

Deep learning, a subset of machine learning, employs artificial neural networks to model complex data relationships (without manual feature engineering) and excels in processing high-dimensional data including images (LeCun et al. 2015: 436–44). Computer vision enables AI to interpret and create images by mimicking human visual understanding. It requires vast data for training, employing algorithms like deep learning and Convolutional Neural Networks (CNNs) to learn to differentiate and interpret visual information autonomously (Krizhevsky et al. 2017: 84–90).

These methods underpin Generative AI (GenAI) - the subset of artificial intelligence technologies capable of generating new data that resembles, yet is distinct from, the training data it has consumed (Goodfellow et al. 2014). This technology does not understand or analyse the data as a human might, but operates through complex algorithms and neural network architectures, such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), leveraging vast amounts of data to learn patterns, styles, or structures and so create something

new and often unpredictable (Kingma and Welling 2022).

GANs consist of two neural networks, the generator and the discriminator, which are trained simultaneously through a competitive process where the generator aims to produce data indistinguishable from real data, while the discriminator strives to detect the difference between real and generated data. This adversarial process results in the generation of high-quality, realistic outputs including synthetic images (and many other mediums including text, audio, film, code, 3D models etc) (Radford et al. 2016).

Designers across creative disciplines have begun to use GenAI design tools – predominantly to produce numerous design alternatives quickly (thus widening the design exploration space and efficiency) – but also to analyse consumer data to reveal patterns and trends that can inform the design process, and to simulate product performance and so 'test' a design before it is committed to manufacture.

Key visual design tools include 'Stable Diffusion' and 'DALL-E' which offer designers AI tools for generating images from textual or image inputs, facilitating applications including image translation. These techniques are complemented by tools like 'Midjourney' and 'Craiyon' for different quality and speed needs, and 'Lexica', which aids in understanding AI-generated images. 'Dreambooth' personalizes AI models for generating new images of specific subjects in varied contexts. 'ControlNet' and 'Breadboard' provide more control and organization in image generation, enhancing collaboration between AI and designers. Web based platform 'Krea AI' enables designers to create imagery that is attuned to their style, and that aligns to their existing concepts or products. Existing design tools are incorporating AI capabilities – most notably 'Adobe Photoshop' – offering designers the speed and scope of GenAI within their current workflows. Designers are also developing bespoke AI enabled design tools. 'Underlay' generates base volumes with accurate perspective, proportions, and lighting for designers to then download as a .PNG file to sketch over. Tools including 'Hypersketch' and 'Vizcom' take initial sketch ideas and generate realistically rendered options the designer can then further modify. 'Aslan Designer' is an as yet unreleased tool developed by Korean start-up Narnia Labs, who have been developing their tools in collaboration with Hyundai and LG Electronics as well as other Korean design and engineering firms.

Key to maximising the benefits of these generative AI tools is a technique called prompt engineering - crafting the text input to produce the desired AI output - this entailing the creation and optimising of text inputs to enhance the performance and usability of language-based AI tasks. Effective prompts allow clearer communication with AI, improving response accuracy and quality. Additionally, designing unbiased prompts can help mitigate AI model biases, contributing to fairer and more inclusive AI applications. Mastery in areas like natural language processing and a deep understanding of the intended application are essential for effective prompt engineering. Manipulation of written language is not a skill traditionally associated with a visual design practice, so those designers who do successful utilise these new computational design tools are broadening the nature of design practice, and are changing the role and value of the designer to a more 'in-direct' form of practice. In this computationally enabled form of design practice the designer is increasingly responsible for defining the parameters of a design, with computational design taking these commands to directly shape the visual attributes of the design.

1.3.3. A review of critical responses to the use of GenAI in creative design practice

(Van Der Maden et al. 2023) note;

"Generative technologies are developing rapidly and many designers are using them. Yet, there remains little published work on the use of GenAI in design."

Much of the published material available today comes from HCI (Human Computer Interaction) researchers, but there is a growing collection of published material from practitioners and academics in design disciplines including architecture (Bölek et al. 2023: 91–104) and interior design, fashion (Choi et al. 2023: 39), digital User Interface (UI) and User Experience (UX) (Stige et al. 2023) and systems and service design (Reis et al. 2020) are considering the broader impact of GenAI on creative design processes.

At the most prosaic, industrial designers are evidencing how GenAI tools (including existing toolsets such as Computer Aided Design software) enable the rapid iteration of design solutions and how these can be used to arrive at a 'better' design within existing developmental timeframes, or quicker (Yin et al. 2023: 566).

In 'Generative AI for Product Design: Getting the Right Design and the Design Right' Hong et al. of the Toyota Research Institute (2023) borrow a phrase from Buxton (2007) to critically review the use of GenAI tools at early conceptual ('getting the right design') and later developmental ('getting the design right') phases of an industrial design process. They examine the speeding up of design space exploration offered by GenAI tools and suggest it presents challenges in terms of inspiration,

fidelity, and idea diversity. Stepping from Youmans and Arciszewski's principle of 'design fixation' (2014: 129–37) Hong et al. suggest the instant access to high fidelity, but potentially naïve design ideas produced by GenAI tools may hinder the designer's problem solving and creativity by shortcutting the low fidelity ideation phases:

"The HCI and design disciplines have emphasized the gradual evolution of designs from low to high fidelity with evaluation interspersed throughout iterative steps in the design cycle. The additional time spent moving from low-fidelity to high-fidelity may result in important learnings that may lead to creative breakthroughs."

Hong et al. align with Sbai et al. (2018) in suggesting the designer's initial use of GenAI tools would be as a source of inspiration and that GenAI tools could be developed to promote idea diversity and help control the level of diversity desired:

"...future development of GenAI tools should consider computational means for increasing idea diversity by offering ideas that are visually and semantically distinct from each other, and create appropriate mechanisms for users to control the desired level of diversity to prevent significant deviations from each idea."

And that these tools should be developed to comply with systematic exploration methods;

"...we should explore opportunities to integrate our knowledge of conceptual mappings in natural language – that are sensitive to different social and cultural contexts – as well as human-made products that embody some knowledge of the problem and design space."

Hong et al. address the challenges in prompt engineering, where designers struggle to translate concepts into text for GenAI tools, and propose they are developed to:

"...interactively prompt users to specify and correct these details (either through language or imagery), [so] GenAI systems can aid the user in iteratively improving the scene in fewer input-output loops. Only then can designers begin to consider adding variations while retaining control over specific design elements."

Moving from conceptual to developmental design phases Hong et al. propose GenAI could be used to ensure functional and aesthetic choices (design goals) are maintained throughout the development process:

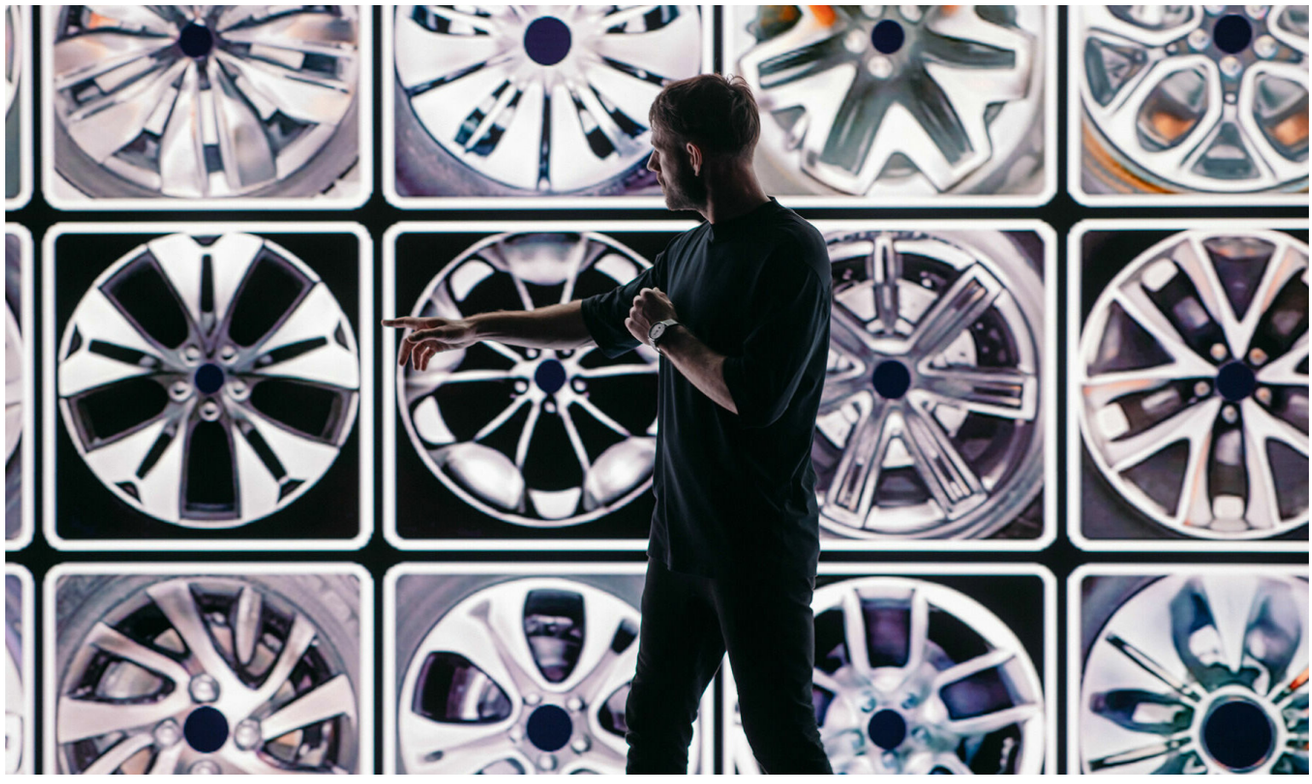
"The larger challenge exists in representing the tension between functional and aesthetic requirements and teaching GenAI models to generate results that consider the combination of these constraints."

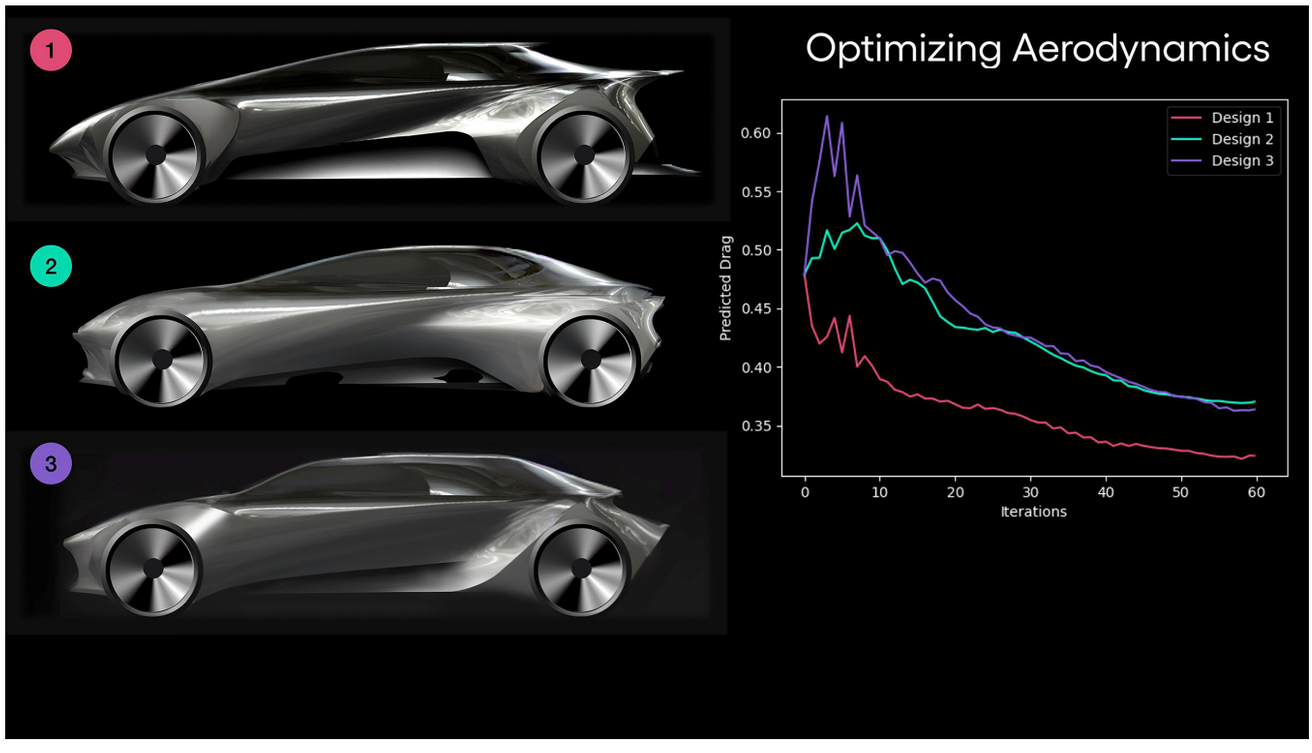
Hong et al. step their critique outside of direct design practice (the 'what/how') to consider the in-direct influence GenAI tools have when applied to design process management (the 'who/why'). This approach sets out a model that includes: first the evaluation of design decisions through multi-modal representations of consumer preference; second the limitation of current 'frozen in time' GenAI tools to rapidly and without significant cost expense be updateable to respond to the changing nature of consumer preferences over time; and third the legal (intellectual property) and ethical (diversity and inclusion) concerns around the use of GenAI design tools.

Further reflective research looks beyond the specific mechanics of GenAI tools to consider the impact they are having on creative design process. Hyunjin uniquely tie an application of GenAI – the optimising of designs for a manufacturing process – to a new role for the designer; the creation or definition of a 'Generative Design System' (2020: 727). Hyunjin offers a hybrid design system where

Right, top
Fig. 1.3.4.i. AUDI. 2022. "Out of the box thinking" – designers are inspired by details in FelGAN's creations. [photograph].

Right, bottom
Fig. 1.3.4.ii. TRI. 2023. The new generative AI technique optimizes aerodynamic drag in successive iterations based on parameter inputs from the designer. [digital image].




1
2
3
Optimizing Aerodynamics
Design 1
Design 2
Design 3
Predicted Drag
0.60
0.55
0.50
0.45
0.40
0.35
0
10
20
30
40
50
60
Iterations

the designer manually intervenes between stages of generative design work by the GenAI system to review the work done, select preferred designs and modify them accordingly. Thoring et al. use the term 'The Augmented Designer' to propose that GenAI tools should be used to compliment and extend the skills and practice of the human design practitioner (2023: 3345–54). Stepping from the 'four levels' of design knowledge proposed by Thoring et al. (2022: 17–32), they formulate an adapted model that offers a role for GenAI in design knowledge. They combine this with the concept of Evolutionary Creativity (Thoring and Müller 2011: 137–47) to propose a research framework for GenAI and agenda with ten areas for further investigation. Design researchers are using workshop methods to define GenAI design frameworks (Van Der Maden et al. 2023) and Bartlett consider the impact of GenAI on design education also (2004: 55).

1.3.4. Application of GenAI in contemporary Automotive Design practice

Van Der Maden et al. are not automotive design researchers, yet this could be the design discipline that most clearly evidences their assertion (1.3.3.) on the lack of published material from the design profession about their use of GenAI tools – a reflection of the dearth of critical engagement automotive designers have with their practice as explored in Chapter 3.1.

In Q4 2018 BMW published a press release titled 'Computer-Assisted Art - the Fascination of AI Design' in which quotes the president of BMW subsidiary Designworks, Holger Hampf: "We are feeding both technical parameters and design concepts into the program. It has the ability to learn and takes into account the different specifications as it creates variants." (BMW 2018).The press release provides little evidence of the GenAI tools BMW designers have tested or are using or evidenced the design output of these tools either. Hampf predicts that within ten years "AI will be taking care of more and more day-to-day routine tasks" and BMW present GenAI tools that can automate mundane design tasks, but emphasis that they believe the human designer's practice will remain similar to prior to the introduction of these tools, and that they bring a distinct value which GenAI tools cannot offer:

"AI is creating the time and space for designers to do what they are good at. After all, customers don't just buy a car to get from A to B. They are also seeking an emotional experience. And that's something that can only be achieved by a designer with a passion for the thing he or she creates."

In Q2 2023 BMW's design leadership's perspective on the role of GenAI tools and the value of the human designer remain broadly similar, with Design Director Adrian van Hooydonk stating:

"We are experimenting with it in design, for instance in wheel design... You can set a few parameters – like, you want a five-spoke wheel, it should only weigh this much, it should be a 20-inch rim – and then the computer begins to generate ideas for you... Still, as a person, as a human being, you need to be the art director. You need to pick. You still have to guide the process – it's not like the computer can completely invent things, but it can combine various parameters into a proposal much quicker than a human being," (Sergeev 2024).

In Q4 2022 Audi announced FelGAN (combining 'Felge', the German 'rim' with Generative Adversarial Networks acronym 'GAN'), an in-house developed GenAI tool intended to inspire new rim designs (Audi 2022). One algorithm generates new wheel designs while the other evaluates them against photos of existing wheel designs to enhance their realism over time, enabling Audi's design teams to explore an exponentially larger array designs ideas within existing development cycles (Figure 1.3.4.i).

FelGAN enables designers to experiment with core elements: form, graphics, detail, colour and texture – and assists them in refining ideas into a comprehensive design. Each design is assigned a unique mathematical value or 'DNA', enabling designs to be reproduced or modified later. FelGAN is a cloud-based tool (to reduce processing times) and leverages Streamlit technologies (a Python framework). The user interface allows Audi designers to input their own concepts into FelGAN and augment them with AI efficiency. FelGAN's underlying technology has potential to be expanded into a broader AI design platform and so influence other design areas within Audi; currently in development is an AI rating system to evaluate the carbon footprint of designs generated by FelGAN.

Audi published a video (Audi 2022) along with the press release which briefly previews the FelGAN interface, and features interview clips with Daniele Sirigatti, Design Exterior Innovation designer, who summarises the advantages:

"For rim design where a lot of rims have to be generated for car, it's very useful to have a tool that allows you to quickly get inspiration. This very specialised artificial intelligence methods learns how to create something, how to pixel by pixel, create an image."

Vladislav Rosov, Machine-Learning Engineer continues, describes FelGAN offering:

"...It is something between an assistant and a companion, this is a friend in a bar, who will maybe suggest some new ideas for your daily work. AI just makes life easier, and for designers it helps [them] to focus on what really matters."

Toyota Research Institute (TRI) has introduced a new GenAI technique aimed at enhancing the vehicle design process, their approach enabling designers to incorporate initial sketches and engineering constraints into the generative AI process and streamlines the integration of design aesthetics with practical engineering considerations (Arechiga et al. 2023). TRI were the first (and at the time of writing, only) automotive design related or specialised GenAI research group to have published papers on their work. The technique leverages Computer Aided Engineering (CAE) software optimisation principles to embed aerodynamic and other engineering constraints directly into the design iterations led by GenAI. This method speeds up the design process by reducing iterations and ensures the resulting designs also meet engineering standards (Figure 1.3.4.ii). TRI's AI tool enables optimisation of factors including aerodynamic drag which is critical for designing electrified vehicles as directly impacts vehicle efficiency and range. TRI emphasis the key benefit of their AI tool as merging creative design with precise engineering and this offering faster and more efficient vehicle development.

In Car Design Review X, the 2023 edition of the annual review published by online automotive design website Car Design News, automotive journalist Guy Bird addressed the use of GenAI tools in automotive design and provides on-record quotes from leading contemporary automotive designers (Bird 2023). Those interviewed saw the tools as a method to rapidly generate and explore new ideas - Jamie Barrett, senior exterior design expert at Shanghai based Chinese Battery Electric Vehicle (BEV) start-up HiPhi describes AI tools as:

""a very practical tool for a car designer," mainly as a way of swiftly generating ideas and exploring avenues "without fear of failure." He stresses that it still takes a trained eye to extrapolate the good from the bad..."

Design leadership are publicly more sceptical of GenAI tools; Maximilian Missoni, Design Director of Scandinavian BEV brand Polestar describe AI processes as:

"".. basically skimming the net to recombine existing elements"... implying it has most value as a form of fast reconnaissance, a machine-driven survey of prior art.".

Stellantis Chief Design Officer (CDO) Ralph Gilles comments that AI is:

"kind of a cliché of every detail rising through the surface, so you can quickly see what not to do sometimes. This is what the world expects you to do - so let's go a different direction."

and, ex-Mazda Executive Designer Tom Matano similarly considers GenAI tools unable to create: *"the intangible, illogical component of the purchase decision... so much of design is about pushing beyond logic."*

Those from outside the immediate design profession are more willing to discuss their GenAI experiments. Bird quotes James Reid, an art director based in San Francisco who has used Midjourney to produce vehicle concepts that bring together disparate visual references and themes whilst exerting control over the output through prompt engineering:

"...I began to think about what if radical architects like Shin Takamatsu, Bruce Goff and Kendrick Kellogg created vehicles in the style of their buildings, without any engineering constraints... Part of the thrill of Al is visualising what I want and trying to steer it to that through 'prompts', then being completely surprised by the alternatives the machine generates..."
Reid's enthusiasm is evidently shared with many other – often younger, more junior or student automotive design practitioners – as evidenced by the fast-growing online communities these designers share their work within; the Instagram accounts @mobilitylabs.ai and @automotive.ai share automotive design concepts created using GenAI and as of March 2024 have 45,800 and 19,900 followers respectively.

1.3.5. Conclusions – A failure to break the paradigms

GenAI and computational tools are being used to make existing design process more efficient, to explore more design solutions than feasibly could in current time periods, or to make design and development processes shorter and so reduce costs and respond quicker to changes in the market. These tools are referred to as GenAI, but they could be more simply described as 'automated' design tools, and so seen similarly to other 'automated' design tools – Adobe Photoshop, Autodesk Alias, etc – this shift in language recognising that these tools are being adopted in a way that changes design practice but not the model within which that practice occurs.

Published research on design and GenAI is reactive, a posteriori knowledge that is a response to what designers are already doing in practice, and attempts to retrofit GenAI tools into existing theories of creativity, models of design knowledge or design process. Verganti et al. suggest that with the introduction of AI to design, the principles of design thinking remain the same but the nature of practice changes (2020: 212–27). There is little research that begins from a priori knowledge and considers the broader conceptual and theoretical possibilities afforded by computational design tools and use these to imagine new forms of creativity, models of design knowledge or design process.

The purpose of industrial design process is to output an object to be manufactured (at whatever scale), yet computational design tools are being studied without regard to this relationship between design and manufacturing. Some acknowledge or critique the inability of current GenAI or computational tools to generate a design that meets all manufacturing constraints, yet there has been little attempt to broaden the frame through which these tools are considered to include design and manufacturing processes together.

Somewhere between the points of an initial idea to a manufactured object there must be a process of post-rationalisation where the conceptual design (represented by a sketch, 3D digital data file, physical model, or other) is 'fixed' and then broken down so that it can be turned into an object that can be manufactured. This manufactured object might be designed to be repaired, modified, adapted, disassembled – though it is generally not so – and requires foresight from the initial design. So, what was once an unfixed, changeable 'design concept' becomes a fixed immoveable 'production reality'.

Computationally generated designs are recognised for their iterative nature and the ability to evolve, adapt or improve over time, but are being used as a design tool up to the point of post rationalisation only, which within current models of product lifecycle and manufacturing technique totally severs the link between computational system and physical reality. To realise the full potential of these computational design tools would require a similarly computational method of construction that maintains the link between digital computational system and physical reality.

Audi's press release announcing FelGAN pictures the GenAI tool being used in the design studio accompanied by a physical model of a wheel being CNC machined from modelling board (Figure 1.3.5.i.) suggesting a design has been created by the GenAI tool and then subsequently manufactured as a one-off prototype.

The press release does not show the in-between process that post-rationalises the GenAI design to make it ready for manufacture; taking the 2D data from FelGAN, modelling the key surfaces using Computer Aided Styling (CAS) software, adding engineering details in Computer Aided Design (CAD) and then finally passing the design to the CNC machinist who would use Computer Aided Manufacturing (CAM) software to generate the tool paths to machine the physical model. After this process if the GenAI design were to be updated, it would have no effect upon the physical design; the two have been disconnected.

Design practitioners are not being challenged by academia on the topic of AI and design. Both largely take and use tools that are given to them by computational engineers – evidenced by TRI and Audi, Weisz et al. (2023) propose design principles for the creation of GenAI tools, but they are researchers from HCI, not the Industrial design field. Designers are missing the opportunity to create or tailor

Right, bottom
Fig. 1.3.5.i. AUDI. 2022. It started with a numeric code: at Audi, the wheel designs become reality through the use of a high-tech milling machine. [photograph].

computational design tools that are connected to the specific manufacturing process they are design for.

By obsessing over the specifics of these design tools in isolation from manufacturing, the discourse around AI is encouraging designers to worry about their intellectual and financial relevance in an increasingly automated world (Smith 2023), or to ignore it entirely (Matano 2023). Industrial design academia and professionals are retrofitting these tools into existing models and frameworks, this awkward semi-embrace – expressed in terms of AI 'enhancing' the human designer - seeks only to defend existing forms of creative expression and misses the opportunity to define new models of design and manufacturing that leverage the unique capabilities of computational design tools.

If a combined design and manufacturing system could output objects that maintain the ability to be iterated, evolved or changed over time this could offer designs that are more profitable, or have lower embodied or operational emissions, or be flexible and responsive to customer need. It could also be an opportunity to positively imagine new roles for the designer that might lead to new forms of authorial voice. Design academia is in real danger of preaching to the design profession about the ethics of AI – of policing rather than leading – and if designers don't take responsibility for proposing new models of computationally enabled design and manufacturing, create their own tools and define their own role, someone else will, and market forces will curb their agency entirely.

Chapter 2 - Contribution to New Knowledge, Epistemological Positions and Methodological Frameworks

Chapter 2 – Contribution to New Knowledge, Epistemological Positions and Methodological Frameworks

2.1. Knowledge Claim, Research questions and Aims and Objectives

This chapter sets out the new knowledge claim and evidences the process and methodologies that have been used to structure the project.

2.1.1. Knowledge Claim

This thesis contributes to the field of automotive design. This practice-based research has been conducted following the Design Council's Double Diamond methodology and through the framework of Vaughan's 'Designer/Practitioner/Researcher'. It is conceptually influenced and steps from Mario Carpo's 'Second Digital Turn'. It is the first piece of research to adopt computational design and automated construction methods from a new architectural movement called 'discrete architecture' and apply them to an automotive design context. This novel design process has been named 'Discrete Automobility'.

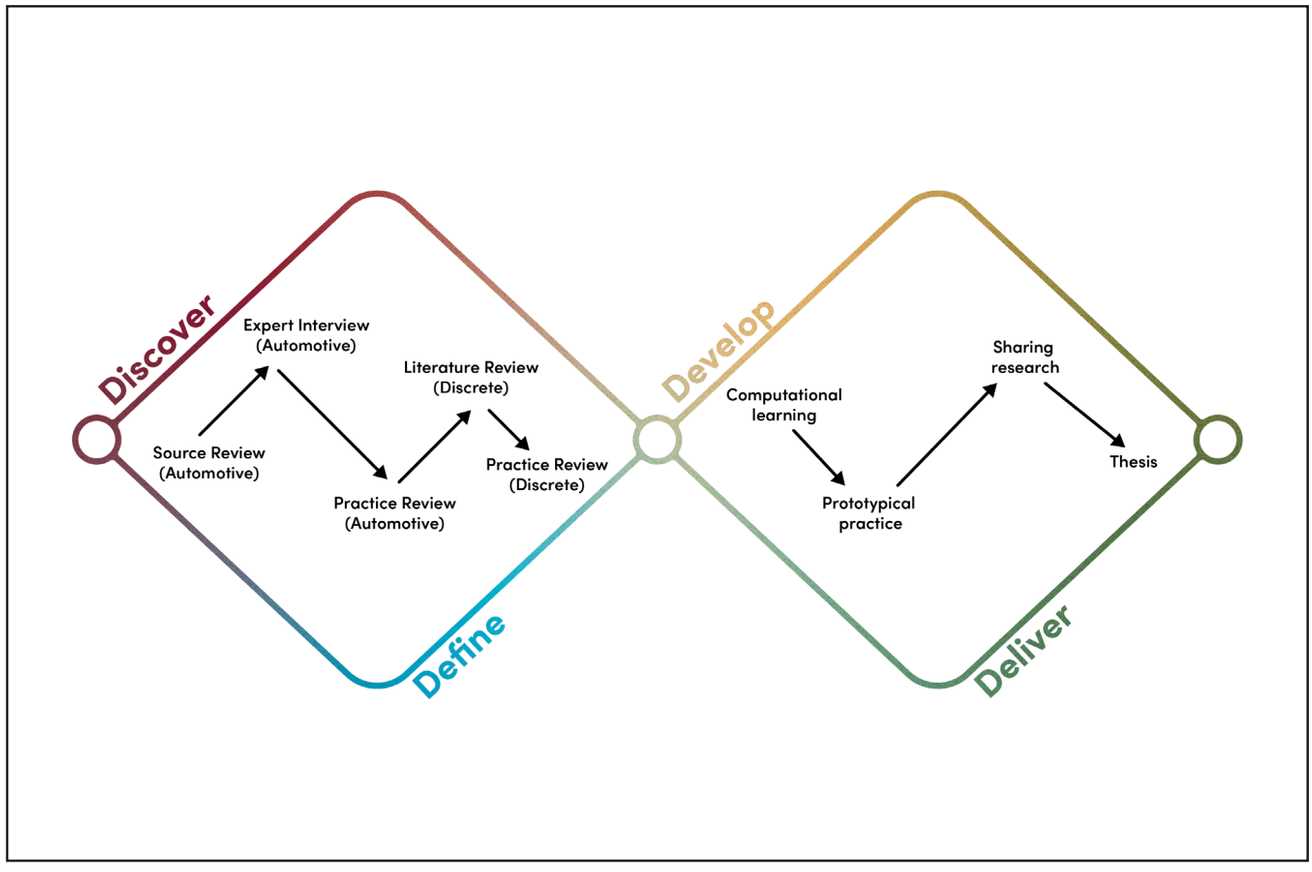
'Discrete Automobility' proposes (in Chapter 4) a conceptual system that adopts a platform-based approach to the design of interior spaces for Connected, Autonomous, Shared and Electric (CASE) vehicles. These spaces, constructed from aggregated assemblies of a single, repeated and self-interlocking part geometry, are flexible and infinitely adaptable into different configurations. This would offer a vehicle interior design that is infinitely adaptable too, reassembled for each trip, for each individual and adjusted for optimal utility, comfort, and journey experience.

Discrete Automobility is a circular design and construction method that would enable Mobility as a Service systems that could reduce the number of vehicles produced, on the road, and deliver more sustainable transportation solutions (this need identified in Chapter 1.1).

Discrete Automobility offers a solution to the issue of utilisation rate, identified by Nunes and Hernandez (2019) and others (in Chapter 1.2.4.c.) as a key barrier to the adoption of CASE vehicles in Mobility as a Service systems.

Discrete Automobility proposes recasting the role of the automotive designer away from the direct manipulation of physical materials – which could increasingly be performed more effectively and efficiently by a computational design system (see Chapter 1.3) – towards the definition and control of the (immaterial) system parameters within which design occurs. This challenges the value and authorial privileges of the automotive designer which have remained assumed and largely unchallenged since the beginning of the 20th century when contemporary automotive design practice was established alongside the mass production line (see Chapter 3.1.).

Right
Fig. 2.2.i. Double Diamond Methodology. 2024. Image by the Author.


Discover
Expert Interview
(Automotive)
Literature Review
(Discrete)
Source Review
(Automotive)
Practice Review
(Discrete)
Practice Review
(Automotive)
Define
Develop
Computational
learning
Sharing
research
Thesis
Prototypical
practice
Deliver

2.1.2. Research Questions

The project is structured around five key questions;

1. What are the macro trends (political, social, economic, cultural and technical) that will influence the automotive design practice in the 21st century?
This question is addressed in Chapters 1.1., 1.2. and 1.3.

2. Is automotive design practice in its current form successfully responding to these changes, or is it equipped to do so in the future?
This question is addressed through Chapters 1.1., 1.2., 1.3 and 3.1.

3. Are there other models of design that automotive design could adopt to increase its resilience and respond more successfully to these changes?
This question is addressed in Chapter 3.2.

4. What would this revised mode of design look like and how would it change the automotive design practice; what would be the role of the designer?
This question is addressed in Chapter 4.

5. How would this new model of design and forms of practice be received by current practitioners?
This question is addressed in Chapter 5.

2.1.3. Aims and Objectives

The Aims and Objectives step from the research questions and the findings of Chapters 1 and 3 to deliver the knowledge claim. They are evidenced in Chapters 4 and 5.

2.1.3.a. Aim

The aim of this research project was to adopt a set of automated design and construction methods from architectural academia and use them to formulate a novel prototype automotive design practice that could demonstrate how future vehicle designs could be made more flexible in their design and layout configuration and therefore be utilised at a higher rate.

2.1.3.b. Objectives

1. Design the theoretical underpinnings for and demonstrate key stages of a vehicle interior design process based upon discrete methods that have been adapted for use within an automotive context.

2. Demonstrate the key stages of this new process through physical prototyping and digital design assets.

3. Develop a toolkit (a combination of physical prototypes and website resource) that can be used to share and teach the key principles of the novel process to other automotive design professionals.

4. Present the research to other automotive design professionals, gather their feedback and use this to identify future areas for further research and development work.

5. Produce a final thesis that presents the contribution to new knowledge and reflects critically on the transition that has occurred from designer to designer/practitioner/researcher.

2.2. Framework and methodology

The research project has been structured around the Design Council's 'Double Diamond' methodology (Figure 2.2.i.). This provided the work plan for completion of the various objectives through the framework of Discover, Define, Develop and Deliver. Since the inception of the Double Diamond methodology in 2004, The Design Council has issued revisions, the most recent in 2019. This incorporates a 'Framework for Innovation' that introduces socio-economic factors into the methodology. The methodology is most used for the development of products and services and is increasingly applied social or systemic design, often with talk of generative and self-organising elements (Jones 2014) manifested at various stages. The 2019 revision of the Double Diamond features arrows to mark points of 'iterative' design activity. As it became clear that this research would be crossing into architectural and computational design methods, the former situated within a different model of production to design and the latter being an open-ended process with infinite solutions, a concern was raised that a fixed design framework would be too static and might limit the research.

This thesis takes the position that the methods of the research process need not be the same as the methods that are the subject of the research. The original (2004) version of the Double Diamond provides a methodology for a research project, that being a process which must have a clear start and end point. This methodology has not been overly described or defined, which allows me the freedom to purpose it relative to my research aims.

2.3. Practice and epistemology

The thesis' contribution to knowledge has a relationship to practice. Articulating the nature of this relationship has been a challenge and a position that shifted throughout the

early phases of the project. What previously seemed to be problematic – a weakness that undermined the validity of the research – is now a more comfortable and a dynamic relationship exists between research, practice and the models of production within which that practice occurs.

This thesis is a Practice as Research (PaR) project. The doctoral training programme at Falmouth tends strongly towards an arts, specifically performing arts, focus. This led to a first attempt to apply the PaR models of Robin Nelson (2013), which, whilst engaging, missed application to the discipline of the thesis. Moving into writings tailored to a design research approach, the focus was primarily on establishing the value of PaR in comparison to established or traditional forms of research (Feast and Melles 2010), or, differentiating 'design' research from scientific methods of falsification (Metcalfe 2015). These are undoubtedly important issues and provide an understanding of the value of PaR from a wide angle of perspectives, but still the relationship between practice and knowledge within the context of this research project was not explained. Through further reading, principally Laurene Vaughan's edited collection 'Practice Based Design Research' (2019) an epistemological framework for the research was established.

The first issue to address was that of 'too much practice'. If this research was undertaken solely from the position of the automotive designer reliant upon traditional practice to generate knowledge, what was produced would have simply been the same, albeit with some iteration, to what was there previously. This reflects the dire state of critical discourse within the automotive design profession and academic tradition, which this thesis proposes is due to the models of production that frame practice (Chapter 3.1.). Zabolotney discusses this issue in terms of political economy within the field of Communication Design:

"Designers determined to focus on the political economy of design will need to foreground political economy in their practice, rather than having it as a condition of other, dominant, forms of design practice. Leading out with social processes and relations as a condition of political economy, which sets all contexts for design, has the potential to change design practices. Coming to terms with an honest critique of design processes and consequences is the first step in developing a richer, and responsive, discipline." (2019: 26)

If the first issue was the 'how' of practice, the second was a definition of what constituted 'practice' ('is'). This project aimed to generate knowledge through practice, but this has first required the stepping outside of trained (automotive design) practice. Initially, this was achieved through source review methods (Chapters 1.1., 1.2., 1.3. and 3.1.) that suggested contemporary automotive design practice might not be able to deliver upon future mobility design needs: increased flexibility in design to accommodate a broader range of use cases. A secondary review process of architectural and computational methodologies - specifically Carpo's 'Second Digital Turn' and related 'discrete' architectural methods (Chapter 3.2) - identified a possible new approach to both design and construction that could offer this flexibility but would require a fundamental reassessment of the role and value of the designer. As a consequence of this research (Chapters 4 and 5), the approach taken in this thesis has experimented with a different approach that has changed the activities that constitute the labour of automotive design practice - and its value. The proposed shift of design focus in this project is away from manipulation of proportion, form, colour and material (either directly by hand or through the use of partially automated Computer Aided Design (CAD) tools) towards the definition and control of parameters within the context of fully automated, platform-derived systems.

It seemed that much of the earlier work on PaR models within design assumed the role of the designer to be one that this research would leave behind. Through this research and evolution in practice, what Vaughan, building on the work of Schön (1983) and Jarvis (1999), describes as becoming a "Designer-practitioner-researcher":

"Too often, discussions about doctoral programmes focus on programme structures or research outcomes. Not enough consideration is given to the transformation that this long and focused body of research manifests – the PhD graduate. Across the literature on the future of doctorates there is a growing awareness that the destination of doctoral graduates is changing, as are the industry and disciplinary sectors that are employing or applying doctoral expertise in their organizations... Skilled professional designers contribute to both our material and intellectual world – the world of commerce, culture and wellbeing. As the world of knowledge work transforms at an ever-increasing pace, fed by the affordances of digital technologies and an increasingly globalized, mobile world, designers must adapt to change and lead it, responsibly and creatively. That is the role of design – to manifest the world that we are becoming. This is the challenge for the contemporary designer." (2019: 16)

Whilst Vaughan does not adopt a position totally allied with this thesis' 'discrete' influenced position (specifically the idea of designers 'leading' and therefore situated as gatekeepers) the position acknowledges the changing nature of 'practice'. This is important from a personal/professional perspective as the author's practice has evolved from industrial designer to automotive designer to an automotive design strategist.

This research introduces methods of design and construction that are novel to the automotive design profession, but with the explicit intention of using these to start questioning established models of production and the power structures in which they are entwined. Vaughan continues:

"The rise of practitioner-research in the fields of design is one means that designers can use to prepare themselves for becoming advanced in their domains; for developing the critical dexterity and rigorous processes that will enable them to practise in informed ways. Practitioner-research is deeply situated in the nuances of the practice of the researcher, and the most consistent enquiry is into the daily patterns of practice of the researcher. For design, these are the everyday acts of design practice that the designer takes from project to project, accumulating a body of expertise throughout the duration of their practice." (2018: 17)

Through this perspective the research activities, source review, expert interview and artefact/practice analysis become part of a 'second digital turn' aligned design practice. Finally, a critical consciousness of the political economy within which this design work occurs completes a definition of 'practice' from which new knowledge is generated. Design is political (Fry 2010), but this thesis recognises the limits of design practice and the agency of the designer when operating in the political arena (Chapter 3.1.): to change the automotive industry will require more than a revolution in the design studio. Nevertheless, this thesis will contribute both new knowledge and epistemological positions to the discipline with the intent of encouraging others to begin their own reappraisals of automotive design practice.

2.4. Methods

2.4.1. 'Discover' and 'Define' (Source Review)

The first diamond (Discover and Define) has been composed of source review activities. 'Discover' can be understood as the research stepping outside the 'how' of traditional automotive design practice, and 'Define' as reframing and changing the nature of what 'is' the new automotive design practice this thesis offers.

2.4.1.a. Literature Review A (Automotive)

Borrowing a structure from Li et al. (2018), this literature review began with keyword searches in the Falmouth and Royal College of Art library catalogue. After only providing a limited number of results, this approach was applied to a Google Scholar and Mendeley keyword search. As discussed in Chapter 3.1. there is little extended reflective practice within automotive design, so the list of texts to analyse was short. This prompted a change in approach and the greater use of primary research methods. Despite this, several key texts were identified and analysed based on systematic review methods from Kovačić, Mutavdžija and Buntak (2022). These provided insight into the issue of practice vs model of production and established the need for greater flexibility and adaptability of vehicle use in the future, and on issues of sustainability, CASE factors outside automotive design and development of computational design techniques. The knowledge gained from this stage is discussed in Chapters 1.1., 1.2., 1.3 and 3.1.

2.4.1.b Practice and Artefact Review A (Automotive)

Future mobility concepts produced during the period of the research (2018 – 2024) and that relate to Connected, Autonomous, Shared or Electric developments were catalogued (Appendix i) and reviewed through methods of trend analysis. The intent was to identify the approaches to adaptability and flexibility that have been taken by automotive OEM, external consultants, and automotive tiered-supplier design teams over the past five years. A focus is placed upon advanced design activities and concepts. These skills of trend analysis are regularly employed in the author's professional practice when producing trend reports, engaging in research to support formulation of design strategies or to generate new product proposals (See Appendix iv for CV and description of key achievements in current role).

A similar method was used by Mausbach (2010) in his thesis review of sustainable design languages for automotive vehicles. Several concepts were reviewed through attendance at automotive and mobility show reviews, offering deeper insights through experience of the concept and the opportunity to discuss the process behind concepts with their designer. Desk research has constituted a large proportion of the activity, working through industry databases to identify concepts, then cross-referencing press releases with further publicly available writing to identify characteristics and extrapolate key trends. In some instances, it has been possible to supplement this with primary research when conducting the expert interviews (2.4.1.c.). A small number of autonomous concepts only address exterior design concerns and have not been included in the review. Concepts by Chinese design studios have been identified but due to lack of publicly available information their incorporation into the review has been more challenging.

The focus of this review was on concepts produced and shared publicly by professional design practices and studios, thus providing some method to validate and benchmark in lieu of an established 'peer-review' structure. Many automotive design practitioners and students produce and share concepts through social media channels such as Instagram and Behance. Whilst acknowledging that they do not carry the economic-cultural weight of concepts released by studios (from which strategy can be derived), some of these offer alternative approaches to the issues of flexibility and adaptability in future mobility scenarios and have been included. This research method informs Chapters 1.2. and 3.1.

2.4.1.c. Expert Interview (Automotive)

The expert interview (see Appendix ii for raw transcripts and summaries) was undertaken as a supplement to the core research methods over the course of several months to informally build the author's understanding of current automotive design practice through interviews with expert professional automotive designs. It afforded the opportunity to ask the questions that the literature review could not answer. This is a research method used in the author's professional practice, utilising the methods of Laurel (2003) and Trochim and Donnelly (1999). This research chose to target automotive interior design specialists at either a directorial or managerial level to provide insight into day-to-day practice alongside broader discussions of models of production. Potential interviewees were identified through professional networks, recommendations from tutors at the Royal College and from attendance of automotive design shows. The interviewees were selected to give an account of contemporary automotive practice across global markets, market positioning and company type (OEM or new market entrant). Each interviewee verbally agreed to the interview consent form (see Appendix ii.a.) approved by the UAL ethics committee.

A total of eleven interviews were conducted in English, over the web or phone, with each lasting approximately thirty minutes. The interviews were recorded. A list of questions (see Appendix ii.b.) gave a basic structure to the interview but were not followed strictly, a deliberate decision to enable conversation to facilitate exploration of new areas of knowledge relevant to the individual participants. The recordings were then transcribed using Otter.AI and each conversation summarised and then rapidly analysed for key themes, returning to the original transcript (see Appendix ii) when further insight was required. This process follows best practice from the author's professional practice and aligns with elements of Guest, Namey and Chen (2020). Initial insights from this method confirmed the importance of the model of production, the use of digital tools within the context of the first digital turn (i.e. automation of manual labour) and some understanding of the need for flexibility, contributing to Chapters 1.2., 1.3. and 3.1.

2.4.1.d. Literature Review B (Discrete)

The Coordinator of Theory in MArch Architectural Design at the Bartlett shared reading lists which served as a starting point for research into discrete methods of construction. The analysis predominantly focused upon understanding the theory that underpinned the discrete and the way it adopts computational design and automated construction methods. This was through a range of published literature, including print, journal, conference proceedings. This updated and evolved existing knowledge around 'digital' architecture and the political, social and economic history of automation. The discrete literature review partly influenced Chapters 1.3. and 3.1; and was the basis for 3.2.

2.4.1.e. Practice and Artefact Review B (Discrete)

The review of literature on the discrete defined a clear theoretical basis and outlined the methods proposed. It did not provide the basis for fully comprehending the practice-based activities that constitute the discrete. The review of practice began with the work of the 2018/19 cohort of MArch Architectural Design Research Cluster Four at the Bartlett, who are taught by the leading practitioners and theorists in the field of the discrete. The team behind one project, ALIS, shared their pre-published project report which offered insight into the methods they had used. Attendance at several exhibitions and crits around the topic of the discrete has further aided understanding of the various methods.

2.4.2. 'Develop' and 'Deliver' (Practice and framing)

The second diamond (Develop and Deliver) deliver the core element of practice-based research and are central to the knowledge claim. 'Develop' entailed first learning new computational design tools and methods and then secondly through prototypical practice developing the first 'Discrete Automobility' concepts (Chapter 4) 'Deliver' was the presentation of these concepts to other automotive design practitioners and reflecting upon their feedback as part of the project evaluation (Chapter 5)

2.4.2.a. Computational Learning

This first phase of practice-based research was focused on learning the new tools and methods that would be needed to develop the novel 'Discrete Automobility' process. The research evidenced in Chapter 3.2. suggested the need to expand the technical skillset of the automotive designer to include computational design tools. It was decided to learn Grasshopper (GH), an open source, visual coding based computational design tool that is part of popular Computer Aided Design package Rhinoceros 3D, and supported by an ecosystem of third-party developers who create specialist 'plug-ins' which can be used to extend the capabilities of GH. A grounding in the basic concepts of GH and establishing a sufficient level of competency was achieved working through Tedeschi Algorithms Aided Design (Tedeschi 2014). This was reinforced by taking part in a weeklong online workshop titled 'Introduction to Computational Design' organised by DRIVEN, a Paris based start-up incubator. Further learning of GH plug-ins is detailed as part of the practice review in Chapter 4.

2.4.2.b. Prototypical practice

The experimental practice phase is central to the knowledge claim of this thesis – it is through the practice that the novel 'Discrete Automobility' design process has been developed. Binder and Brandt have attempted to visualise the relationship between research question, design research programme and experiment and propose:

"Our suggestion is to see design research practices as fundamentally homologous to any other design practices, both in terms of the way they are driven forward by a dialectic between programme and experiment and in how they actualize potentialities through experientially manifesting the possible. This does not mean that design practices are in themselves research practices. Research practices must be answerable to a research question or concern that resides outside the programme. Still, exploring the possible can only be pursued through adhering to a programme." (Binder and Brandt 2019: 101-110)

In this sense, the earlier chapters of this thesis (Chapters 1 and 3) can be seen as initial responses to the research questions, but their primary purpose has been to 'set the brief' for the practice evidenced in Chapter 4 to respond to and deliver the new knowledge that answers the research questions in full; or, as Binder and Brandt describe in their title, 'Design (Research) Practice'. Chapter 4 provides a detailed account of the prototypical practice, offers reflection on the new knowledge that has been created and provides a stepping off point for future design and research work.

The process developed through the research was intended to be shared with other automotive design professionals through a toolkit and presentation, this element guided by Dickson and Stolterman (2016) and Kärnä-Behm (2022).

2.4.2.c. Sharing the research results

When the prototype 'Discrete Automobility' workflow had been created, it was shared via a website (www.discreteautomobility.com), and via presentation/workshops that were designed to introduce the principles of 'Discrete Automobility' to automotive design professionals to gain their feedback and encourage further experimentation with the tools developed. The research was presented on ten occasions to a mix of OEM design teams, independent design professionals, academics and postgraduate student programmes. This process is described in Chapter 4 and a summary of the feedback and suggestions for future design and research work are detailed in Chapter 5.

Chapter 3.1 – Fordist to Neo Fordist

Chapter 3.1 – Fordist to Neo Fordist

3.1.1. Introduction

In this chapter, a history of automotive design is charted as it relates to the role and practice of the automotive designer today. It is proposed that the foundational elements of praxis have remained largely consistent since the introduction of mass production techniques ('Fordism'), and extrapolates how these political, social, and economic factors have formed institutional power structures which define the designer's role, but also limit the scope of design discourse.

This discussion considers how these structures limit the scope of design practice and progresses to consider how late 20th century management and production techniques have codified design practice, and its critical discourse, in terms of efficiency, risk reduction, and derived de facto professional ethics. These very construction methods and their associated economic model: 'if enough customers want it, it is ok to build it' lead to a situation where it is difficult for the automotive practitioner to make moral judgements on their work, instead hiding behind 'professional distance'; a pressing concern given the urgency established in Chapters 1.1., 1.2., and 1.3.

This chapter also reinforces the conclusions from Chapter 1, and the central argument of the thesis: that contemporary automotive design practice is limited to an extent that renders it unsuitable to address the contexts and demands of future mobility.

3.1.1.a. Aims and Objectives

The chapter addresses research question two; *Is automotive design practice in its current form successfully responding to these changes [Question 1], or is it equipped to do so in the future?*

This chapter summaries the history of automotive design practice (3.1.2.) and frames this praxis within the economic model of production it occurs. 3.1.3. examines the critical discourse within automotive design practice and compares it against architectural practice as an adjacent creative design discipline. It is suggested that the space for critical discourse in automotive design practice is narrow, and that the discipline lacks a tradition of reflective practice. 3.1.4. concludes the chapter suggesting the current lack of political consciousness could mean that automotive designers are not well equipped to anticipate and consider new frameworks within which their practice might be required to occur in the future.

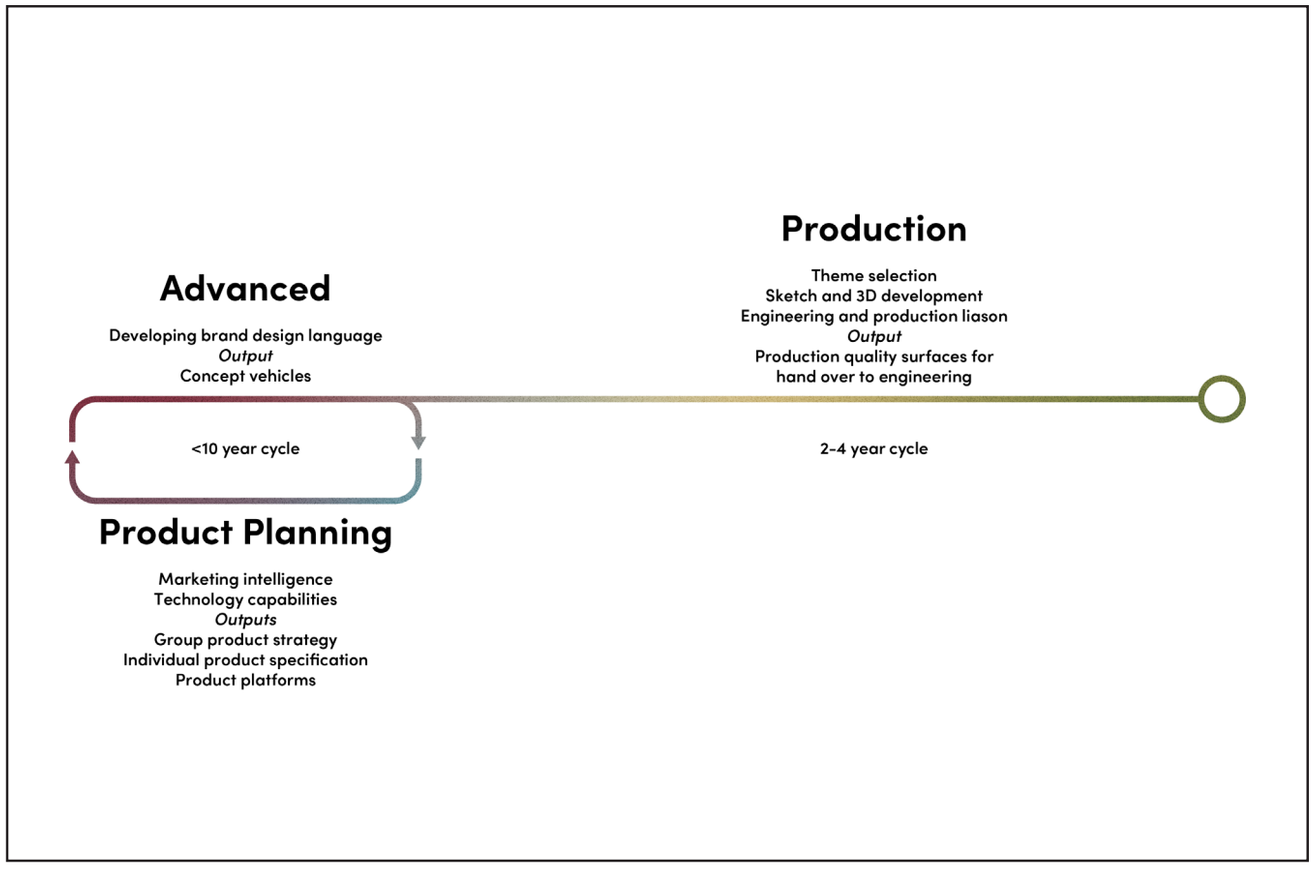
3.1.1.b. Methods

This chapter was written from knowledge generated through Literature Review A (Automotive) (Chapter 2.4.1.a.), Expert Interview (Automotive) (Chapter 2.4.1.c.) and Literature Review B (Discrete) (Chapter 2.4.1.d.).

3.1.3. 'Repurposing the pen' revisits an essay published in March 2021 by the website Form Trends (Dooley 2021).

This chapter borrows theoretical framing from the work of architectural theorist and historian Douglas Spencer, from whose analysis of postmodern and 'Parametricism' movements the term 'Neo-Fordist' is derived.

Right
Fig. 3.1.2.i.: Advanced and Production design schedules. 2024. Image by the Author.


Advanced
Developing brand design language
Output
Concept vehicles
<10 year cycle
Product Planning
Marketing intelligence
Technology capabilities
Outputs
Group product strategy
Individual product specification
Product platforms
Production
Theme selection
Sketch and 3D development
Engineering and production liason
Output
Production quality surfaces for
hand over to engineering
2-4 year cycle

3.1.2 Origins of automotive design practice

The origins of vehicle design practice can be found in the coach and boat building techniques of the mid-late 19th century, where bespoke exterior and interior elements were designed, generally to order, onto a pre-engineered frame (Parissien 2013). The establishment of Fordism as the dominant method of automotive construction in the early-mid 20th century defined the role of the automotive designer within standardised production lines (Votolato 1998).

The futuristic consumerism of the 1920's introduced the term 'product stylist' and the notion of visual trends. Towards the middle of the century, the process of 'badge engineering' in American markets meant the designer was tasked with the differentiation of standardised models (Bayley 2009). Contemporary automotive practice is defined as either 'production or 'advanced'. The former is concerned with the design of products for sale today and the latter, which is the focus of this research, the development of concepts which signpost the creative and technical direction of a brand (Meadows 2018).

Figure 3.1.2.i., developed from the work of Baback Yazdani (2006, 2008) frames this practice within the wider model of production. The platform traditionally described the underlying chassis structure upon which the vehicle is designed (Macey 2014:12). From the mid-late 20th century, the move by all mainstream car manufacturers towards shared platform architecture, whereby multiple models of vehicle could be derived from a single engineered structure, was concurrent with the growth in popularity of neo-liberal managerial structures. Central to this shift was the growth of the product platform (Meyer and Lehnard 1997) and the subsequent growth in size and influence of product planning departments (Robertson and Ulrich 1998), which were dominated by engineering, marketing and business management specialists as opposed to design professionals. Driven by economic efficiencies and risk reduction, this transition signalled an evolution from Fordist to what we might term 'Neo-Fordist' production methods.

3.1.3. 'Repurposing the pen'

Automobiles are one of, if not the, most technically advanced consumer products. Automotive designers are a distinct subset of the industrial design family, trained to create complex, highly resolved three dimensional forms for volume manufacturing. Creating 'the new thing' is the source of the designers' professional/economic value - and often their personal identity too. Automotive design is intertwined with global culture, politics, and economics, yet something is missing: the discipline lacks an intellectual tradition. Commercial pressures have been allowed to dictate design education and this legacy makes it difficult for the automotive designer to engage with the urgent issues of today.

It has become fashionable for automotive designers to compare themselves to architects, perhaps originating from proportion-derived design methods. Architecture shares many of the challenges facing automotive design: the economics of production have significant influence and its culture is arguably as concerned with the architect's claim to authorial voice as it is with how the object relates to the people for whom it is supposedly designed.

Architecture has practitioners who reflect on their work and engage with theory. This is under threat from those who see it as a political inconvenience (Spencer 2016), the current models favour those from a position of privilege (Martin 2010) and do not afford representation to all voices (Matthews 2019) but, there is at the very least some form of critical reflection upon practice. An intellectual tradition is embedded in architectural education, so this reflection extends beyond the academy. Outside the institution, practising architects (not all, not enough, but some) engage with their discipline intellectually. They read and write, critique ideas and advance positions (Sorkin 2019). These discussions extend beyond 'what' to 'why': a framework exists to discuss the theoretical aspects of their practice. Automotive design uses some of the tools (see Chapter 3.2) and has superficially adopted some of the language of architecture (and the turtlenecks), but not the engagement with theory and critique. The architectural form of engaged practitioner and critical discourse does not exist in automotive design.

Automotive design remains a 20th century industry, predicated upon high volumes and low margins. The design historian Gregory Votolato describes automotive design as a "closed shop" (2015: 74). It is predicated upon a 'Fordist' mentality; it is naturally risk-averse, resistant to change and suspicious of critique.

Theory is only engaged with by a select few through the commodified notion of 'thought leadership' (Sessions 2017). Ideas that cannot be communicated through a sketch or a mood board are considered too complex. This is the result of, and further reinforces, the long-established and unchallenged political ideologies (Nobel 2011) that underpin automotive design. Instead, anti-intellectualism haunts the discipline as there is little incentive to reflect upon practice. The scope of design activity is limited, and the automotive designer is as much a product of mass-manufacturing as the vehicles they create. This lack

of agency (Noble 2000) means that any change to the methods or role of the designer are the result of externally imposed conditions.

Many automotive designers balk at the term 'stylist', but are not trained to reflect critically on their work. They come from similar backgrounds and attend a handful of design schools with similar curricula. These institutions neglect theory, choosing to educate through projects that ape the real world. Students face mounting levels of debt and see little value in difficult activities which do not directly increase their job prospects. Institutions, framing the student as 'customer' (Raaper 2019), (Fletcher 2020) see the written dissertation or history and theory programmes as unnecessary and costly: if they ever had one, they are now being slowly eroded from the curriculum (Whiting 2011). The intellectual stimulation of university education has been chiselled away and a hollowed out technical-vocational skeleton remains.

There is a large volume of public, published, and peer-reviewed literature on automotive engineering research. There is an active community of human factors and ergonomics researchers. But the foremost automotive designers – those at the top of creative design processes – rarely, if at all, participate in structured critical analysis of their practice, that of their contemporaries, nor of the models of production within which this practice occurs. Interviews tend towards self-advertisement, and discussion to defensiveness, at best serving to reinforce preconceived positions rather than to reveal new ones. There are isolated examples of critically engaged vehicle design, but these can only be critiqued on individual merit and not as part of a broader discourse.

The printed literature on automotive design tends towards one of three categories; Technique; sketching, visualisation, modelling ('How to'), Historical; a theorist (i.e. not practice trained) or worse, enthusiast, documenting previous car design ('What was') or Technical; packaging configurations and engineering considerations ('For what'). Of course, critique can and does exist outside of the written word. Writing cannot articulate all forms of knowledge (Ednie-Brown 2017: 131) and presents significant barriers to those who are not trained or predisposed to this form of communication. It is an imperfect medium which we must work to make more accessible, as it does at least offer a platform for the sharing and critique of new ideas. Describing 'what' or 'how' is relatively straightforward; discussion of 'why' is more challenging, but so much more valuable if we are to understand and create change.

A recent political awakening, particularly amongst a younger generation, recognizes that to 'not be political' can be political, as a tacit endorsement of the status quo (to 'be political' simply meaning to consciously engage in a debate). Both product and service design have extolled 'design thinking' or 'design as problem-solving' as offering a 'third way' solution to political issues – a questionable over-reach (Iskander 2018), (Kolko 2018). Architecture has similarly struggled with its role/image, with some seeing it as a platform for political activism. Automotive design practice will not be a substitute for overt political action, particularly when the limits are placed by the model of production within which it sits (risk adverse Neo-Fordism). A design-led engagement has definite limitations, but a shift from passivity to political consciousness is an essential first step towards a discipline that can meaningfully engage with the political, social, and cultural discourses of the societies it designs for.

3.1.4. Conclusions

There are small signs of progress amongst the automotive press and some design schools, however these are yet to deliver substantive change. Automotive design needs coordinated action to establish an intellectual tradition. A starting point would be industry and academia jointly re-evaluating existing models of design and the relationship with production cycles. Theory cannot be limited to the institution and should permeate the discipline: this can only happen when practising designers collectively decide to value their work beyond traditional commercial terms or the aesthetic preference of a select few 'tastemakers'. Academia could play a more active role as a critical friend to industry, whilst also conducting research outside of commercial pressures or influence.

A new educational experience that is less individualistic and competitive and where students are taught to question as much as they are to create would lead to a new generation of designers better equipped to critically engage with their discipline. Design leaders could make further effort to establish platforms and channels for reflection and critique as they are the ones who have the power to resource new journals, conferences or digital channels and so ignite meaningful debate. These actions would affirm the importance of an intellectual tradition to younger designers and encourage their participation in it.

Finally, designers can only speak freely if those at the top of industry and academia urgently address the discipline's poor record on diversity and job security. This means the over-reliance on temporary or contract employment agreements and badly (if at all) paid internships must end. By engaging in critique - public relations teams may be

occasionally challenged – the discipline will exert greater ownership of the problems it is a part of. Applying a critique is not a means of imposing a negative view; rather, it is a route towards positive, progressive solutions.

There is an analogous relationship between the inflexibility of 'Neo-Fordist' production methods and their likely inability to meet the need for highly adaptable, highly utilised Mobility as a Service vehicles, and the staid discourse of automotive design. Chapters 1.1., 1.2., and 1.3., conclude that on their respective issues (sustainability, utilisation, and computation) automotive design is failing to look outside of existing paradigms: the risk averse nature of the automotive industry limits automotive designers to a single narrow lens. The lack of critique has established a hostility to new ideas and could ultimately be the reason that contemporary automotive design is unable to adapt to deliver upon the challenges of tomorrow.

While this thesis is situated within a critical design discourse, it does not claim to be exhaustive in its treatment of the many intersecting fields it touches. There are well-established spatial and sociological theories - from Lefebvre's Production of Space (Lefebvre and Nicholson-Smith 2013), a foundation for Soja's concept of Thirdspace (1996) to John Urry's analysis of automobility as a socio-technical system (2004) - that offer rich frameworks for understanding the broader implications of mobility, infrastructure, and the politics of space. Similarly, experimental design work such as that by Arup's Advanced Geometry Unit (AGU) align with some of the techniques applied here also (Bosia 2010).

However, these projects are largely developed outside the field of automotive design. What distinguishes this research is that it originates within automotive design practice, using its tools, constraints, and production logic as a critical site of intervention. This work is not theoretical commentary from the outside, but a situated attempt to reformulate automotive design practice from within. It contributes new knowledge precisely because it emerges from the discipline it critiques.

These other references serve as important adjacent or supportive contexts for the work, and may offer future avenues for collaboration or theoretical framing, but they are not the primary focus here. This thesis contributes to a still-nascent but necessary tradition of critical, practice-based research by and for automotive designers.

Chapter 3.2 – Introduction to discrete architecture

Chapter 3.2 – Introduction to discrete architecture

3.2.1. Introduction

This chapter introduces the emerging experimental architectural practice of 'Discrete' construction, beginning with an explanation of Mario Carpo's 'Second Digital Turn' concept that frames these ideas. The work of leading practitioners is reviewed in this chapter before a critique of the discrete is offered in terms of adapting its methodologies and positioning of the designer to be suitable for use in 21st century mobility.

3.2.1.a. Aims and Objectives

This chapter addresses research question three: *Are there other models of design that automotive design could adopt to increase its resilience and respond more successfully to these changes?*

3.2.2. introduces the 'Second Digital Turn' concept and examines how discrete architecture has emerged from this theory. 3.2.3 conducts a review of leading discrete architecture practice and identifies the key themes of flexibility and participatory design. 3.2.4. concludes the chapter applying a discrete lens to automotive design practice and questioning how the discrete could be purposed in automotive design.

3.2.1.b. Methods

This chapter was written from knowledge generated through Literature Review A (Automotive) (Chapter 2.4.1.a.), Literature Review B (Discrete) (Chapter 2.4.1.d.) and Practice and Artefact Review B (Discrete) (2.4.1.e.)

3.2.2. The second digital turn

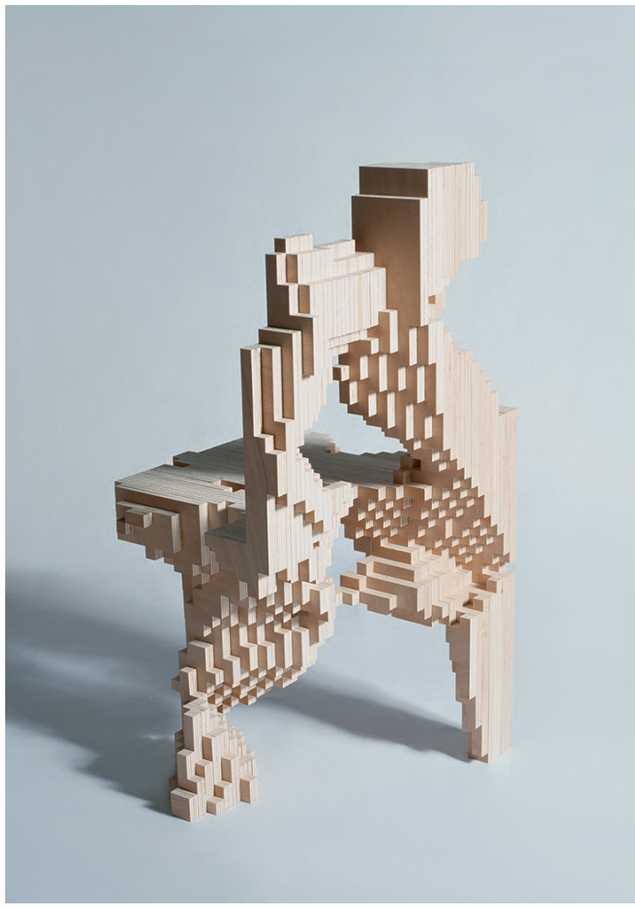
The closing decades of the 20th century saw the replacement of analogue design and construction methods with digital ones; the replacement of the drafting board by Computer Aided Design (CAD) programmes a prime example. Architectural historian and theorist Mario Carpo proposes that the impact of these first digital tools - algorithm aided design software or computer numerically controlled construction techniques - was to make previously manual labour more efficient (Carpo 2013). The digital tools suggested a future of mass customisation and hinted at a participatory design process (Carpo 2011), both of which failed to materialise at scale. The repeatable accuracy of these tools was impressive, but never fundamentally changed the design process.

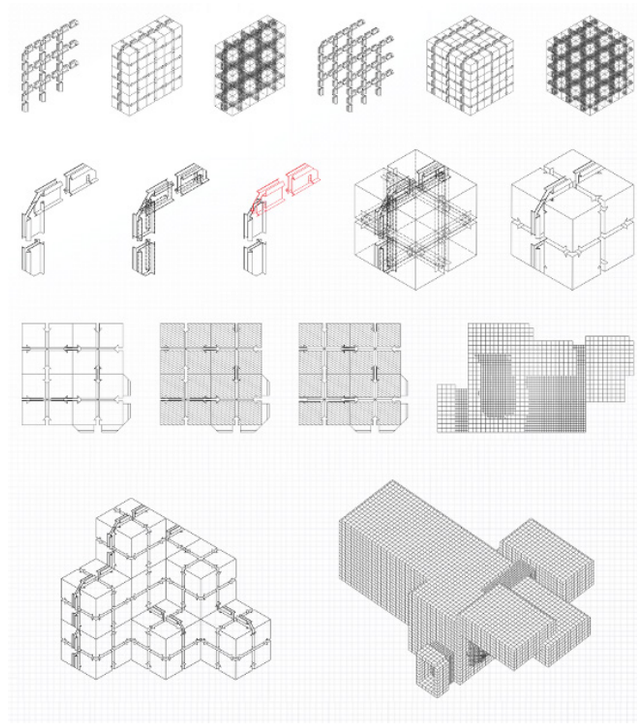
There has been fierce debate within architecture around the term 'digital' and equally the political manner within which these first digital tools were purposed. Both proponents and critics of neoliberal thought sought to establish a relationship between this self-organising derived political position and the generative and bio-mimic elements of these new algorithmic aided design processes (Leach 2015). Claypool (2019) describes how the ease in creation of complex geometry in digital facilitated design resulted in buildings which were difficult, time consuming and expensive to produce, thus limiting the use of these design tools to those who could afford to do so. Furthermore, a disconnect existed. Once 'designed' digitally, a process of post-rationalisation was required to effectively 'redesign' the building for its construction. These structures were inflexible and not adaptable to changing needs.

Right, top
Fig. 3.2.3.a.i. EZCT Architecture, Hatem Hamda and Marc Schoenauer. 2004. Chair Model 'T1-M' after 860 generations. [photograph].

Far right, top
Fig. 3.2.3.a.ii. EZCT Architecture. 2009. Universal House system. [digital render]. The City as a Project [online].

Far right, bottom
Fig. 3.2.3.b.i. Mickey Matter by RC4, the Bartlett. 2016. [photograph].





Through analysis of the digital outside of architecture, Carpo has defined a 'second digital turn' in the relationship between architecture and computational technologies. Carpo proposes a future architectural practice that is concerned with the definition of systems within which design activities occur and the control of their parameters, as opposed to the direct manipulation of material. This recasts some of the architect's authorial privileges. Drawing from computer science, particularly ideas of 'discrete' data, Carpo establishes a framework for the automation of knowledge-based labour. These computational design methods have been evolved in conjunction with construction techniques, founded upon the concept of 'voxels', best described as three dimensional 'pixel-like' parts which can be aggregated and assembled into infinite configurations (Morel 2019). The part to whole relationships of these methods presents new questions of meronomy (Koehler 2019). 'Discrete' like and associated computational design methods have been developed by several architectural design and research institutions, including Block Research Group (BRG) at the Institute of Technology in Architecture at ETH Zürich (Frick et al. 2015), MIT, Boston (Tibbits 2017) and USC Los Angeles (Sanchez 2019). Researchers at the Design Computation Lab (DCL), the Bartlett School of Architecture and Built Environment, University College London consider automation as a political issue and are explicit in their intention to develop the discrete as a progressive architecture movement which advocates for a more equitable future (Claypool et al. 2019). Leading practitioners at DCL include Gilles Retsin, Mollie Claypool, Manual Jimenez Garcia and Kevin Saey.

3.2.3 Practice review

This review examines the work from EZCT Architecture, Unit 19 and Research Cluster 4 at the Bartlett, University College London and the Plethora Project, associated with the University of Southern California (USC) School of Architecture in Los Angeles.

3.2.3.a. EZCT Architecture

The Paris based office EZCT Architecture & Design Research was co-founded by Phillipe Morel who publishes widely on issues related to computational architecture. In 2004, EZCT Architecture in collaboration with Hatem Hamda and Marc Schoenauer produced Chair Model 'T1-M' (Figure 3.2.3.a.i.). This design was the output of a study on optimisation, using genetic algorithms to construct chair forms with computational design. Model 'T1-M' was arrived at after 860 generations (86,000 structural evaluations) and represented one of the most evolved designs from a series of 25.

In 2009 Morel and EZCT Architecture & Design Research proposed 'Universal House'. Stepping from Alfred Farwell Bemis 'The total matrix of the house' and Sou Fujimoto Architects 2013 pavilion for the Serpentine Gallery, London, 'Universal House' introduced the concept in architectural construction "of parts that no longer have any relation to the whole, nor any predefined meaning or function" (Retsin 2019: 11). This integrated building system comprises self-interlocking discrete blocks that can be plugged in any direction. These square parts act like three dimensional versions of a two-dimensional pixel, as discrete elements that can be fixed together using a special joint mechanism (Figure 3.2.3.a.ii.).

3.2.3.b. Research Cluster 4 (RC4) at the Bartlett, University College London

In 2016 Panagiota Spyropoulou, Hyein Lee, Pooja Gosavi and Pratiksha Renake, researchers from RC4 produced 'MickeyMatter' (Figure 3.2.3.b.i.). This used a spherical rounded element produced at different scales and designed

Right, top
Fig. 3.2.3.b.ii. Tallinn Architecture Biennale Pavilion. 2017. [photograph]. Retsin [online].

Right, bottom
Fig. 3.2.3.b.iii. Gilles Retsin Royal Academy of Arts Installation. [photograph]. 2019. Retsin [online].

Far right, bottom
Fig. 3.2.3.b.iv.: ALIS, with a smaller model inset, Bartlett B-Pro September. 2019. Image by the Author.


RESEARCH CLUSTER A

to accommodate tolerances in the assembly process. The design uses serial produced (i.e. standard) parts that demonstrate differentiation in their organisation when assembled (Garcia 2016).

Gilles Retsin of RC4 has developed a discrete architecture practice that produces voxel parts from Cross Laminated Timber (CLT) that are designed to perform equally well in any structural condition: under compression, tension, as a cantilever or as a column (Design Boom 2017), enabling the design of constructions that can use the same part produced at volume in any function of a building construction. Retsin has used this approach in the design of 'The Diamonds House' in 2016, 'Tallinn Architecture Biennale Pavilion' in 2017 (Figure 3.2.3.b.ii.), a proposal for Nuremburg Concert Hall in 2018, an entry for Suncheon Art Platform in 2018 and an installation at the Royal Academy of Arts in 2019 (Figure 3.2.3.b.iii.).

ALIS (Automated Living System) was developed by post-graduate students in Research Cluster 4 at the Design Computation Lab, the Bartlett. This research cluster is associated with Automated Architecture (AUAR), a company run by some of the lab's research and teaching staff and who have now taken on the further development of ALIS. Figure 3.2.3.b.iv. shows ALIS configured as a living space at the Bartlett B-Pro Show September 2019, and Figure 3.2.3.b.v. as a co-working space at The Building Centre in January 2020. ALIS purposes a discrete workflow, purposed towards the provision of community centred architecture and construction.

Architizer describes ALIS as such:

"The system is based on a single, repeating building block, which can be cut by a CNC machine and robotically assembled by two industrial robots. Once prefabricated, the building blocks can be assembled into a variety of home typologies, from single family houses to backyard extensions and complete multi-story housing units, which can all be reconfigured and adapted over time. A set of algorithms was produced to generate and evaluate different building assemblies. With ALIS, AUAR wants to advocate alternative models for automation platforms for housing, which allows local construction, interaction with community groups and adaptation over time" (Architizer 2020).

The construction of the 'voxel' building blocks can be seen in Figure 3.2.3.b.vi.

Figure 3.2.3.b.vii. illustrates the use of algorithmic design methods to generate different configurations dependent upon different scenarios of use, alongside various environmental and technical considerations. Through ALIS, the compatibility of discrete systems with Circular Economy frameworks can be observed. During the installation at The Building Centre, a prototype booking system offered an insight into how people could be afforded agency through the flexibility and adaptability of a discrete system utilising computational design and automated construction methods (Figure 3.2.3.b.viii.).

3.2.3.c. Plethora Project

The Plethora Project, led by José Sanchez, Assistant Professor at the University of Southern California (USC) School of Architecture in Los Angles describes itself as:

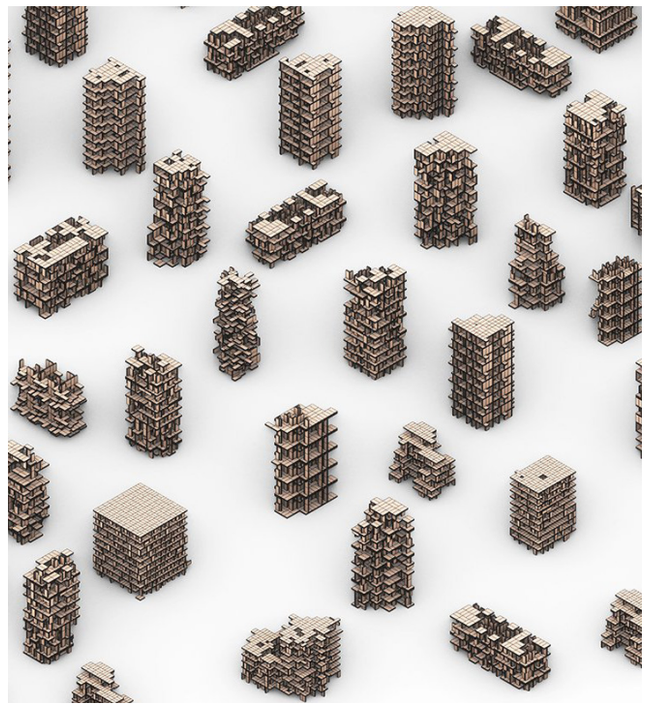
"...a design studio with a mission to accelerate computational literacy in the frame of Architecture and Design. The project was inspired by the "show me your screens" motto of the TopLap live-coding group attempting to get rid of Obscurantism in digital design."

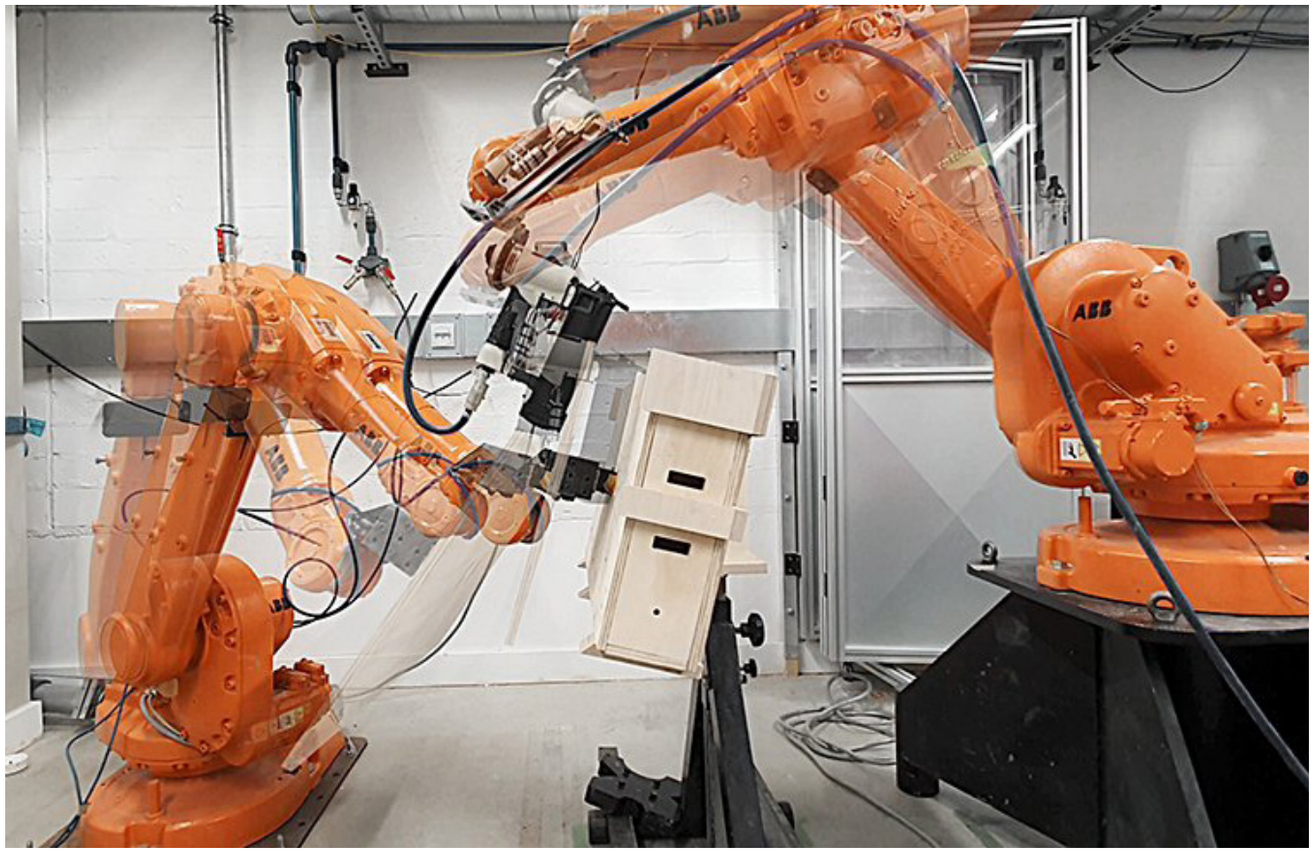
The project was initiated in 2011 as a teaching initiative and has grown to become a design and software development studio. Each project developed advances a thesis of how a

Right, top
Fig.3.2.3.b.v. ALIS at The Building Centre, January 2020. 2020. [photograph] Design Boom [online].

Far right, top
Fig.3.2.3.b.vii. Aggregation of discrete parts. Unknown. [photograph]. Design Boom [online].

Far right, bottom
Fig. 3.2.3.b.vi. Automated construction of discrete parts. Unknown. [photograph]. Design Boom [online].

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repository of knowledge, manifested in building form or software, can be re-used by the public at large, developing a form of digital infrastructure for DIY initiatives.
The studio believes in a humanistic approach to design, placing humans as responsible for decisions, and questioning decision-making algorithms. The research in this sense can be described as intelligence augmentation through the use of digital platforms." (Sanchez Unknown)

Plethora Project's game inspired approach showcases how individual units — digital blocks in a game or physical modules in a building system — can be combined in infinite combinations to create complex and adaptive structures. The project demonstrates the core principles of discrete architecture: flexibility, sustainability, and a departure from monolithic construction methods towards more dynamic and responsive architectural solutions.
The project — crossing architecture, game design, and digital technology — demonstrates the interdisciplinary nature of the discrete; as an architecture movement with roots in computational theory it has a disposition towards integration of knowledge and expertise from other fields. Plethora indicates the scope of discrete architecture beyond building design and construction to apply these principles to urban planning, community engagement, and environmental stewardship.

Plethora emphasises a participatory design process: "Discrete design offers a participatory framework for collective production, placing at the centre the design of open-ended tectonic systems that encapsulate knowledge" (Sanchez 2019: 22–29). "Block'hood," is a video game that simulates urban planning and ecosystem management, inviting players to engage in the design of sustainable neighbourhoods by assembling modular blocks, each representing different building types and infrastructure elements (Figure 3.2.3.c.i.). This interactive platform demonstrates the democratic potential of discrete architecture and educates users about the complexities of ecological and social interdependencies within urban environments (Sanchez 2020).

Combinatorial Nest (Combo-nest) (Figure 3.2.3.c.ii) was a proposal for the Tallinn Pavillion Program at the Tallinn Biennial 2019:

"Combo-Nest is a discrete open-ended tectonic system, that relies on the patterning of material units to grow volumetrically with different motifs. Unlike closed systems, such as a geodesic dome, that operate as a jigsaw puzzle, the units of Combo-Nest define an 'open-whole' susceptible to alteration, growth or pruning. This makes them conducive for a process of iterative design, searching for patterns or configurations that resonate with the local context. Our proposal believes that such a process of identifying culturally relevant patterns (what we could call beauty) is a process that is participatory and collaborative, in which architects can engage in a dialogue and develop consensus with the community."

Combo-nest demonstrated the potential of discrete architecture to leverage the economic efficiencies of mass manufacture, but: "By considering the combinatorics and permutations of discrete modules, serial repetition can be utilized as an expressive grammar." (Sanchez 2019) and through this expressive grammar deliver non-homogenous designs. Plethora delivered a toolkit to the jury team comprised of a scale 'toy' model of the core components (Figure 3.2.3.c.iii), a construction guide as to how the parts could be assembled (Figure 3.2.3.c.iv), and a video game with which the user could virtually build their own Combo-nest constructions (Figure 3.2.3.c.v). This toolkit was created to function as both design aid and educational tool for non-expert user and would have enabled the community of Tallinn to be participants in the design of the pavilion structure also.

Right, top
Fig. 3.2.3.b.viii. User Interface to book a workspace. Unknown. [photograph]. Design Boom [online].

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Fig. 3.2.3.c.i. Block'hood interface. 2016. [video game still].

Far right, bottom
Fig.3.2.3.c.ii. Combinatorial Nest (Combo-nest). 2019. [digital render].


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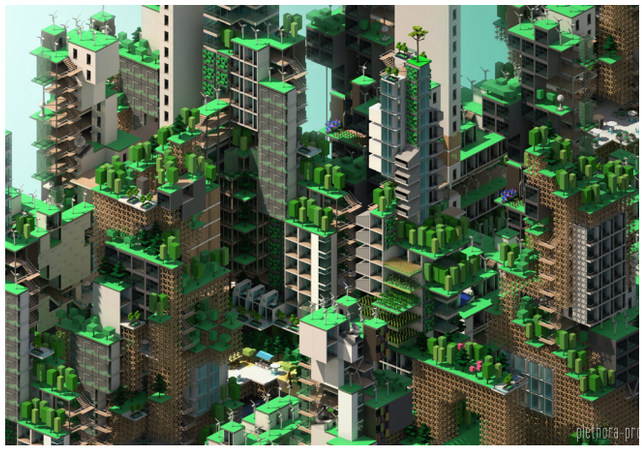

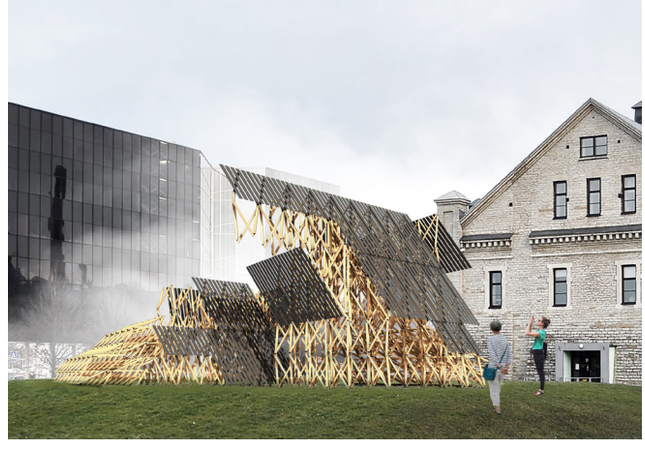

3.2.4. Conclusions

The discrete has also been misunderstood as an aesthetic style, one developed in reaction to the smooth flowing lines of the first digital turn. Discrete architecture – referred to by Carpo as a form of "Computational brutalism" (2019) – creates designs that look the way that they do because of their methods of construction. Comparisons have been made to, and the movement has been described as "a positive departure from", modernism (Koehler 2019). A distinguishing characteristic of a discrete system is that the architect can be valued as the enabler of a truly participatory form of design process, rather than just a gatekeeper or tastemaker (Retsin 2016).

Applying a discrete lens to automotive design practice, the profession has incorporated digital tools squarely and solely through the perspective of the first digital turn - to make its practice more efficient and therefore more profitable. Automation of construction methods has mimicked human labour (Figures 3.2.4.i. and 3.2.4.i.). Times to market have become quicker and de-risked, but the fundamentals of what is produced have not changed (Figures 3.2.4.iii. and 3.2.4.iv.). Whilst greater customisation and adaptability of design is possible (see Chapter 1.2.), the construction process is based upon a post-rationalised structure, the configuration of which is driven largely by engineering concerns and the designer is confined to the role of a 'tastemaker' who applies the visual trends of the moment (Lewin and McGovern 2017).

This thesis adopts discrete methods for two reasons. The first is pragmatic and led by the economics of future mobility; these methods afford the opportunity to produce vehicle interiors that are near infinitely flexible and adaptable, to a level the design and construction methods of today are not capable of achieving. This research questions how such a system could be repurposed for use within a vehicle design context, specifically the interior. Computational design and automated construction could mean that the layout of interior elements could be different for each person. These might be shaped by a combination of scenario of use, user preferences and environmental factors. This presents a challenge to the role of the designer, who rather than designing a specific layout, designed the system within which configuration can occur.

More generally, what size/scale and connection method should the parts be and how is the discrete refined for use with an automotive context? What materials and processes should the parts be constructed from, do they incorporate digital or connective elements? How much variance should be allowed in part geometry, should certain parts be 'pre-assembled'? How does robotic assembly function within the vehicle? What happens to parts that aren't needed? How can brand design languages be applied to the individual parts and still constitute a coherent whole, and how does this extend to the digital experience? This is the techno-speculative element of the project (see Chapter 4).

The second is that adopting discrete methods reformulates the 'what is' of automotive design practice. Discrete construction methods could enable the provision of mobility services to be recast as an element in the design and manufacture process that does not conclude on the production line. Then why should it just be car brands who design mobility services? These methods could feasibly allow non-automotive brands, or local government or community groups to offer mobility services.

This presents further questions: how much of the design process can and/or should be open to other providers and decision-makers? How democratic could and should a new automotive practice be? The opportunity and challenge here, in a discipline which isn't conscious of 'digital turns' (see Chapter 3.1.), will be to posit a new argument for the

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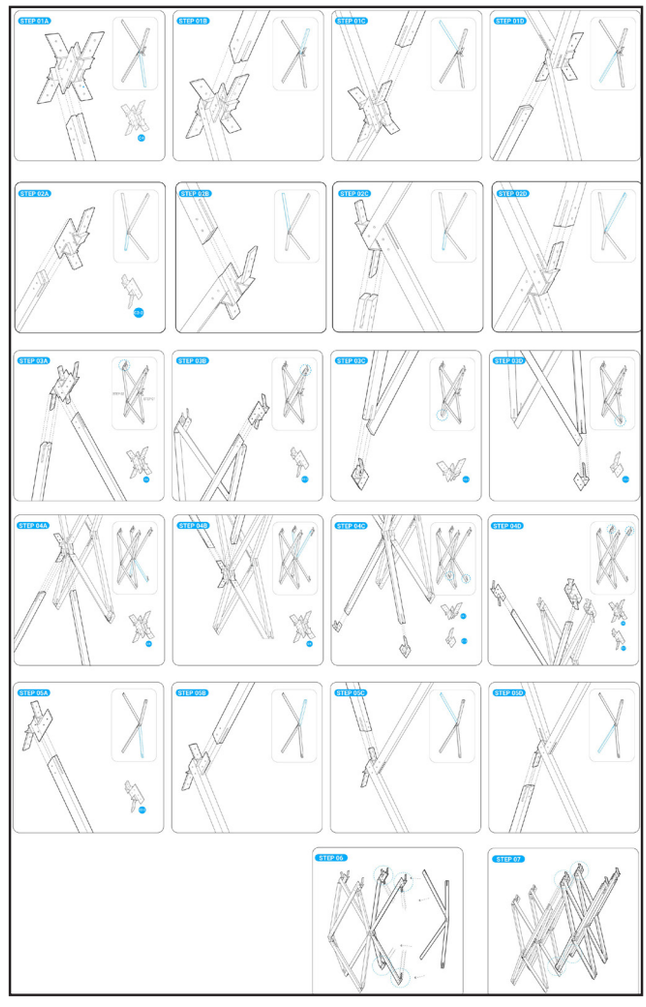
Fig.3.2.3.c.iii. Combinatorial Nest (Combo-nest) – The Toy. 2019. [photograph].

Far right, top
Fig.3.2.3.c.iv. Combinatorial Nest (Combo-nest) – The Instructable. 2019. [photograph].

Right, bottom
Fig.3.2.3.c.v. Combinatorial Nest (Combo-nest) – The Video Game. 2019. [video game still].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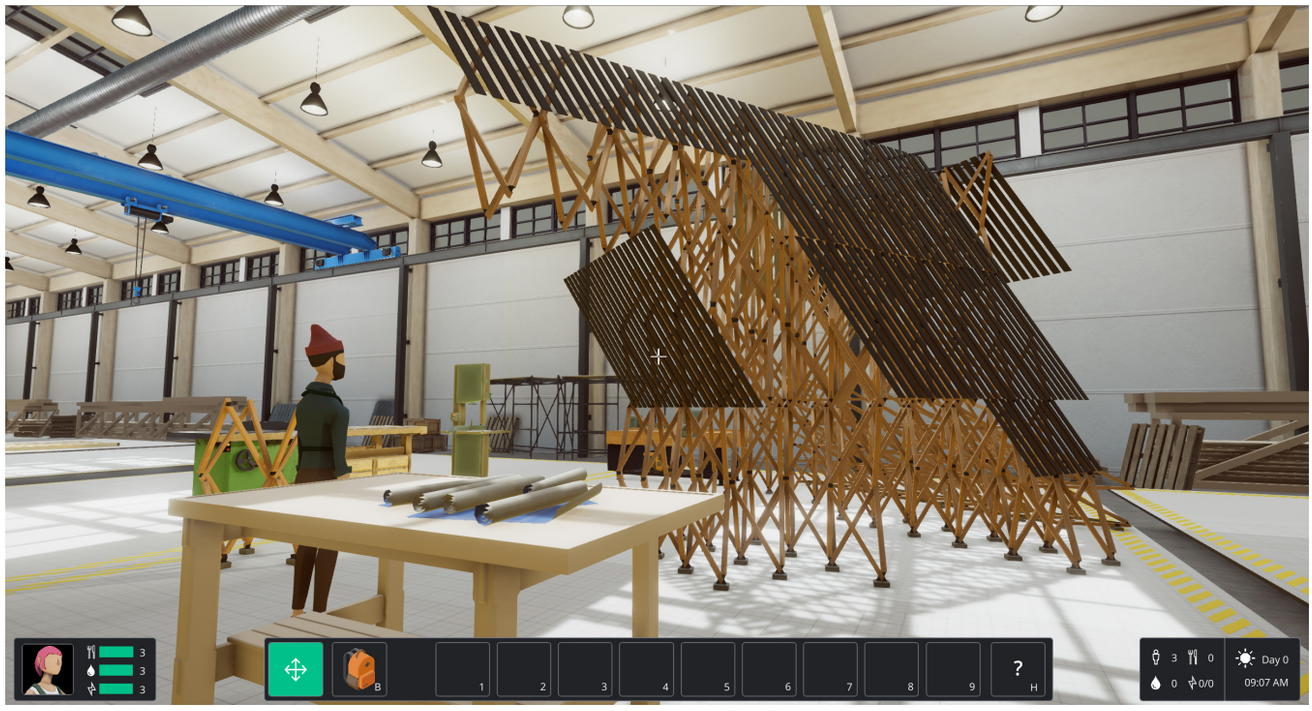
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Fig.3.2.4.i. Early Ford Assembly Line. Unknown. [photograph] The Hand & Eye [online].

Bottom
Fig.3.2.4.ii. Ford Automated Construction Line. Unknown. [photograph]. Pulse [online].

Top
Fig.3.2.4.iii.1931 Ford Model A Interior. Unknown. [photograph]. Adamco Motorsports [online].

Bottom
Fig.3.2.4.iv. 2019 Ford Focus Interior. 2019. [photograph]. NetCarShow [online].

'why is' of automotive design outside of the economic assumptions that have existed at the heart of the discipline since the inception of Fordism, towards a more democratic and participatory model for mobility. This is the political-speculative element of the project (see Chapter 5).

Chapter 4 - Practice

Chapter 4 - Practice

4.1. Introduction

Discrete Automobility is a conceptual voxel-based construction system that applies the principles of discrete architecture to an automotive context. This could offer a highly flexible interior design and construction method with near limitless configuration options, enabling the design to be constantly adapted to the needs of different customers.

Discrete Automobility offers a level of flexibility that could be instrumental in the design of future vehicles that operate as part of a Mobility as a Service system and require a very high degree of utilisation. The issue of utilisation – ensuring Shared Autonomous Vehicles are being used as close to 100% of the time as is possible – is a key barrier to the adoption of MaaS services as low utilisation rates can mean services are unprofitable (see Chapter 1.2).

4.1.1. Aims and Objectives

This chapter answers research question four: *What would this revised mode of design look like and how would it change the automotive design practice; what would be the role of the designer?*

4.2. Introduces 'Education Brick', the first ever Discrete Automobility concept and prototype. 4.2.1. evidences how the voxel part was designed and developed. 4.2.2. describes the systemic elements of the concept. 4.3. states the key claims for new knowledge. 4.4. imagines the passenger experience of a future Discrete Automobility experience. 4.5. concludes by summarising how the practice has been shared.

4.1.1. Methods

The methods used in the research documented in this chapter are described in Chapter 2.4.2.a and 2.4.2.b.

4.2. 'Education Brick'

Education Brick is the first ever Discrete Automobility concept. The term describes both the voxel and the system. It has been designed to function as a development tool to design, test and prototype elements of computational design and automated assembly methods. It is not a full and functioning Discrete Automobility system, but a concept that shows how one might function in the future. Education Brick has also been designed to communicate the principles of Discrete Automobility to others (see 4.5.).

Figure 4.2.i. is a theoretical demonstration of the system and its circular nature. A pre-determined layout (a saved positioning and configuration of bricks) that best serves the use case would be selected. This layout is then modified based on journey specific contexts. This modified layout is then constructed by the in-vehicle robotic arm. This process is then repeated for the next user. This process offers a circular design construction method for vehicle interiors.

Designing a prototype system with functioning elements is a different proposition to outlining a theoretical one. Figure 4.2.ii. maps the functioning of the demonstration system and the key tools used. Figure 4.2.iii. describes how the demonstration system was designed. It should be noted that this is not truly a 'discrete' model, with only part automation of inputs, a disconnected or simulated User Experience (UX) (which would sit at the front of the model rather than the end in a discrete system). Rather it is a best attempt at demonstrating a 'discrete-like' workflow.

Right
Fig. 4.2.i.: Discrete Automobility concept system. 2023. Image by the author.

The Education Brick system exists as a 3D digital model in a Rhinoceros (.3dm) file. The prototype computational design elements exist as Grasshopper (.GH) file. When opened together the described elements of the system can be demonstrated. Key plugins used include Wasp, Ladybug and Robot Components. Wasp (Rossi 2023), (Rossi and Tessmann 2019) is an open-source plug-in (Eversmann and Rossi 2024) for Grasshopper that enables the design of discrete assemblies:

"The description of each individual part includes basic information necessary for the aggregation process (part geometry, connections location and orientation). The set of connections define the topological graph of the part, which is then used to define the possibilities of aggregation with other parts. The core of the framework relies on a set of aggregation procedures, allowing generation of specific structures from the combination of different modules. Each of these procedures is composed of strategies for the selection of basic aggregation rules, described as an instruction to orient one module over a selected connection of another module." (Rossi 2019).

Wasp was learnt through the support documentation and tutorials produced by the developer, Andreas Rossi (Temporary Autonomous Architecture Unknown).

Ladybug is an environmental analysis plugin for Grasshopper that is widely used as a design tool in architecture and interior design to conduct rapid analysis of the environmental and spatial experiential performance of a design (Sadeghipour Roudsari and Pak 2013), (Willis et al. 2017), (Mackey and Sadeghipour Roudsari 2018). Robot Components is a Grasshopper plugin that enables the definition of a robotic arm within the Rhino/Grasshopper environment and the programming and generation of Computer Numerical Code that can be outputted to the robot arm to perform the programmed movements (Robot Components 2024).

4.2.1. Part design

The Education Brick voxel (Figure 4.2.1.i.) is an irregular octahedron with compound curvature form. Pill shaped extrusions extend from the surfaces of six sides and the face of these pills shapes is perpendicular to the crown point of each face. Two sets of these pill shape faces run in parallel to each other. The top and bottom surfaces run horizontal and the two side surfaces are at an interior angle of 20° from the top surface. Two surfaces are at 150° and 130° from the top surface. These pill shapes contain either two or three circular points where the method of connection can be placed. This combination of angles and connector points enable a wide range of connections which are defined by the designer through rules.

Physical prototypes have been created and 1:1 and 1:24 scale and use magnetic connection methods. This required two brick variants to be created, 'Type A' with one set of polarisations and 'Type B' with the reverse set of polarisations. The magnets for the 1:24 scale models were painted red or blue to indicate their polarity. Having two variations adds complexity to the design, but these were ultimately chosen for the ease of use when demonstrating the system they facilitate. It was speculated that electromagnets could be used in a future system.

The first 'iterative' stages of Figure 4.2.iii documents the design of 'Education Brick'. This includes finding the initial volumes of the part from an ergonomic study and iteratively developing towards a part that is then modelled to automotive standards in Autodesk Alias (Figures 4.2.1.ii – v). Figures 4.2.1.vi – x shows the batch production of 1:24 scale prototypes that were used to test the design and deliver workshop and presentations to help other designers learn about discrete practices. A series of 1:24 scale skateboard platforms were also produced (Figures 4.2.1.ix and x).

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Fig. 4.2.i.: Discrete Automobility concept system. 2023. Image by the author.

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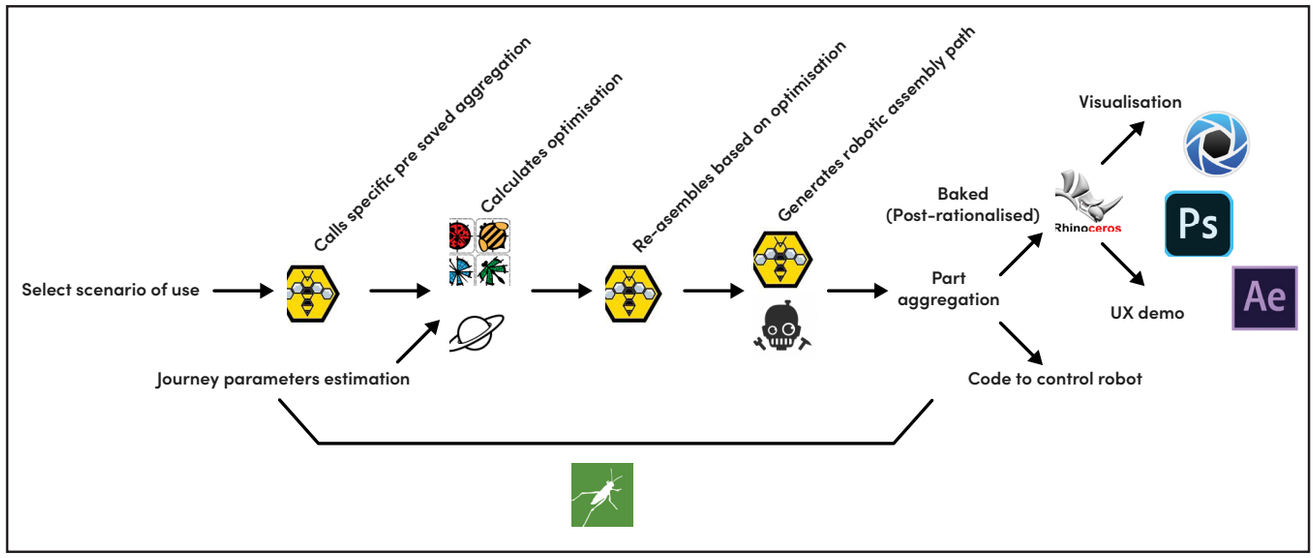
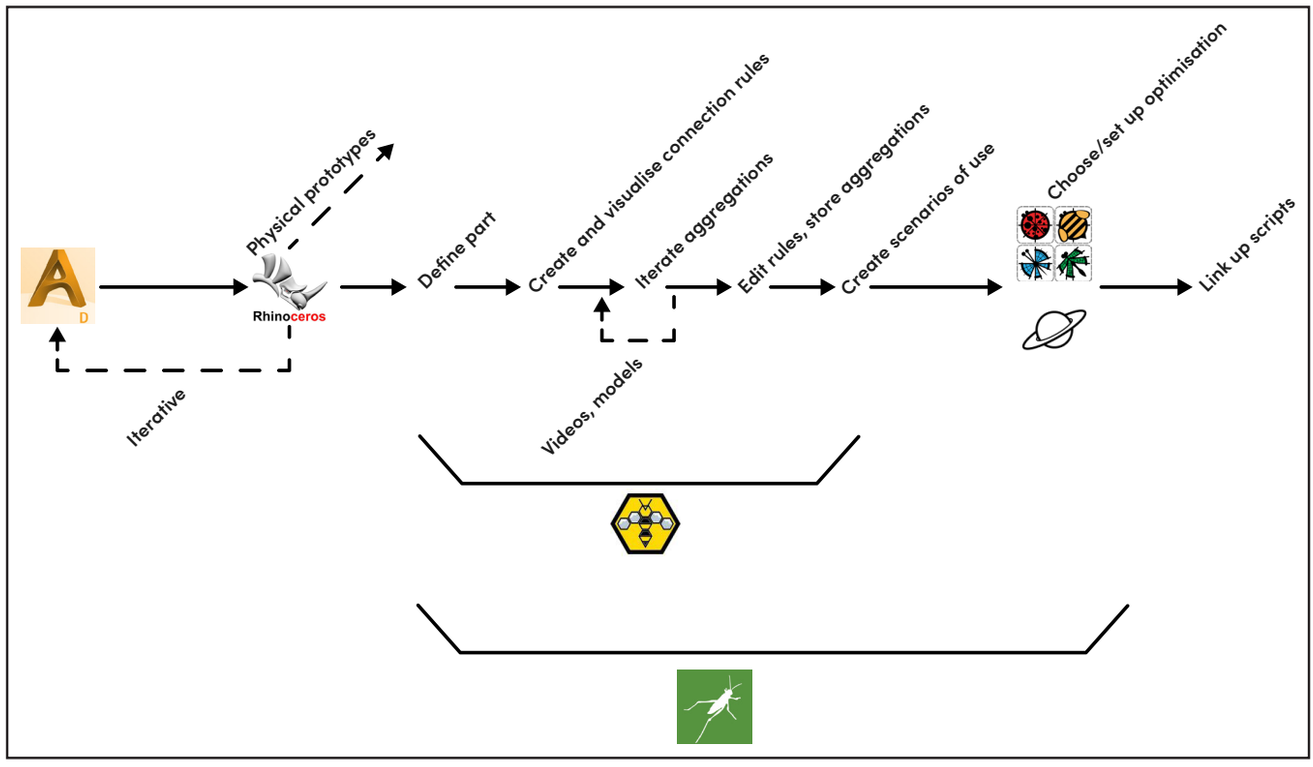
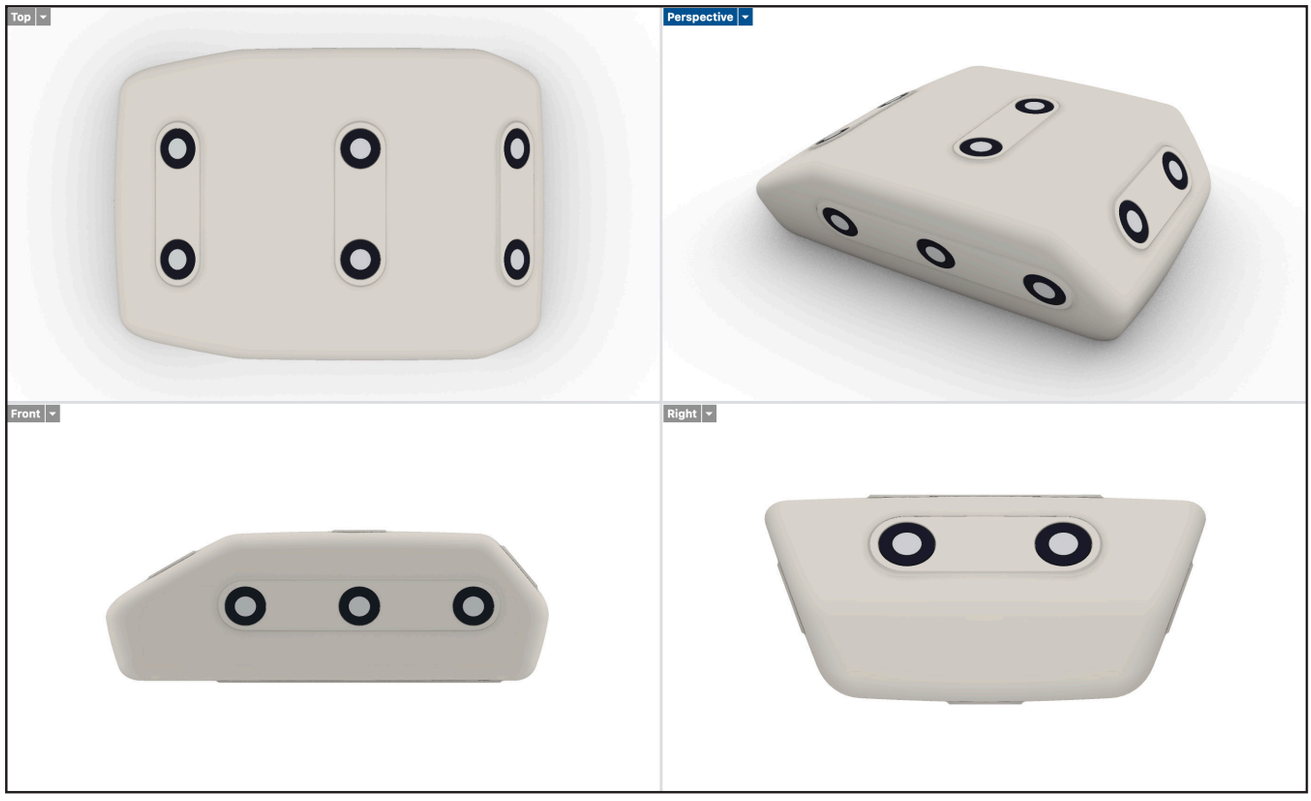
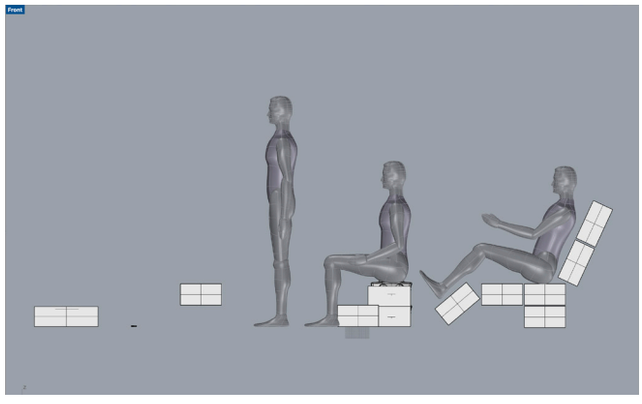
Fig. 4.2.iii.: Design workflow. 2023. Image by the author.


Select scenario of use
Calls specific pre saved aggregation
Calculates optimisation
Journey parameters estimation
Re-asembles based on optimisation
Generates robotic assembly path
Part aggregation
Baked (Post-rationalised)
Visualisation
UX demo
Code to control robot


Physical prototypes
Rhinoceros
Iterative
Define part
Create and visualise connection rules
Iterate aggregations
Videos, models
Edit rules, store aggregations
Create scenarios of use
Choose/set up optimisation
Link up scripts





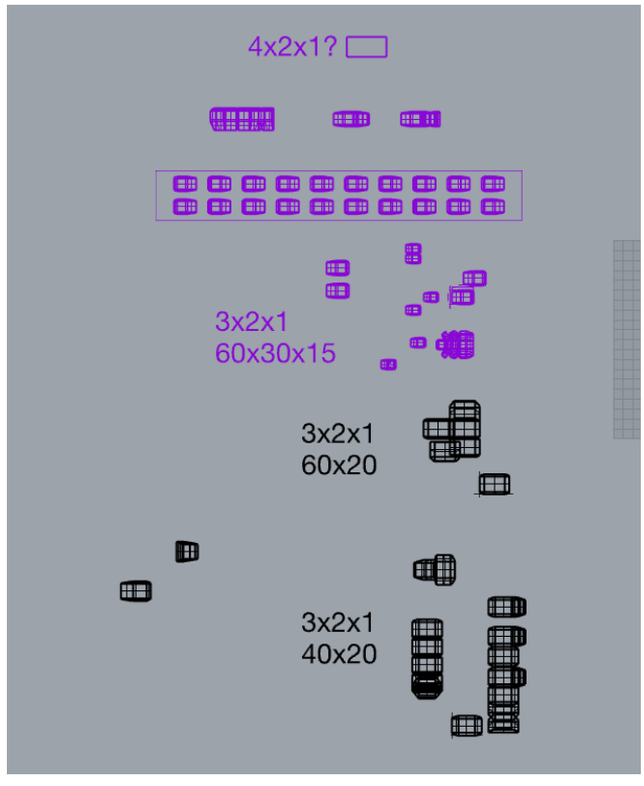


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Fig. 4.2.1.i.: 'Education brick'. 2024. Image by the author.

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Fig. 4.2.1.ii 'Ergonomic study' 2021. Image by the author.

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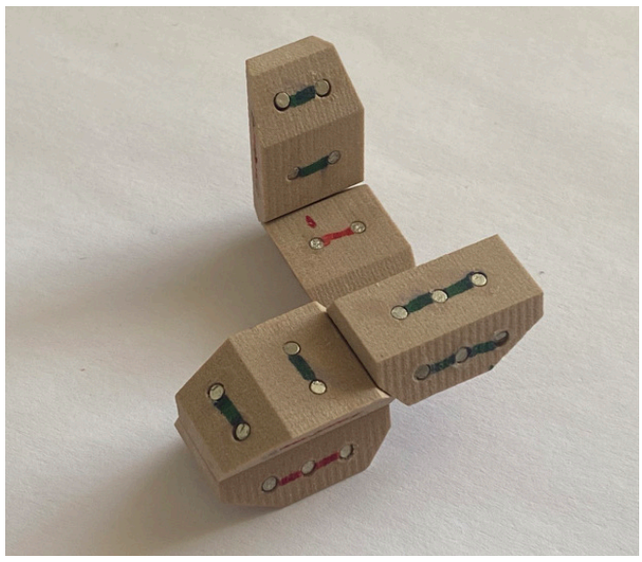
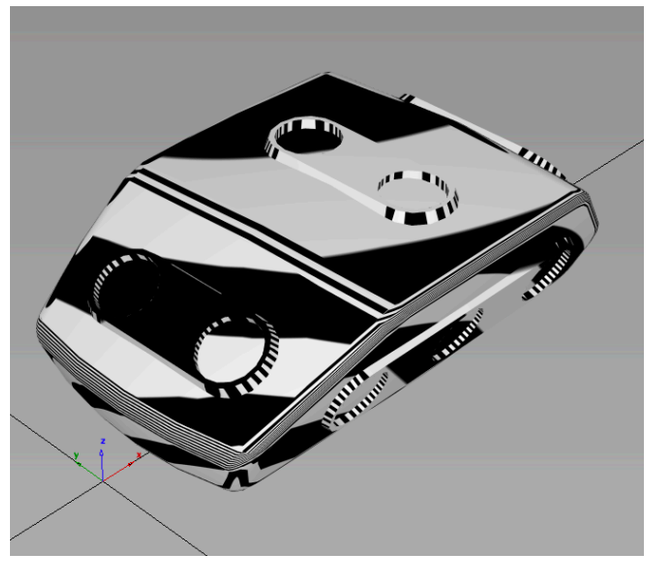
Fig. 4.2.1.iii 'Form development 1'. 2021. Image by the author.





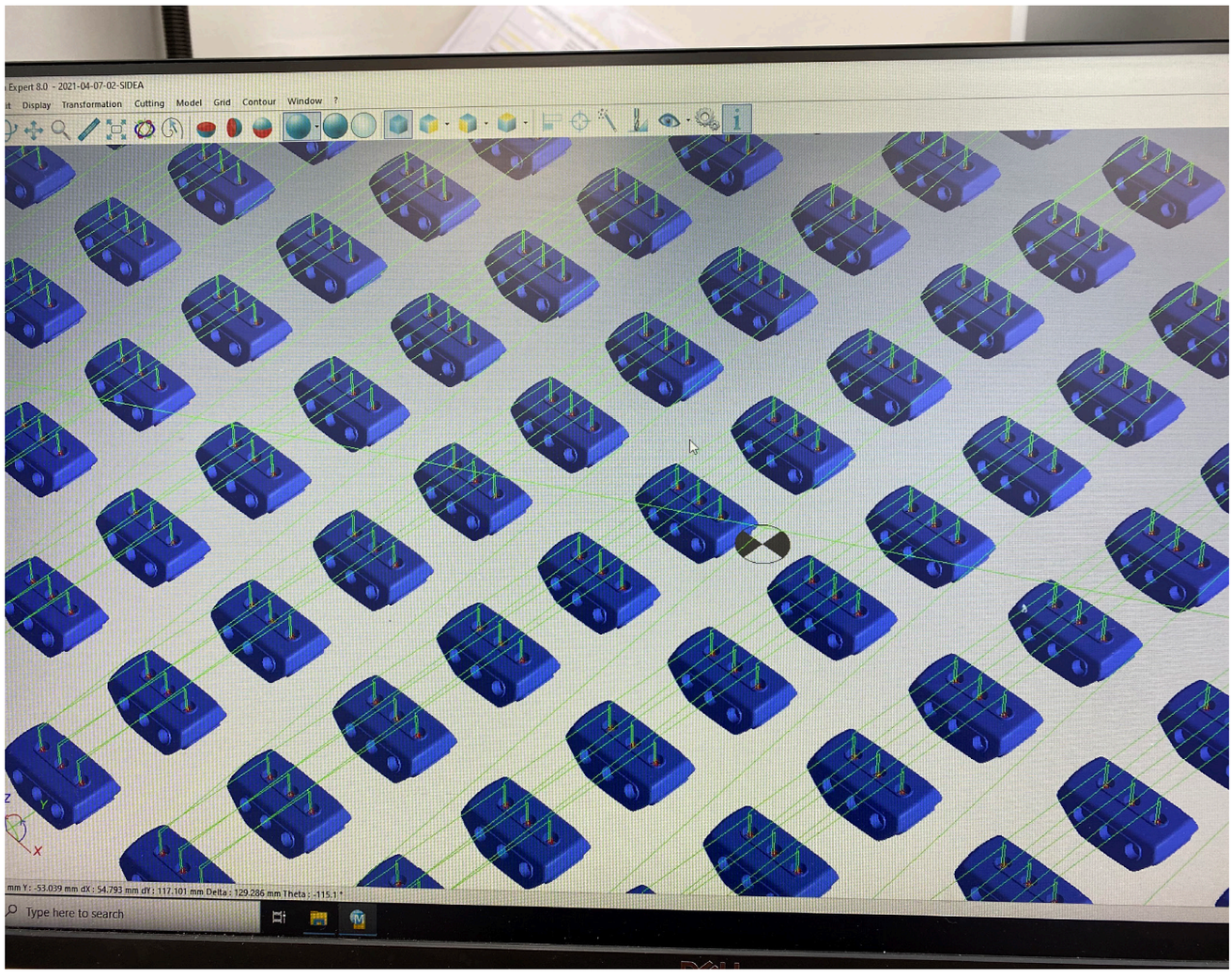


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Fig. 4.2.1.iv 'Form development 2'. 2021. Image by the author.

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Fig. 4.2.1.v 'In Alias'. 2021. Image by the author.

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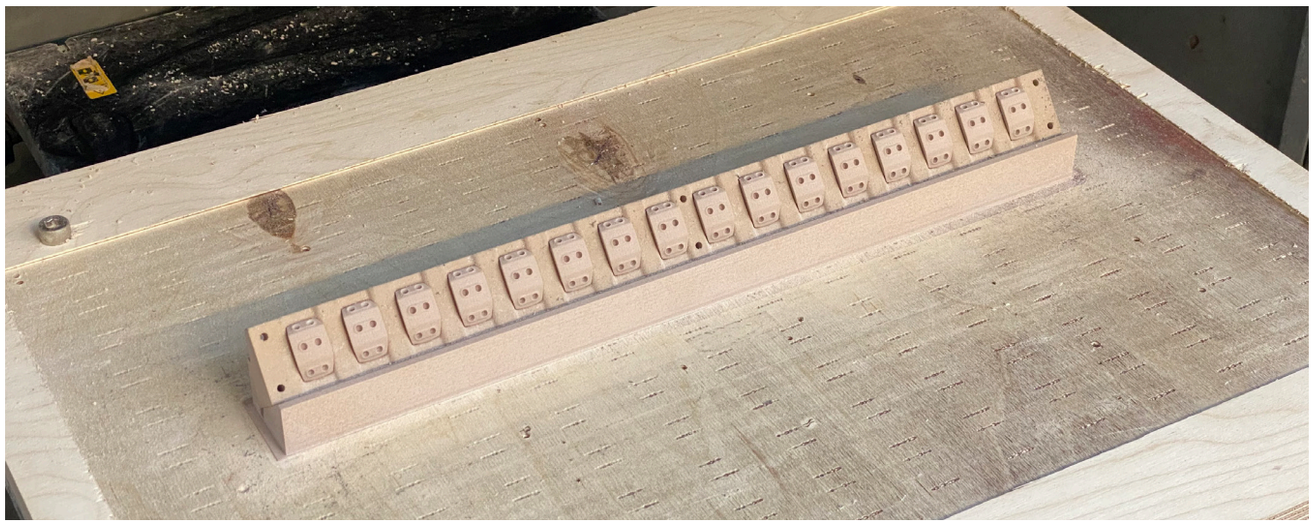
Fig. 4.2.1.vi 'Lost in the CAM'. 2021. Image by the author.



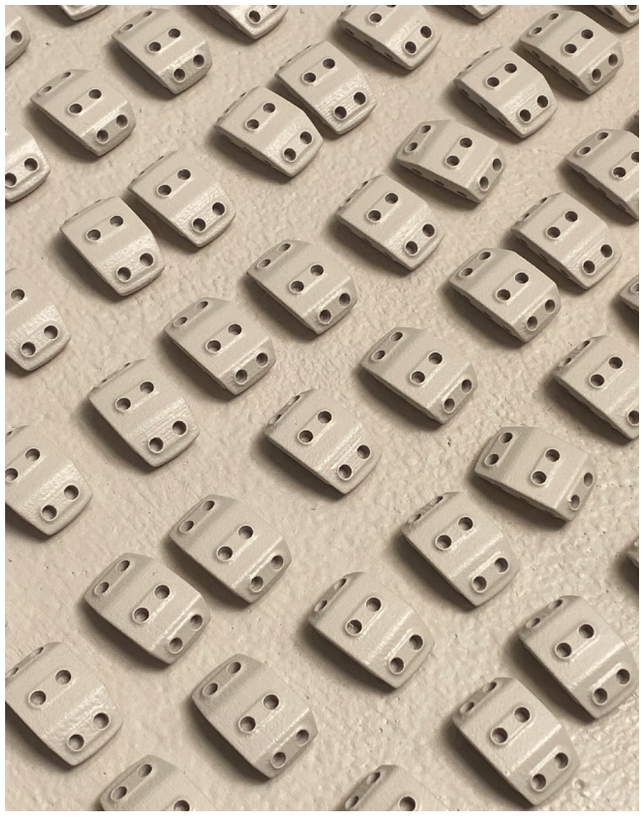


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Fig. 4.2.1.vii ‘Multi-purpose fixturing’. 2021. Image by the author.

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Fig.4.2.1.viii ‘Sprayed 1’. 2021. Image by the author.

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Fig. 4.2.1.ix ‘Sprayed 2. 2021. Image by the author.

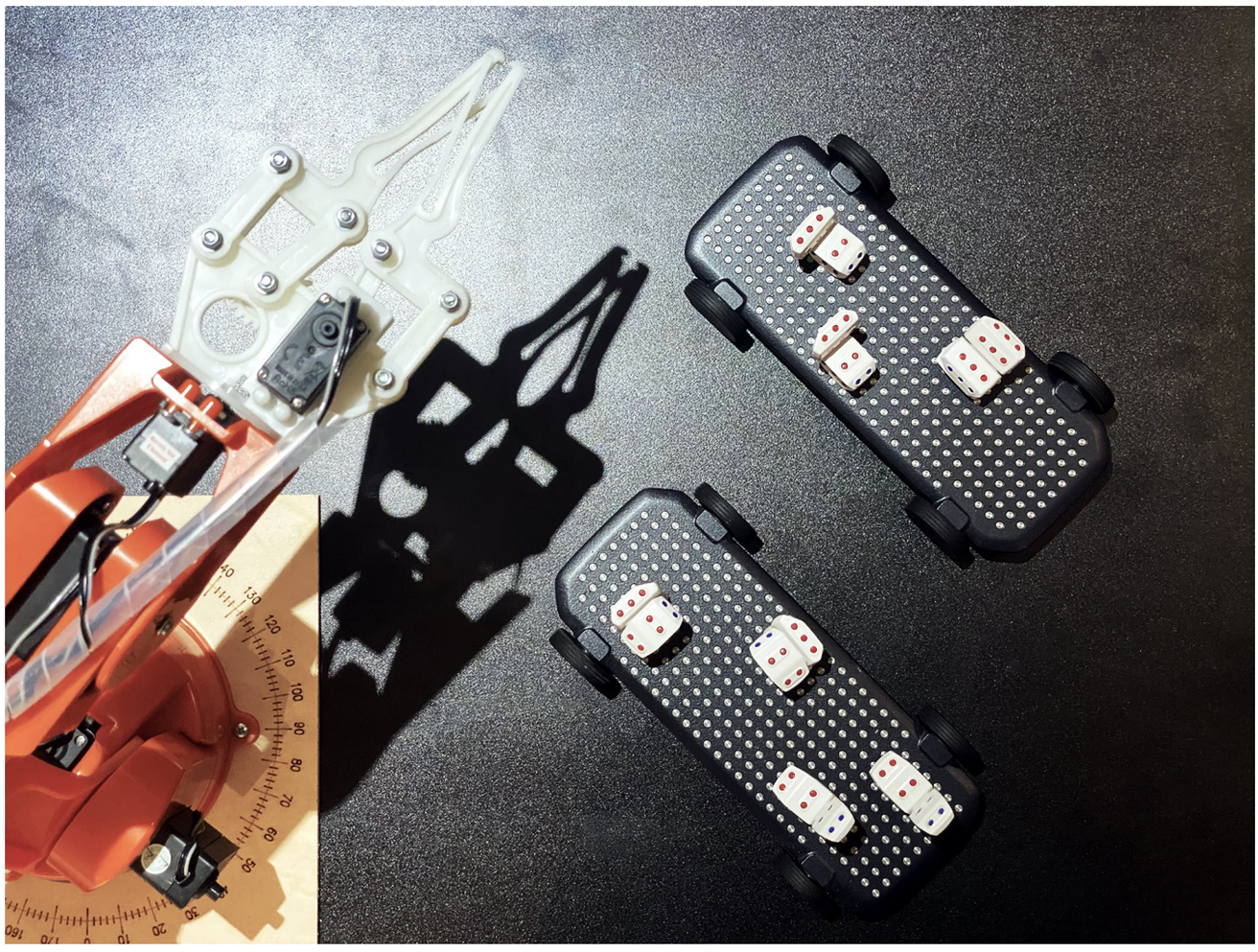

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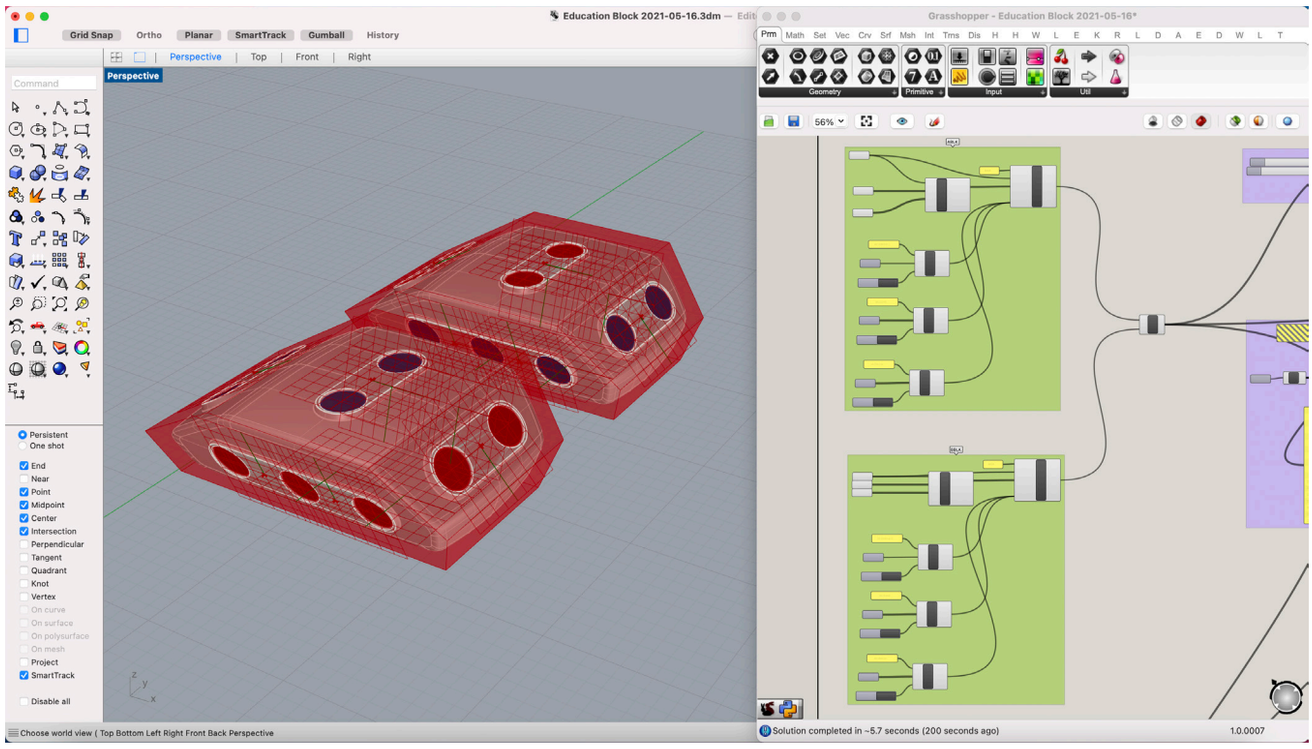
Fig.4.2.1.x ‘Toolkit’. 2022. Image by the author.



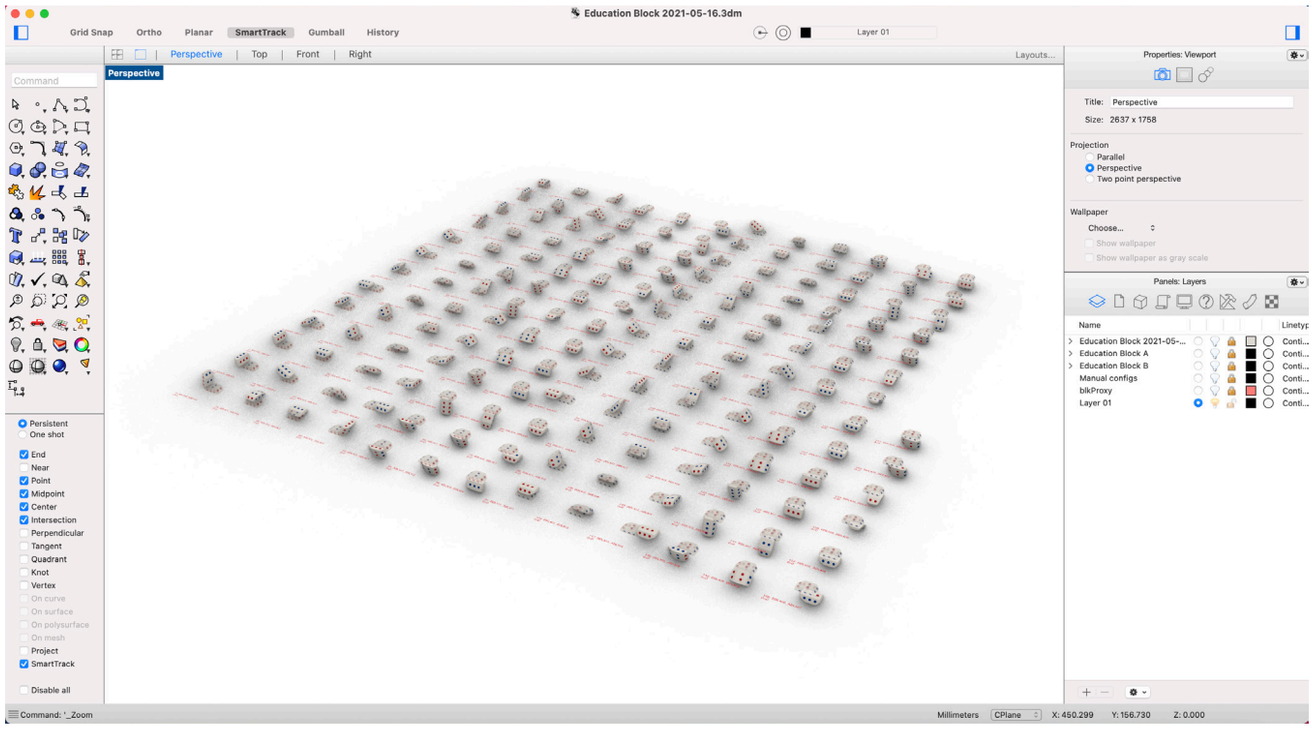


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Fig. 4.2.1.xi 'Defining the part in Wasp'. 2022. Image by the author.

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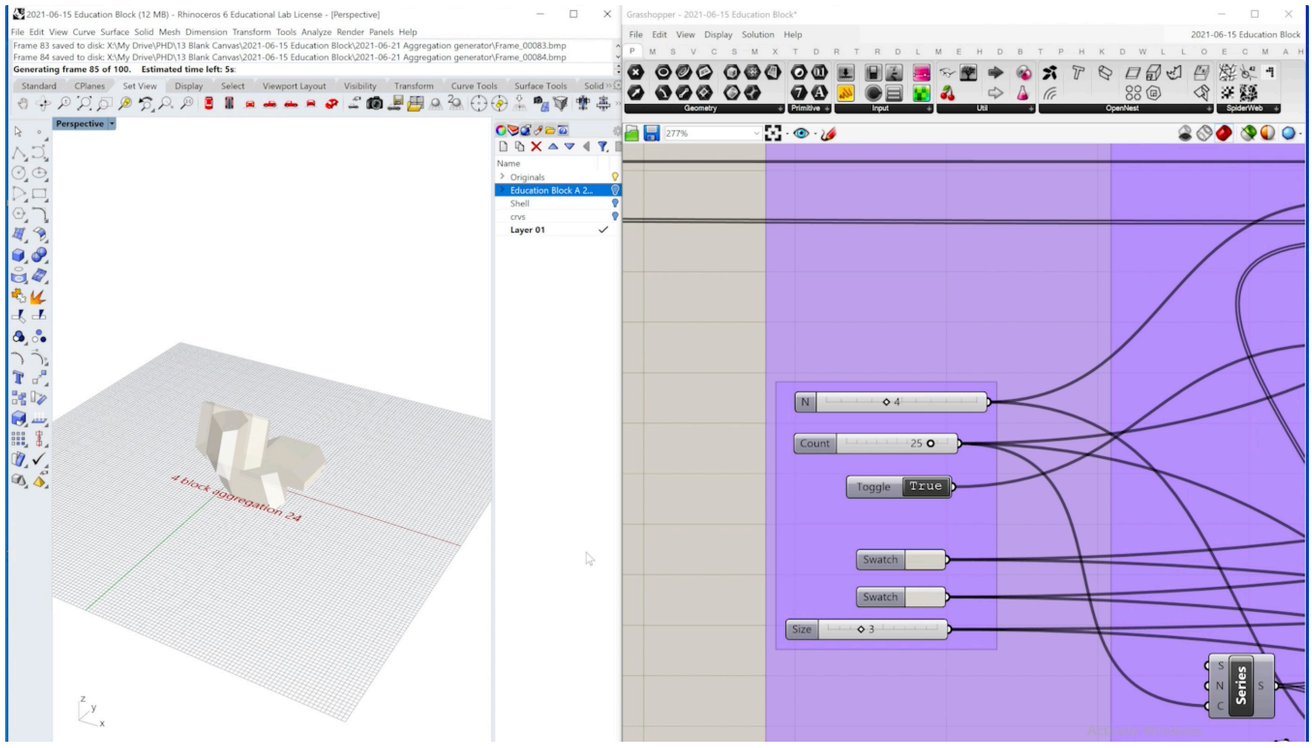
Fig.4.2.1.xii 'Visualising connection rules'. 2022. Image by the author.



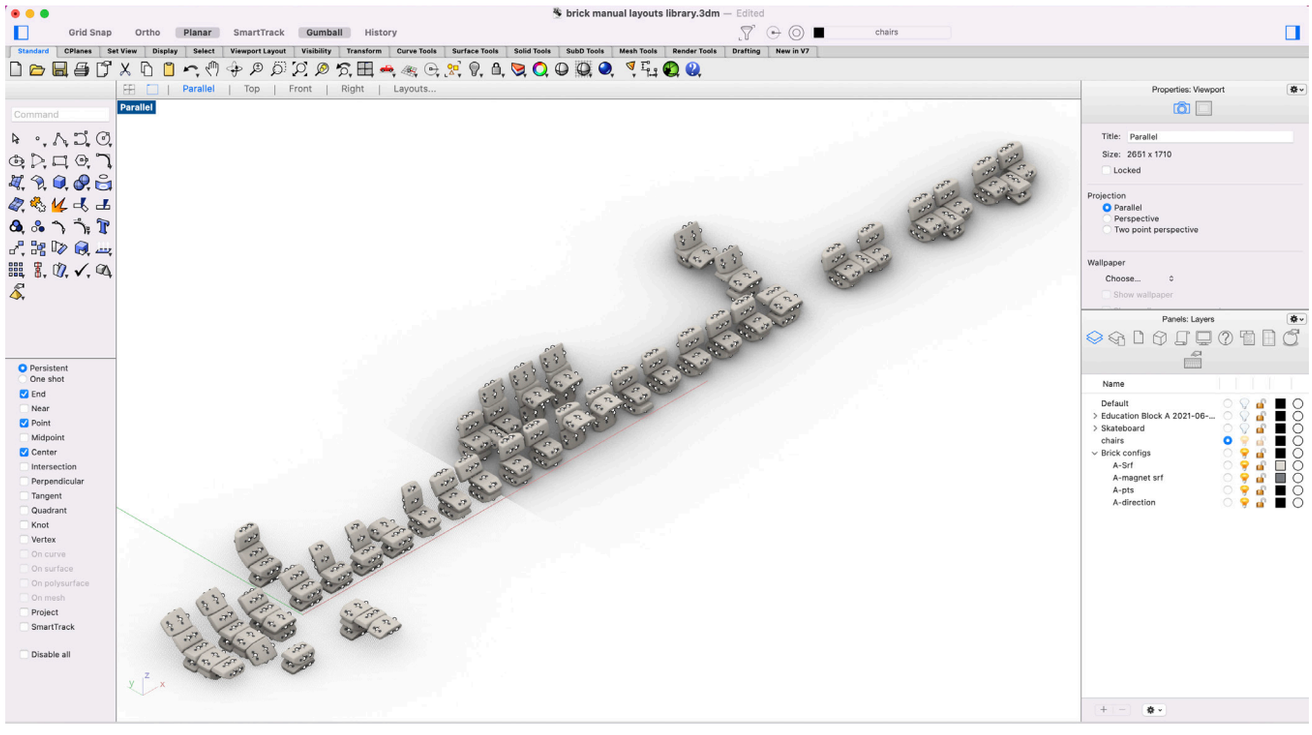


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Fig.4.2.1.x 'Toolkit'. 2022. Image by the author.

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Fig.4.2.1.xiv 'Line of configuration options. 2022. Image by the author.

Figure 4.2.1.xi shows the 3D model in Rhinoceros and being defined using Wasp within Grasshopper; defining the volume of the part, assigning a simplified volume representation and defining the connection points. Figure 4.2.1.xii provides a visualisation of the connection rules. In Figure 4.2.1.xiv Wasp tools are used to generate configuration options based upon the connection rules. These rules and aggregations can be stored as code and so then used in later designs. A modification was made the Wasp tools that enabled screenshots of designs the be automatically captures as .png files, exported, to then be used in animations to review potential design configurations.

This represents a change in automotive design practice. The automotive interior designer is traditionally tasked with the creation of a singular interior design which is captured through sketches and physical and virtual 3D modelling. This design is then broken down through a process of post rationalisation to be manufactured; the 'whole' is broken down into 'parts'. In this discrete workflow the designer is tasked with the creation of the 'part' that when assembled in aggregate can become the 'whole'.

4.2.2.a Layout selection

A simple way to determine layouts is to use rules. In the example in Figure 4.2.i the vehicle has 18 bricks and is being designed for a 4 person family, who are using the vehicle for a short, relaxed journey. The file name would be: 18blk_4p_family_play_no1.3dm.

18blk = number of blocks in design
4p = number of people using the design
family = judgement of intimacy level; Based on four imagined intimacy levels: Personal, Friends, Family or Public. This might determine the spacing between people, the angle they are facing, etc.
play = judgement of activity; Based on four imagined activity levels: Rest, Work, Play. This could further determine aspects of layout such as if there is a desk/table, seating relationships, etc)
no1 = specific design is assigned a number; Once the design has been optimised by analysis and robotic assembly toolpaths have been created, then a number is assigned to the specific design, which could theoretically run into infinity.

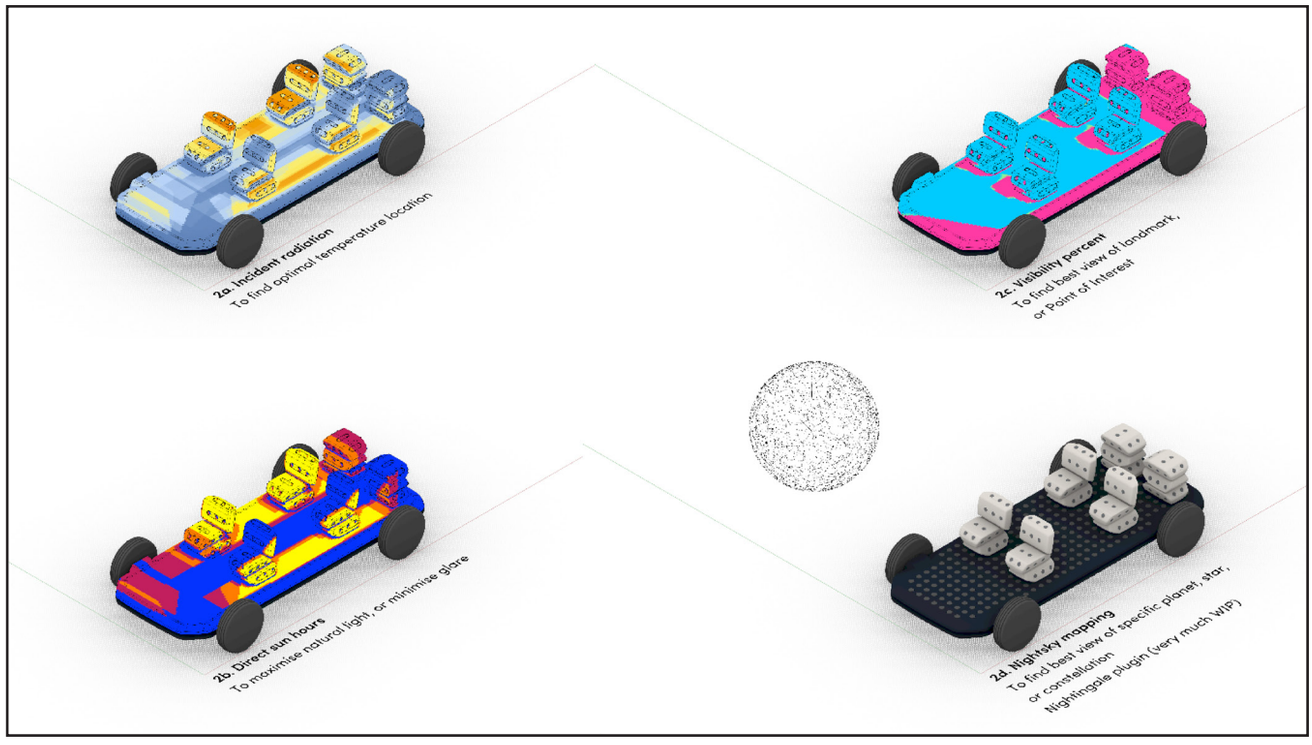
This is a very simple representation of a layout design strategy based upon pre-configured rules. The use of computation means that a potentially infinite number of configurations can be created, with far greater levels of complexity to their parameters than shown here. This rules-based approach differs to one based upon Machine Learning (ML) or General Artificial Intelligence (GAI) technologies. These technologies could enable a system capable of proposing new layout configurations (see Chapter 5.2.1.a.).

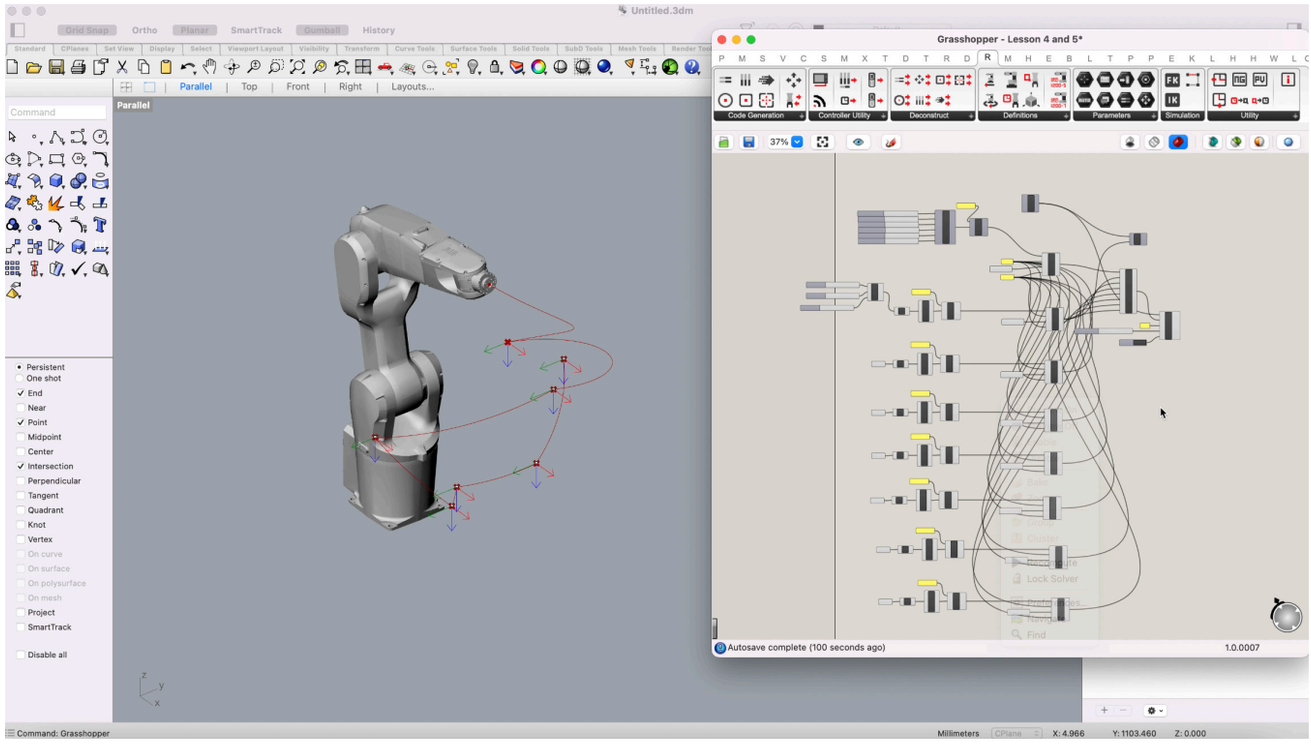
In current automotive practice the designer is responsible for one fixed layout that can accommodate different use cases. Their creativity and value is directly shown in the singular final product. In this new model the designer is responsible for defining the parameters that determine a layout. The designer's creativity and value is in-direct, mediated by the end-user, but with a far greater scope of influence. Layouts (and so design, be that individual designer or brand) will be judged and valued for the level of complexity (the number of parameters and the degree to which these parameters can be affected) they afford.

4.2.2.b. Modification of the layout

The selected layout can be analysed to make recommendations modified to the specific journey.

Right
Fig. 4.2.2.b.i. 'Analysis results on geometry'. 2022. Image by the author.


2a. Incident radiation
To find optimal temperature location
2c. Visibility percent
To find best view of landmark,
or Point of Interest
2b. Direct sun hours
To maximise natural light, or minimise glare
2d. Nightsky mapping
To find best view of specific planet, star,
or constellation
Nightingale plugin (very much WIP)

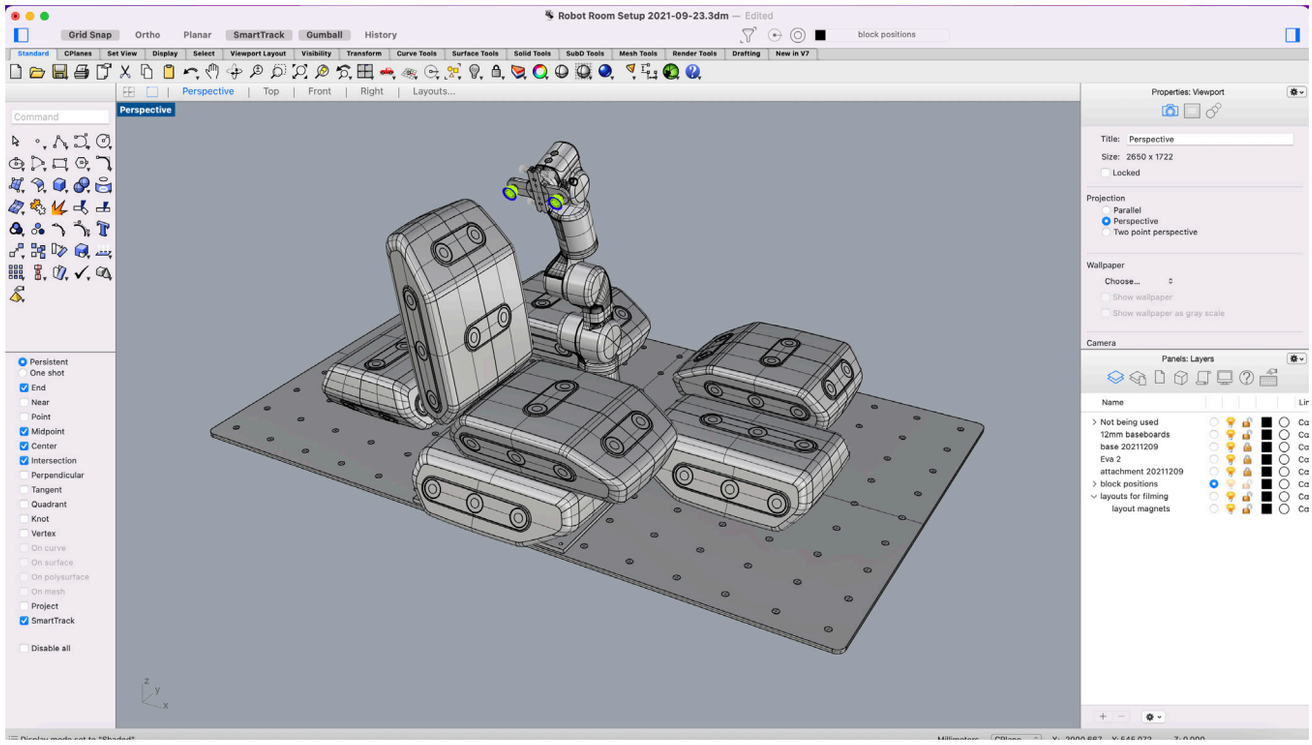


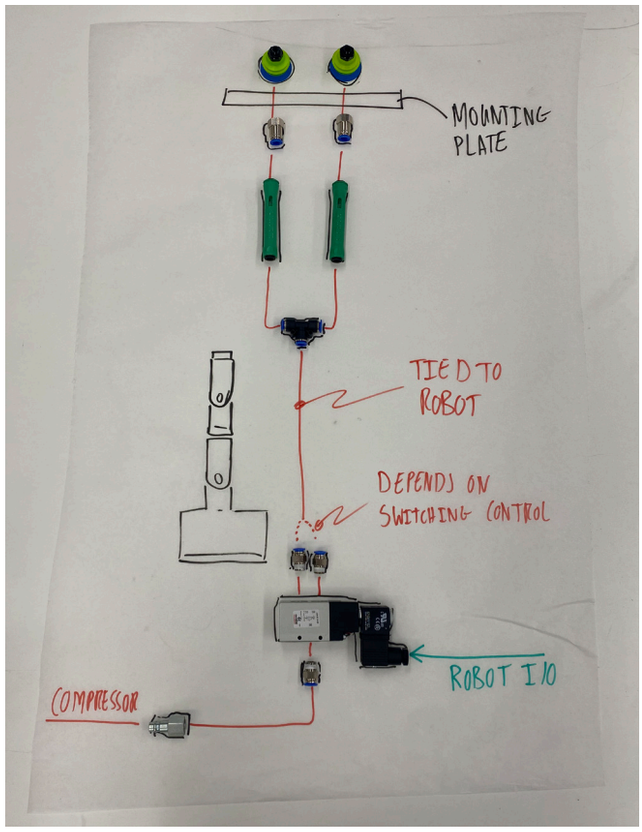
Top

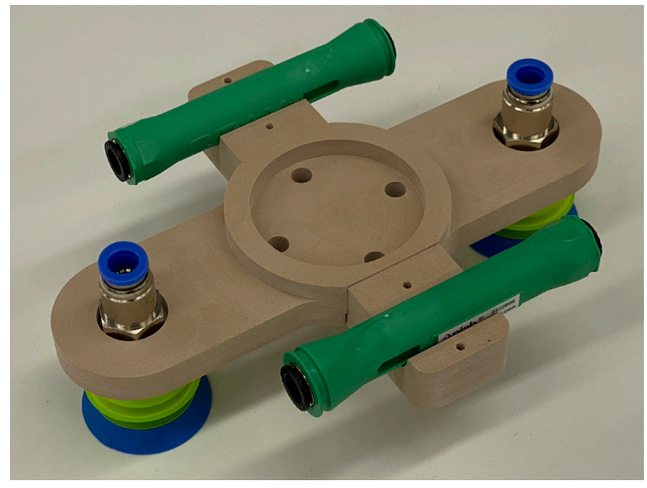
Fig.4.2.2.c.i. 'Robot Components UI'. 2022. Image by the author.

Bottom

Fig. 4.2.2.c.ii 'Constructing 1:1 prototypes'. 2021. Image by the author.







Top
Fig. 4.2.2.c.iii 'Layout for robotic assembly'. 2021. Image by the author.

Bottom, left
Fig. 4.2.2.c.iv. 'Designing a vacuum suction head'. 2021. Image by the author.

Bottom, right
Fig.4.2.2.c.v. 'Vacuum suction head'. 2021. Image by the author.

Elements of this modification process have been demonstrated using Ladybug plug-in tools:

1. Determine incident radiation to find optimal comfort,
2. Calculate direct sun hours to maximise natural light or minimise glare and visibility percentage
3. Find best position in the vehicle to view an external point-of-interest.

Figure 4.2.2.b.i shows the analysis results on a layout. What has not yet been achieved in this demonstration process is the automatic updating of layout aggregations based on environmental and view analysis. This is a difficult challenge with possible solutions speculated in 5.4.1.a.

This concept of context driven layouts is an entirely new proposition to the automotive industry and is central to the proposition that discrete techniques could offer mobility experiences that are unparalleled in their ability to meet customers' needs and requirements. This concept creates a new form of value proposition that design can offer the customer and extends the influence the designer can have on the service experience further.

4.2.2.c. Robotic assembly of a configuration

Figure 4.2.2.c.i. pictures the simulated control of a robot arm using Robot Components in the Rhino/Grasshopper environment. Robotics Components could be used to assemble a Wasp generated aggregation as the Wasp aggregation would output a cloud of point data which Robot Components could then use to generate assembly instructions. It was decided not to demonstrate this within the Grasshopper environment because of the time this would take to evidence a known attribute and would likely still require further manual intervention to demonstrate fully. Later in the process, it was determined there would have been difficulties using the code outputted from Robot Components to control the available robotic arm.

Instead, efforts were put into producing 1:1 scale versions of 'Education Brick'. During the initial design process 1:1 scale volumes had been created to help evaluate the design and surfacing. To make them light enough for the robot arm to manipulate them safely these new 1:1 models had to be CNC routed from 25mm foam. These were then assembled and glued together using fixtures to ensure precision in the construction, sanded back and spray painted with eight bricks (four Type A and four Type B) produced in total 4.2.2.c.ii. 25mm magnets were housed in discs and placed in the pill shaped extrusions. Testing showed that the magnets needed to be protrude above the surface of the pill face to ensure a tight connection between parts.

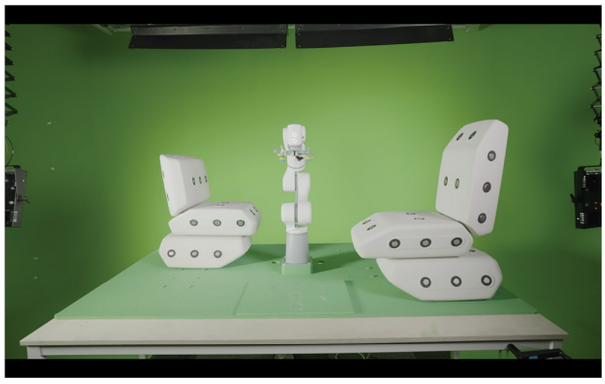
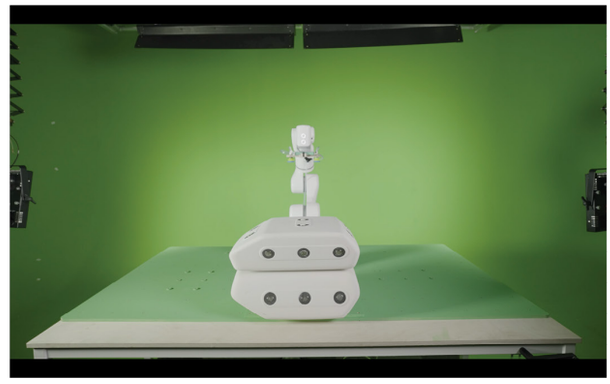
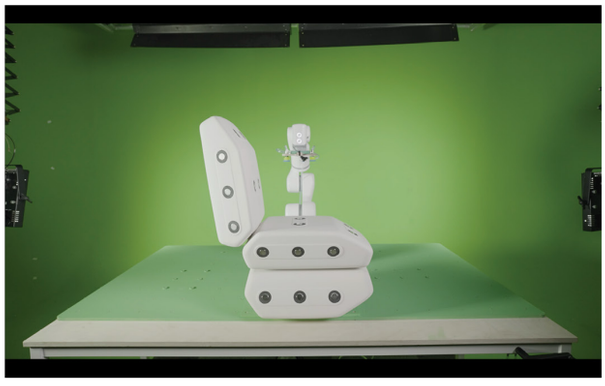
It was initially intended to use an Epson robot arm to assemble the 1:1 prototypes, but working with the Robotics department a EVA robot was purchased from Automata Technologies. This offered an easy method of programming the construction of different chair forms from the 1:1 scale 'Education Brick' prototypes. A custom vacuum suction head was designed and built (Figure 4.2.2.c.ii. and iii), which would use compressed air to pick up the bricks. A large board was created with metal location points to secure the bricks via the magnets. Experiments were then conducted to use the robotic arm to construct different seating designs (Figure Fig. 4.2.2.c.iv).

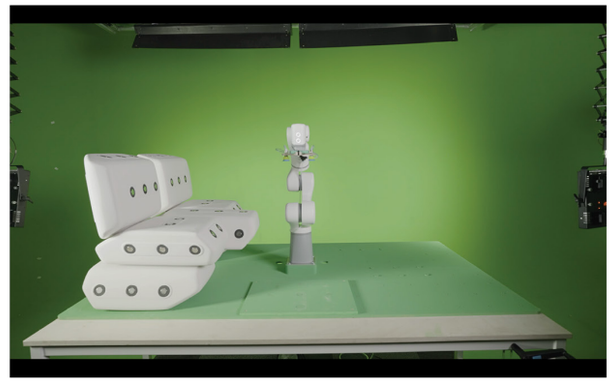
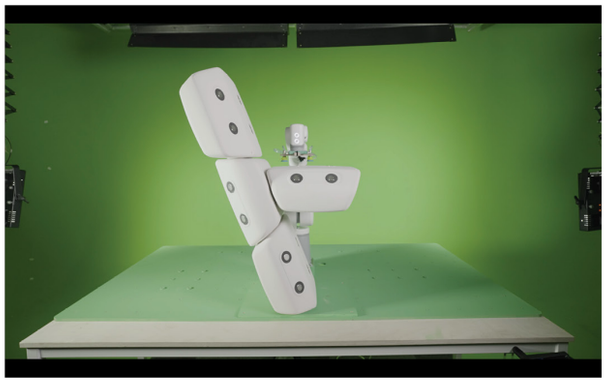
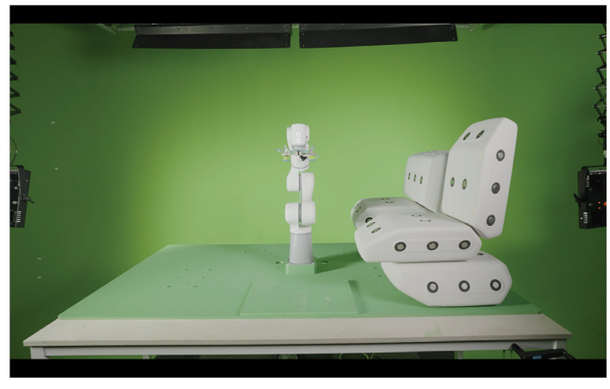
4.3. Key claims for new knowledge

4.3.1. A discrete construction approach to automotive interior design

This project is the first to apply a discrete approach to the design and construction of a vehicle interior. Whilst previous designs have explored modularity and other techniques to deliver greater flexibility in design (Chapter

Right
Fig. 4.2.2.c.iv. 'Stills from video'. 2021. Image by the author.

1.2), this 'Discrete Automobility' system removes the process of post rationalisation by adopting a construction process with a digitally inspired structure (voxels that can be assembled like data, or pixels on a screen). The constructed object remains attached to the method of design, so when the design is changed so the constructed object can be reconstructed also.

This pushes the potential flexibility and adaptability of an interior design to a new level, particularly when considering the introduction of new techniques such as journey specific interior constructions that are informed by environmental comfort or journey experience factors.

4.3.2. A circular approach to automotive interior design

Chapter 1.1 demonstrates the urgency with which humanity must adopt more sustainable modes of transportation if it is to avert the worst effects of the climate crisis. This chapter suggests automotive design is not responding to this issue as convincingly as it might. This research has demonstrated a method of construction that aligns precisely with circular design and construction techniques. Being voxel-based means that parts can be removed, repaired, and replaced as required. The ability to introduce new voxel parts that fit with those existing leverages circular design principles to improve the value offer of the product over time. The increased MaaS utilisation rates this discrete model would enable would also reduce the number of vehicles that need to be produced or on the road at one time, further reducing the environmental impact of transportation.

4.3.3. A framework for re-evaluating the designer's role

The automotive design profession is experimenting with computational design tools that make their existing processes faster and more efficient – to 'augment' them (Chapter 1.3). The profession assumes that certain tasks will always be performed better by a human and is failing to consider their role if this turns out to be false. This project recasts the role of the automotive designer for the computational age as an actor who designs a system of design. In this manner, the value of the automotive designer comes less from the creation of specific physical design attributes and more from the definition and setting of system parameters and components.

4.4. An imagined passenger perspective

In the mid 21st Century, Avi and Val Landenberg live in North London. They have three children, Lana (30), Libby (27) and Hershey (22) and Rumo, their Alaskan Akita. It's been nearly ten years since the Landenberg's got rid of their last car, which became redundant since London's transport body started running their own ride-hailing service.

The Mobility as a Service system uses a fleet of Shared Autonomous Vehicles (SAVs), the exterior manufactured in the Midlands in a factory that once produced private vehicles. The interior uses a 'discrete automobility' voxel-based construction to adapt for each journey to the needs and preferences of the passenger(s).

These were introduced to complement autonomous rail and bus transport services as part of London's aim to ensure all Londoners enjoy equity in mobility service. This was a cheaper and less environmentally damaging than building more extensions to the tube network, and offers

Right
Fig.4.5.i.: 'Education Brick at Herne Hill Velodrome, Milan, outside a discrete house at Somerset House'. 2024. Image by the author.

a higher quality of mobility experience that is also more efficient for all but Zone 1/2 travel.

The service competes with MaaS systems operated by private companies, but Londoners mostly choose this public service because of its democratic accountability model. Passengers can voice-note feedback and suggestions straight to the system designers, who can then rapidly respond to digital service requests, and introduce new voxel designs for physical feature requests. The feedback system means that the service is constantly in evolution to meet the changing needs and demands of London's population.

It's a Tuesday morning and Avi, who works in the music industry, rides his e-bike into town for an in-person meet with a publishing company. They are a long-term client and have been clearing out their archives and found a box of records they thought Avi might want. After their meeting, Avi decides against cycling home and orders one of the discrete automobility SAVs. He taps the 'bike on board' and 'additional storage' buttons so the interior assembly will accommodate storing the bike and the records on the journey home.

Val is a psychologist who recently completed her PhD and runs a private practice alongside her post-doctoral research. She is working with a patient suffering from low moods and as part of the counselling process Val is conducting their sessions whilst walking around Hampstead Heath to offer a connection to nature and improve the patient's wellbeing. She orders a car to take her to the heath via the patient's address. When booking, she chooses the 'daylight' option, which will assemble the chairs to provide maximum sunlight exposure on the path of their specific journey - boosting vitamin D exposure time for both her and the patient. After picking up the patient they begin their session in the private space of the vehicle as it takes them to the heath for their walk.

The sunny day is less ideal for Lana; she and her husband Ben are due to go over to her parents for lunch but her 6-month year old Raphael has just started teething and has a slight fever. When ordering she taps the 'baby on board' feature, so the vehicle will position a baby seat in the position that will have the most shade during the journey, and there will be space for the pushchair to fit in without her needing to fold it up.

Libby moved out several years ago but is temporarily back at home to recover from a knee surgery. She has a physio appointment to go to but can't go up or down steps, so using the tube is not an option. When ordering the ride, she uses the seat designer function to tailor the seat so that it will be at the right angle for her leg, whilst also positioning a sideboard next to her so she can enjoy lunch on the way. On the way back, Libby picks up Rumo from the vets, using the 'pet on board' feature to adapt the storage space to offer a shaded spot for Rumo to lie down in.

Hershey is studying film in Berlin but has caught the high-speed train into St Pancras with his girlfriend. This is her first trip to London so as Hershey books he adds Alexandra Palace as waypoint and picks the Shard as a point-of-interest. The vehicle arrives with the seats positioned so that when they're at Alexandra palace they have the optimum viewpoint over London. That evening they get the trains out to see friends in southeast London but there are no trains back that late so they order a ride that can seat them and the five other friends they are with.

4.5. Sharing the practice

The 1:24 scale 'Education Bricks' and 1:24 scale skateboard platform were used to produce a toolkit toe teach the principles of discrete architecture to automotive design professionals (Fig.4.2.1.x). This tool was inspired by the work of Sanchez (2019). A Keynote presentation was designed to be used when presenting the research also.

A website – www.discreteautomobility.com – serves as the online 'home' of the research. On the website is an extended abstract, an animated video that introduces the principles of discrete construction and summarises the process overview, and a video of the robotic assembly of 'Education Brick' parts. There is also a 'practice diary' page which shares stages of the research, and a reading list for interested readers. There is also an easter egg when viewed on an iOS device; on the homepage are line drawings of both 'Education Brick' and the vehicle assembly. Using Apple's Safari AR Kit technologies, when tapped on a 3D model of each will load and allows the augmented projection of the 3D model into the space around the viewer (Figure 4.5.i).

Chapter 5 - Conclusions

Chapter 5 - Conclusions

5.1 Introduction

Over the course of 2022 the research was presented to practitioners in the automotive design and education fields and their feedback has been used as the base for the project evaluation.

5.1.1. Aims and Objectives

This chapter answers research question five: *How would this new model of design and forms of practice be received by current practitioners?*

5.2 summarises who the research was presented to, 5.2.1. the methods used to present it and 5.2.2. summarises the feedback into key themes. 5.2.3. offers reflections on this feedback. 5.4. outlines future opportunities for development in discrete automobility and more broadly in the discipline.

5.1.2. Methods

Following the methods outlined in Chapter 2.4.2.c.

5.2 Feedback from automotive design teams

The research was presented to designers at OEMs including:

- Ford (4 designers, European studio)
- Geely (Zeekr) (6 designers, European studio)
- Honda (1 designer, European studio)
- Nio (2 designers, European studio)
- Arrival (4 designers, UK studio – note, Arrival have since gone into administration. The head of design, Jeremy Offer, who was on the call, has since joined Volvo as CDO.)
- Toyota (3 designers, European studio)
- Volvo (2 designers, European studio)

Academics and students:

- Raphael Zammit (CCS)
- Damien Horst, Jonas Sandström and automotive and UX students (UMEA, Sweden)

Automotive design professionals:

- Chris Bangle
- Marek Pawlowski

5.2.1. Presentation method

These meetings were held over video call, except for Toyota who were presented to whilst the author was on a work-related studio visit. The project presentation detailed in Chapter 4.5 was used to communicate the project. This presentation would take 15-20 minutes and would be followed by a discussion period, usually lasting 15-30 minutes depending upon time available.

The presentations to designers from OEMs were hosted on their video conferencing platforms and as such the conversations could not be recorded, and notes were taken by the author. It was decided that the same approach should be taken for all presentations.

5.2.2. Key themes from feedback

From notes taken during each presentation, key themes and topics of discussion have been identified:

5.2.2.a. Regulations, safety, and ergonomics

During every presentation - often the first point of feedback - was a scepticism that the discrete construction system could meet vehicle safety standards and regulatory requirements. It was also commented that the 'Education Brick' specifically would not meet ergonomic function requirements.

5.2.2.b. Flexibility at what cost?

Multiple participants questioned what was being sacrificed in favour of design flexibility. These included complexity of design, optimisation, cost, weight and ergonomics. Some suggested that the voxel designs could be more specialised, and specific to a task, or a hybrid system where part of the interior was a discrete construction and part was a fixed design. A frame based modular system was also proposed.

5.2.2.c. Alternative (non-auto) application

Many participants suggested that the process might be better suited to non-automotive applications, primarily public transport, but also micro mobility and military applications where it was suggested it could also be applied to exterior design.

5.2.2.d. Economics

A few participants commented on the economics of the model, questioning if complex voxel designs could be economic to produce even at scale. Economic modelling of the system was proposed as a next step. The inclusion of the robotic assembly system within the vehicle was challenged also; might the system work over a longer period so that rather than feature robotic assembly for every journey, the design is changed occasionally. Some OEM designers commented on the imperative that design delivers financial value for brand and suggested that MaaS systems were not compatible with this.

5.2.2.e. Consumer attitudes to sharing

A few participants voiced scepticism about shared ownership models, suggesting that they are not compatible with a premium automotive brand, and reinforcing the belief that discrete methods would be better applied to other forms of transportation.

5.2.2.f. Urgency of research questions

Some participants, particularly automotive OEM designers, commented that the research questions engaged with issues that automakers were failing to engage with or engage with in a meaningful way. These include total lifecycle approach, the need for automakers to stop seeing the point of sale as the final part of the customer relationship and the engagement of automotive designers in the digital systems and services customers experience. Whilst some had questioned the economics of selling fewer vehicles (5.2.2.d.) others noted that external market forces were likely to push the adoption of MaaS services, especially in urban areas, so there was a need for design to consider how it could bring greater value into the product lifecycle.

5.2.2.g. Value of research

Most saw the topic and research work as a valuable theoretical exercise. One participant saw the value from a societal perspective and a provocation as to the role vehicles should play. One designer commented on the value of research that examines the link between design and manufacturing and the limits manufacturing and regulation places on design and recognised the need for automotive designers to become more engaged in the design of future manufacturing processes. Some ask if the tools (Wasp and the ability to aggregate similar parts) might find application within existing design practice: for example to test new design solutions, than as an entirely new method.

5.2.2.h. Prioritising the system over the human

Several participants commented that the system might – through not addressing safety regulations – be prioritising the needs of the construction method over the customer. One participant suggested that Human Centred Design methods could be used to identify voxel designs that could respond to different needs and trends in society.

5.2.2.i. Comments on borrowing a method

The methodology of borrowing a processes from architecture was queried by a few participants. This was on the basis that the limitations and requirements in automotive design are different to those in architecture (a building doesn't move or need to be crash tested) and it was questioned if the method of adopting new tools was of benefit.

5.2.3. Reflections on feedback

This presentation phase was an opportunity to showcase the 'Discrete Automobility' system and to test the underlying questions of the research. It was positive that most designers saw a value in the focus of the project and the urgency of the research questions. It suggests that further research from the perspective of design practitioners would be valued.

The question of safety had been expected; this was an area the project deliberately didn't explore, knowing that consideration of safety and regulations would limit the scope of the research. Whilst Discrete Automobility does not meet safety standards today future work could evolve it with this consideration, and it can be speculated that if autonomous driving control becomes widely adopted standards might change. This focus on safety might tell us more about the automotive design practice today. All participants recognised safety as a key issue, but only one went on to provide a possible solution – applying a 'soft' design strategy, such as that used by Pininfarina in their 2004 Nido concept (Figure 5.2.3.i). That only one participant suggested an alternative could be seen as evidence that the automotive design profession is too constrained by their current practice when it comes to questions of future mobility.

There was little engagement with the topic of computational design and the possible changing role of the designer. At the end of the presentation and during the discussion participants were asked to imagine how they might approach the design of the system and of voxels relative to their brand, but there was little engagement

with these questions. At the beginning of the research it had been intended that longer workshops would have been held with design teams, but none could meet the time commitment. Conducting a series of workshops to see how different automotive designers respond to the challenges of voxel and system design would be a valuable piece of future work.

5.3. Key Findings and Contribution to Knowledge

This thesis has developed and demonstrated a new approach to automotive design practice, one that is critically aligned with the demands of Connected, Autonomous, Shared, and Electric (CASE) mobility. The research aimed to adopt automated design and construction methods from architectural academia and use them to formulate a prototype automotive design methodology that could support more flexible and reconfigurable vehicle interiors - offering increased utilisation across a wider range of use cases.

The outcome is Discrete Automobility - a novel design and construction methodology that proposes a shift away from the direct authorship of fixed physical form, and toward the orchestration of parameters and system behaviours. Drawing from the architectural movement of discrete design and influenced by Mario Carpo's Second Digital Turn, this research applies voxel-based logic, modular assemblies, and automation-enabled workflows to the automotive interior for the first time.

The concept was embodied through the prototyping of the Education Brick system: a voxel-based design tool that supports automated assembly, configuration, and layout adaptation. This demonstrates how interior environments can be dynamically tailored in response to journey-specific and user-specific requirements. Importantly, my design practice moves beyond the speculative, showing how robotic workflows, digital design environments, and material construction can be integrated into a functioning, demonstrable system.

The central finding is that Discrete Automobility offers a platform-based approach to vehicle interior design that decouples form from function. Instead of a singular layout optimised for one fixed context or demographic, this method allows for rapid, repeatable reconfiguration across contexts. This level of adaptability could support higher utilisation in shared mobility models and contribute to more circular, sustainable approaches to vehicle production and operation.

This thesis also contributes to the discourse around Practice as Research (PaR) within design. The practice element is not an illustration of theory but the primary generator of new knowledge. By stepping outside the constraints of conventional automotive design tools and traditions, the research proposes a new form of practice - one that combines critical speculation with computational execution and real-world prototyping.

Further, the thesis makes an epistemological contribution by reframing the role of the designer. Rather than being threatened by automation and computation, the designer is repositioned as a systems author - crafting spatial grammars, rule sets, and behaviours that structure how interiors can be assembled, adjusted, and reused. In this model, creativity becomes indirect: it lies not in the final form, but in the frameworks that make multiple forms possible. This redefinition is offered as a new position for design in a computational and post-industrial economy.

Discrete Automobility represents both a method and a provocation. It offers an actionable response to CASE challenges and introduces a new design methodology to

Right
Fig. 5.2.3.i.: 2004 Pininfarina Nido Concept. 2008. [digital render].

the automotive field. It also invites further enquiry into how design practice might evolve in the face of automation - not through retreat, but through active redefinition.

5.4. Future opportunities

5.4.1. Developing Discrete Automobility further

Opportunities for new research identified through presentation of the research (5.2.) include: Designing a 'fully soft' interior to address safety concerns; Demonstrate how smaller voxels could be used to deliver better ergonomics; Run workshops with automakers to consider how discrete principles could be adopted to their brand and design – experimenting with form, detail and materials of the voxel; explore the applications for discrete principles in public transportation design. Further developments to the Discrete Automobility system include:

5.4.1.a. Connecting up more of the system

Connecting up more elements of the Grasshopper (GH) system would mean that the analysis could automatically drive the aggregation. In messaging with Andrea Rossi, the developer of Wasp, a proposed system was to use a grid of locator points, upon which parts can be placed. The parts would be pre-placed based upon pre-determined scenarios of use. Analysis would then be run and used to 'score' each locator point. The point with the highest/lowest score would be used as the base point for a predetermined field, which would be derived from and a bounding box of a graph grammar controlled aggregation. This would be limited but would enable some automated modification to an aggregation. Rossi is examining this and other possible methods to enable this functionality.

5.4.1.b. Use of Gen-AI and other Machine Learning tools

Specifically, there is opportunity to use methods of GenAI or Machine Learning to create and evolve the scenarios which are then used to drive the voxel aggregation. Machine Learning techniques were learnt during the research (Driven by Volumes 2021), (Google for Developers Unknown) and there is a body of research from architectural academia that this could step from (Goodman 2019), (Tarabishy et al. 2019).

5.4.1.c. Develop automotive specific tools in other programmes

Rhino and GH are not the dominant software tools in design studios which today use Autodesk Alias or Catia for surfacing, Blender for rapid modelling, and Unity and Unreal Engine for visualisation. Autodesk Alias now incorporates Dynamo, a visual coding programme similar to GH. Several of the GH plug-ins, such as Ladybug and Honeybee are available for Dynamo. Bringing the functionality of Wasp, which is built on the same technology as Ladybug, to Dynamo should be feasible and would further encourage experimentation with discrete techniques within the automotive industry. The possibility of bringing discrete automotive tools to Unity and other conceptual software could also be explored further.

5.4.1.d. Design of bespoke robots

Future Discrete Automobility concepts should push the design of task-specific robots in the interior (rather than using a robot arm that is not necessarily optimised for the task). Opportunity to design robot and part together more closely.

5.4.1.e. New connectors

Develop new methods of voxel connector that are specific to an automotive application.

5.4.1.f. Briefs for future discrete vehicle concepts

1. A rural transport vehicle, with a medium scale voxel (the closest to Education Brick) formed from sheet material and experimented with non-block form.
2. A short haul flight alternative that explores how very small scale voxels could deliver a premium/luxury experience.
3. An urban mobility design, using a reduced number of large voxels akin to a public outdoor furniture.
4. Using discrete system tools to adapt passenger carrying vehicles for users with particular needs and requirements. Particularly useful contexts would be SEND school transport and ambulances.
5. Using discrete system tools to arrange loading patterns within freight vehicles

These concepts could be used to both demonstrate the design capabilities of Discrete Automobility further, and develop system demonstrator technologies, and would be an opportunity for greater reflection on the potential for discrete tools to be used in a way that makes design processes more democratic and challenges the power models inherent to current models of production.

5.4.1.g. Presenting in new ways

Developing a Discrete Automobility concept that can run on a game engine and shared with others / enable both automotive design and non-expert users to experiment with discrete methods.

5.4.2. Broader opportunities

5.4.2.a. Building a Machine Learning (ML) database for automotive design

Sites like netcarshow.com offer a wiki of car design images and press releases. This idea would be to build an open-source database of images that can be used to train automotive specific ML and GenAI applications. When users upload their images, they would be encourage to opt in and then 'tag' elements of the image, e.g. for exterior 'wheel', 'door', 'DLO', etc, for interior, 'chair', 'table', 'dash' etc, this providing the AI toolset with a greater understanding of context and ability to manipulate precise characteristics. The tagging system would cover both production and conceptual vehicles and offer equal status to any design, irrespective of who it was produced by. Work by conventional automakers, non-automotive brands, or by individual designers or students will be held alongside each other with equal validity. These datasets would continue to grow over time and will represent a significant contribution to future automotive design practice.

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Appendix i – Flexible and adaptable Case studies

Appendix i – Flexible and adaptable Case studie

Number **Image**

Advanced

2024

Fig. i-AD1

Fig i-AD2

Fign i-AD3

Fig i-AD4

2023

Fig i-AD5

Fig i-AD6

Fig i-AD7

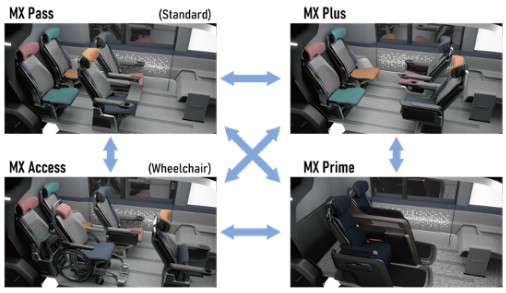


Fig i-AD8

2022

Fig i-AD9

Fig i-AD10

Fig i-AD11

Fig i-AD12

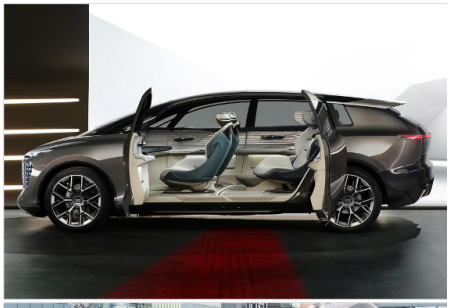


Fig i-AD13

2021

Fig i-AD14

Fig i-AD15

Fig i-AD16

Fig i-AD17

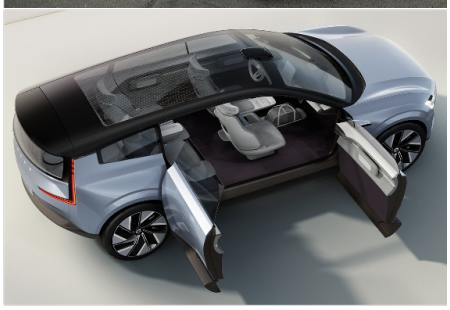


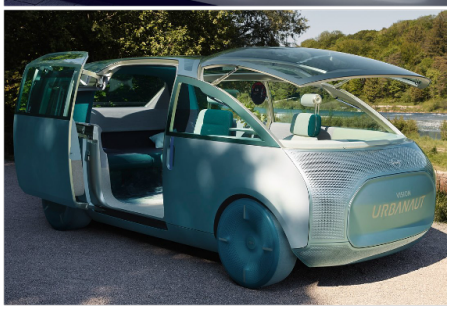
Fig i-AD18

2020

Fig i-AD19

Fig i-AD20

Fig i-AD21



2019

Fig i-AD22

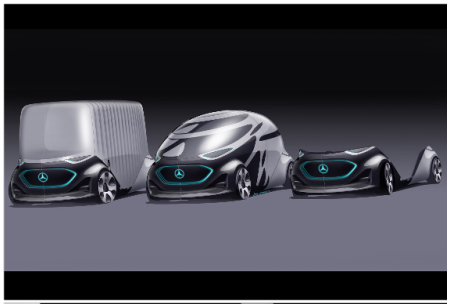


Fig i-AD23

Fig i-AD24

Fig i-AD25

2018

Fig i-AD26

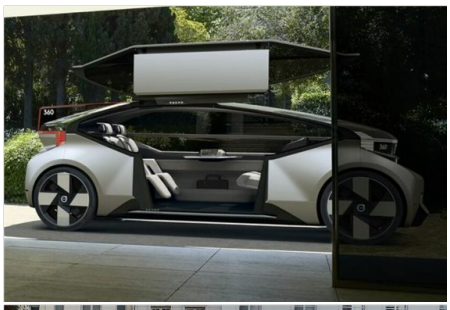


Fig i-AD27

Fig i-AD28

Production

2024

Fig i-PD1

2023

Fig i-PD2

Fig i-PD3

Fig i-PD4

2022

Fig i-PD5

Fig i-PD6

Fig i-PD7

Fig i-PD8

Fig i-PD9

2021

Fig i-PD10

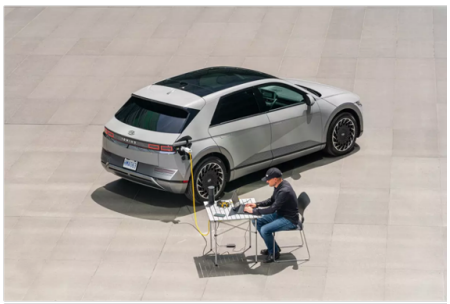


Fig i-PD11

2020

Fig i-PD12

Fig i-PD13

2019

Fig i-PD14

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Title

Fig. i-AD1. Kia. 2024. Kia Platform Beyond Vehicle (PBV) strategy. [digital render].

Figure i-AD2. Hyundai. 2024. Hyundai SPACE Concept. [photograph].

Figure i-AD3. Hyundai. 2024. Hyundai DICE Concept. [photograph].

Figure i-AD4. AC Future & Pininfarina. 2024. AC Future & Pininfarina eTH House Concept. [digital render].

Figure i-AD5. BMW. 2023. BMW i Vision Dee Concept. [photograph].

Figure i-AD6. Toyota. 2023. Toyota Boshoku MX221 (1) Concept. [digital render].

Figure i-AD7. Toyota. 2023. Toyota Boshoku MX221 (2) Concept. [digital render].

Figure i-AD8. GAC. 2023. GAC ERA Concept. [digital render].

Figure i-AD9. Volkswagen. 2022. Volkswagen Gen.Travel Concept. [digital render].

Figure i-AD10. GAC. 2022. GAC Space Concept. [digital render].

Figure i-AD11. Lincoln. 2022. Lincoln Model L100 Concept. [digital render].

Figure i-AD12. Audi. 2022. Audi Urbansphere Concept. [photograph].

Figure i-AD13. Hyundai. 2022. Hyundai ‘Mobility of Things’ Concept. [digital render].

Figure i-AD14. Audi. 2021. Audi Skysphere Concept. [photograph].

Figure i-AD15. Audi. 2021. Audi Grandsphere Concept. [photograph].

Figure i-AD16. Volkswagen. 2021. Volkswagen ID. Life Concept. [photograph].

Figure i-AD17. Volvo. 2021. Volvo Recharge Concept. [digital render].

Figure i-AD18. MG. 2021. MG Maze Concept. [digital render].

Figure i-AD19. Renault. 2020. Renault Morphoz Concept. [digital render].

Figure i-AD20. BMW. 2020. BMW i Interaction EASE Concept. [photograph].

Figure i-AD21. Mini. 2020. Mini Vision Urbanaut Concept. [photograph].

Figure i-AD22. Mercedes Benz. 2019. Mercedes Benz Vision Urbanetic Concept. [digital render].

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Figure i-PD4. Zeekr. 2023. Zeekr X. [photograph].

Figure i-PD5. Volkswagen. 2022. Volkswagen ID. Buzz. [photograph].

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Notes

Appendix ii – Interview transcripts

Appendix ii – Interview transcription and summaries

ii.a. Interview consent

Verbally agreed with the participant before interview began.

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Consent to Participate in Interview

Friday, 17 May 2019

You have been asked to participate in an interview led by Robert Dooley. The purpose of this interview is to discuss vehicle interior design methodologies. The information learned in this interview will be used as part of PhD thesis literature review.

You can choose whether or not to participate in the interview and stop at any time. Although the interview will be tape recorded, your responses will remain anonymous and your name will not be mentioned in the report.

We want to hear your thoughts and opinions. We ask that you answer questions as honestly as you can, but please remember that there are no right or wrong answers to the interview questions.

I understand this information and agree to participate fully under the conditions stated above:

Signed:

Printed:

Date: 17th MAY 2019

Appendix ii – Interview transcription and summaries

ii.b. Interview questions

1. Intro to thesis project
2. Summary of their background
3. Interior design process (what do they do during it? Sketching, modelling +)
4. Where does that sit within the wider context of product development?
5. How would you summarise the interior design process at your organisation? What methods and processes do you use? (Perhaps by talking through me through a recent design project you've worked on?)
6. Is this radically different to your experience at other organisations?
7. Where does the interior design process sit within the wider vehicle development cycle?
8. What are the driving parameters of the design process?
9. How would you define a design methodology?
10. Do the design processes/methodologies of your Advanced and Production teams vary? How do concepts move from Advanced to Production?
11. Are there external factors that lead to you changing your design process? (i.e. cultural emphasis, social, environmental etc)
12. Can you tell me how trends impact your design process?

Appendix ii – Interview transcription and summaries

ii.c. 2019-04-23 DESIGN DIRECTOR, EX FORD - summary

Design Director, ex Ford discussed how automotive interior design processes traditionally focused on exterior design and were product-focused rather than experience-focused. He explained the changes his company made to shift to a more human-centered, experience-driven approach through techniques like empathic research, defining core customer values, exploring emotional impacts of designs, and co-developing solutions with customers. He provided examples of projects that broke from traditional interior architectures and integrated new materials and interactions. Overall, the discussion centered on evolving processes to design holistic interior experiences that provide meaningful value to customers throughout vehicle ownership.

ii.c. Transcript

Robert Dooley 0:00
So

I'll give you a very quick overview of what I'm doing. If that's okay.

Yeah. Okay, so my PhD is looking at

automotive interior design process, and it's specifically trying to understand it is trying to look at how automotive design process is going to need to evolve or change to meet the challenges of autonomy. And the place I'm sort of starting from is a position that current automotive, interior design methods aren't really suited. And the way designs are currently trained as automotive isn't really suited to meet the challenges of autonomy, where we move from a driver first mentality to a driver lyst mentality, you have kind of state state whereby it's more about considering what we're doing within the vehicle, rather than being, you know, given something to design over. But in as part of our search at the moment, I'm actually taking a step back from that, because I need to first of all understand what is current automotive interior design process fully, because I'm in a literature review, but there's very little literature actually, on this subject. You know, there's maybe two books written about interior process. So the reason I'm chatting to yourself is because obviously, you've done a fair amount of it, you've managed that process, I really wanted to speak to you and find out how you might describe your process, or methodologies that you use.

Design Director, ex Ford 1:32
Okay. Do you want to talk about my profit, or you want to talk about what I think?
Yeah.

Um,

Robert Dooley 1:40

I'd be interested to hear your opinion on both. I mean, perhaps I wonder if I don't want us to give away anything confidential. But I wonder if perhaps you could, in a recent or a project you that you might think is fairly typical of your of what you've done. If you could sort of took me through that process for that, that that vehicle, that would be really helpful. Okay.

Design Director, ex Ford 2:05
I might, I might reel it back. I actually think I'm continue my way. Is that right? Yes. I'm Polina. Yes. Yeah. I understand now, why you might have thought that I made basically, that's the good part of the last five years of my life,

trying to solve

this deficit in interior design processes.

It's funny that you think that

driverless vehicles that are

sort of pushing this ship, but I think it's actually technology,

life in general, and people

what the carrier for that, that's driving this change. I, I can talk to you a lot about how it's shifting things. You said to me that literature, carry interior.

Literature.

I think that really howling because I actually believe that process, interior design process is

seen.

It's actually pretty neat. As it evolving itself. pretty rapidly, it's mixtape to, in my opinion.

For the longest time,

area, interior design offices were being led directly by experiences like process. From what I could see working at Ford, our whole product development system is built around and dictated by what it takes to build the next area. And that's where the problem lies.

So you elaborate on that a little bit.

Even if we're just talking about simple, I mean,

basically, we, we work around backup plans and development highly of what it takes to iterate around creating shape metal

for next year products, and the amount of time that a product to make itself into production tooling. You know, reproducing, reproducible on that.

That's what I believe in us. But I've seen and in my

attempt to re addressing how interior design

of what I've been unlocking a lot of this, that makes sense. I would say to the most automated companies are still having their processes dictated by

physical development.

Robert Dooley 5:35
Sure, let's get tested and 3ds. Thank you. I just like to it very difficult when you doing it over over the over the instead of voice but just a I am I am pretty listening. And quiet. So I'm not disturbing you when you're talking. But also I yeah, there's a lot of things. I am really agreeing with you on that, I think really interesting, but obviously to keep it objective it to my research, I'm just gonna let you you do you're talking and then and then so the names are cutting with other follow up questions, if that's okay. Sorry, I feel we have a one sided conversation, but it has to be because otherwise, it goes off being a conversation of us agreeing with lots of things within isn't isn't actually that helpful to my research? Unfortunately. That's really interesting. They think, yeah, thanks for that. Okay, that that, that sort of makes sense. So I understand you take a point that, you know, exterior is has been driving, and probably is in many companies.

Design Director, ex Ford 6:35
But what

Robert Dooley 6:37
would you say is once you've then got that, is it is it fair that you have like a sort of an exterior package, which is defined and then you're designing within that?

Design Director, ex Ford 6:47
Yeah, I think

it's much more fundamental actually. So I yet what you just said, but there is some other impact parameters like when you start a project and finish the project,

basically, it is

a very finite thought and a very finite, but at the end, which will not be true of interior design in the future, they like

digital companies that are

are evolving solution with the customer in the marketplace. So when your lead from a very exterior sort of mentality to solutions, a very fine light, I saw, I put a package together. I thought working through design feasibility, and I iterate how look with design capability. And then I released my by

the tooling in

and then as most of the time where a product might be getting a little bit long in the tooth, and they'll be dropping, and therefore, the task will come along to refresh with minimal spent that product to sort of regained interest in the in the marketplace, again, with with a refresh of the compiler or headlamp details or something like that, but trying to stay away from major architectural items. So I think it's much more fundamental. In the other part of it is also

if you think about interiors, and exteriors,

for the most part, exterior design, get

money to read, to bind the plastic and metal, make a vehicle look different. When it comes to interior design, most of those components are the things that make up the anatomy of the interior, apply to a greatest system. And therefore, systems thinking is really important to have a set of control that banner cost a whole series of products,

or

the architectural elements that cost a whole set of products. And, unfortunately,

and I think companies will try and work this out, as we see.

Next area

works project by project. And an interior has to work across all projects as a system yet the product development system is still built around

getting that one product

in a shot in X amount of months.

Looking at that, that whole system across the board, and I use the analogy that if we were likely not to be building the entire iOS on one product, you know, consistently working on that over you know, X amount of years. And then you know, spending time refreshing that and iterating that in the marketplace.

True. Okay, that makes sense.

Unknown Speaker 10:36

Yep. Okay.

Robert Dooley 10:40
Yeah. Interesting. Interesting. you've drawn that back. Okay.

Design Director, ex Ford 10:47
Is he now? The Kyle? Yeah, yep.

Robert Dooley 10:52
Just Just before we do other, I just saw that you've prompted a couple things we do ask you, is you would you say your experience of Ford's very large covenant know, where if you weren't here before Ford? And were your experiences sort of similar there? Or was it? Was there a difference?

Design Director, ex Ford 11:12
Now, I've been my whole career

in Australia, in Europe.

Robert Dooley 11:21
Okay. And was there differences in the in the different regions? Or was it the same wherever you were?

Design Director, ex Ford 11:27
I think I think

it was the same

is very strongly ingrained for emerging culture and how to do things. The only difference is culturally, with a different emphasis came in through bike lane. Germany was very meticulous around quality iteration, incrementally increased with

us

as not being like that the US is more.

There are a lot less memory land and

incremental improvements and

looking at the next solution, rather than fixing and improving the pop solution. That makes sense. Yeah.

And Australia

Been a long time now. Five years.

In the straight year, I

was finding a date

culturally in between

the US and Europe,

trying to

I think they understood that you're

busy now I

understanding that we very, very good company at the American being. So that was just an interesting.

It was more of the palantir that will try to accommodate. Sure.

Robert Dooley 13:39
Okay. So if then you this.

There's also some distinct or differences in the fuel

of a wider process. There are some variations depending on cultural cultural differences. Coke variation. Yeah.

Design Director, ex Ford 13:57
Yeah. Okay.

Robert Dooley 14:00
D, do you think that

this might seem an obvious one, but do you think

products need to be fundamentally different for different markets? And if so, does that mean that the process needs to be different? Or could you follow the same process and get to the same result?

Design Director, ex Ford 14:20
And

repeat that, again, is a market the

Robert Dooley 14:27
different different markets need different products? which will give you an obvious question, but the sort of follow up to that the caveat place? And if they need different products? Do can they are there for Okay, using the same process? Or do we need to have very distinctly different processes for different markets?

Design Director, ex Ford 14:45
I think

I think different markets need different solution.

I don't think ground up different.

But I think there will be went through a map

being school ization

for many years now being about 15 years, creating new standards. This idea of, I think it's financially driven, a one size fits all sort of closing strategy.

But I do think

there are regional differences, and we should celebrate them. I think if your process is correct, but it's funny, we've been talking a lot about your focus is on

human beings.

And having checkpoints and the process that keeps you close to the customer. I think the process remains the same, because the process is the people you're designing for. And

I think

the internal,

that consumer facing side should be very similar. What will be interesting is how people consume that information,

internally in cooperation,

to make sure that they are balancing how much money we have in the pocket to make things and where we spend that money to accommodate different customers in different regional name.

That's where I think ob

that'll be interesting on

how, how we take that information and work work at it from the business and

technical business perspective.

Robert Dooley 16:55

Sure, okay. That makes sense.

Okay, so

yeah, thank first or taking it out, look at that wider systems type type of thing. That was really good, actually. So just going into some more of the sort of the the actual details of an interior.

Unknown Speaker 17:13
Just so I guess, a question to start off,

Robert Dooley 17:15
I've

Unknown Speaker 17:17
had a really interesting,

Robert Dooley 17:19
really realisation I guess, a few months back, looking at a Ford is it a model, a model as a reference is the Ford Model T with the Model A was really the first sort of,

if you like, real sort of production vehicle, right during,

after the Model T. And if you look at the the Ford Model A, and if you look at the interior of the latest Ford Focus, for example. Yes, they're very, very different in terms of the technology in there, the materials, the manufacturing, manufacturing processes, but actually, if you look at them in terms of architectural terms, if you like the storey well, elements, you know, you still got a steering wheel, you've got pedals, you've got a dashboard, and you've got a seat.

And I'm wondering, why do you think that is? Walk with Dave,

Design Director, ex Ford 18:22
I think

I think

I think cause became will be in there, right? for 100 years now. We have been optimising what it means to drive driving as the core activity. And

it has shaped and formulated into this

actual, like, products, that must be you that white, blue. I don't know it's almost a little bit like a full has a handle and and a car bus has a driver's seat with the steering wheel, back to an instrument panel with the comfort for your adult for your other. And that idea is really hard to shift in people's heads that actually people want the equal beyond

the activity of driving.

That they want to help them do other things, like different types of transition in their life.

Robert Dooley 19:47
Okay, so do you have an example of some in a piece of interior zone way? You tried to do that? Yeah.

Design Director, ex Ford 20:00
You're talking about where we've tried to break what

traditional interior is?

Robert Dooley 20:05
Yes, yeah.

Design Director, ex Ford 20:06
Yeah. Yeah, I do.

You want to say,

Robert Dooley 20:12
yeah, if you if you're able to send to me now or later and just sort of talk me through it, that would be really cool.

Design Director, ex Ford 20:19
Trying to find a presentation. Thanks. Understanding.

Finding

Robert Dooley 21:26
How you doing?

Unknown Speaker 23:28
Hello.

Unknown Speaker 23:37
Hello.

Robert Dooley 25:22
Hi, there, Sri Lanka, kind of

Design Director, ex Ford 25:28
share my screen.

Unknown Speaker 25:29
Okay, great.

Design Director, ex Ford 25:31
I think this is something with at least three or four years ago now. I'm going to stop here. And then we'll go and see what we can go to big data.

many more things we try to do, I think you're,

you know, breaking it constantly balls, what you see is we still have my piece consultants or PR, but we will try to break it.

And we've gone well beyond this. I think the first thing I wouldn't say

about regional differences at the time that we were setting up for the finance in Syria is the regular on getting representation throughout the world very much because we believe people need different solutions and to arrange it. So the biggest thing we wanted to,

to make sure that

we we encourage that, either. Yep.

Okay, in the dialling into that.

That if we're really going to respect the research, the approach needs to be more like a spirit of fight for that. We empathise with the different regions in the world building a system that works for everyone, rather than an American idea. And that's the big shift.

The next it was we we have to go on the secret show is

for talk about how fundamentally shifting the way we upgrade, serious advice. So like I said, the 30 minutes pata was the beginning of my career. And from what I've seen, industry wise, the idea was here a function did cover them with plastic and make them look good. Which is very much an exterior sort of mentality. So we have to tell them that we needed to stop somewhere, I'll try to point around why do we have IP consultant dog was because that's exactly how to set up in the amateur with the things the console and the doors and we shake them. And we shake them for the activity of driving. But we do have this quiet to ensure our processes, right? They go with this to help the company stay in employment industry that we have to shift our approach. And welcome back me. We at the time, we could probably replace this with you but or excite kind of embody the same idea we need to be what the experience design approach. And from an experience was what we were calling a series of members environment over time. That was another problem with the process that an interior was being evaluated exactly like Syria, which would you respond back and look at it that the user Don't touch it. And it was treated like a static object in time. And that it would never evolve itself over time or be moved into? So how do we respect that in our process. And for us to celebrate is how the user discovers and interacts with the vehicle over the course of their journey throughout

the duration of ownership? And how do we create processes that allow them to track and monitor and bind to that right through, multiplies the victory. We finished writing that the tool that we manufacture and then we don't put the

book on trial.

We we engage in it for the very first time he grows and as well, as he gets very new things really release the band's processes to change, which is a huge shape for the automotive industry because that's the new money that was continually spent to just develop the plastic. Now into the marketplace that digital experiences change the way we do this by collection, which is which is a big deal. At that time, we were trying to talk as well to people around how we build an interior experience. If we think about in the past, it was like we need a Mustang a box look like a box. And we've got open shape. It confirmed all cylinders like a box that needs to look like a tonne of soda. And we would go and shake the ice compound going to look like a taqueria operator. And we started to see what we started working very well with the experiential or human centred approach. Over time. We started something called questions keep on asking rap development. The first one was in the factory. And this was a really interesting idea. And secondly, which is a factor is reduced to anthropometric in the automotive industry basically, helping men do they fit in the space and help people stop but it needs to be for that things. And we said that the psychological and feeling component to the human factors are really starting to populate on how we want people to feel. And that that really pushed us to the notion that theatre classes in our industry. Second question we started to ask ourselves was the way you want input and receipts outputs for the vehicle, say hello, hello interacts with the car, as we were talking a lot about. Basically, this got reduced to something called HDMI in the industry. And basically it became touchscreen, and over here has been find the controls in the middle of your car. But we know that interaction is much more comprehensive, and much more multi dimensional. So we were starting to abstract out a little bit. Since your question around why I decided to say, once you sort of understand how to feel the interaction, the activities that need to do that space, then you can start distributing that upon you to say how to leverage that space, what what are they going to do? What would that look like? And we were trying to get away from interior copied and train talking about a rather than rather than a function concerning on four wheels moving in English, in, in the streets, and this was a big make as well. We stopped interiors, interiors, and started talking about the spaces to try and change out How are our disciplines within talked about elevating materials, activating the senses,

really

talking about applicants, things like that, but but rather how do we get materials to contribute to the workforce to the ballroom the way one feel. We also re focused ourselves on things that make up productive, right? So to your point, it accomplished with goals with started looking at actually, what are those BBQ bragging rights what what signals to run in and in in an interior space that product late for the Bentley, find me brothers and the standardisation and wake up in the marketplace. And then the last one was a really tricky one. But we found it really important to introduce this idea

to the world, what are you aiming for, which is almost like a reset go back to the beginning where we can set those feeling we can get the input that we want, we can set up the space, we can ask the material, we can get those bragging rights happening. But at the end of the day, if the customer doesn't find meaning in that product, we can start again, right? Because that's where we say, the money that's been connected with the product? And if the bigger question, then you like that shape or that theory will do you think these products will provide meaning in your life in whatever stage you're at. So we were talking a lot about bullying the previous block us at the centre of light, which I think has been happening in most automated companies, allowing us to guide and craft their experience moving talking a lot about going from industry hygiene to what everyone's doing, which is basically measuring the turnout, craftsmanship, make it show the capital, the economic metric, cost control model material set. And then we have something which I think mostly the interest is they basically measure things going wrong in the marketplace, we separate ourselves that this is not going to get us where we want to we were just starting to allude to the idea that be competitive in the future, we want to shift some of those things to understand seeing, understanding how they interact, the space that they want to live in. And you can start things beyond that. It's broader than it helps us get rather than just product that help one person drive from A to B. And this was our first detected by

a lot of abstracts

the high level concepts that we started putting down and how we work and I think was involved in chaos, but basically at that fibre thought integrate the process so that we could the power and real life.

The testing,

we use a tool within the company that except the psychological, the comfortable appetite for years and years.

How do we get from these broad districts?

How do we have the right types of conversations with customers, which is still ongoing. And what we basically spent a lot of time is trying to derive true key value. And we

make sure we are

centric values is aspiration. And try to use it as an alignment throughout the organisation. So this is our very first attempt at being much closer without researchers, let's say for the South African counterpart. And really co developing empathy and understanding with a customer into 27 that we can use to get that consistent, still evolving a lot. Well, the biggest part of this is those words are so abstract. So we then need to translate these emotions into tangible journeys of the storey. How complete the things the same way. And I think they've evolved.

I think

there's a lot of fights in the industry at the moment where a user journey or a customer storey is very much treated like a cost analysis. We don't use it that way we use it to highlight the value and value of the customer. And then we use those as rally points. So the designers like brown, like the dumbest thing is, I'm going to sit back, we do this because it's the scenarios and that emotion that helps us actually physically devise

solutions, right. So you can't just jump from

spontaneous as a core value functionality and designing something physical that looks spontaneous. How is it you can you can work together to start elaborating on what one thing is like and start building up that network. And that narrative that then helps you shape your physical environment should be enabling them feel like once we've done a lot of this work, and again, I feel like that work did not exist the process previously, it was just a bunch of words, make it look this way. And what we're trying to do is reconfigure those spaces with experiences now. So by doing all the work, we can start developing the deeper understanding of the new stuff and they need blowing up to put pen to paper intelligent part I'm not covering now because of that innovation is we do a lot of ethnography now. But I wouldn't call it like pure, they decided to act out how to collaborate forming that philosophy. So we take this sort of psychological part with much more behavioural ethnography as well and bringing those two reflect the psychological architects together with the paper.

It's very good to get smarter at what we're doing. And

stop that understanding, we then start exploring interior configurations that help us support the occupied. So this is very preliminary stuff. We've done a lot before that. But, again, really working with those scenarios help us understand, how do we really prioritise an experience for one person to the many, and really just talking about it really starts migrating not in Syria, and it still looks like an icy and a console. But what you can see us is trying to push that into the background here, and really start looking at how do I communicate a lot of different priorities, different accommodation, and different people in the space over the neighbours lucky, much more into the whole environment today. So you could say still from legacy calling, and then we continue to shape the states throughout the US. So again, this is a very driving block that we have, for example, and really start putting these options quickly into sort of dynamic, but they

seem to regularly evaluate different

emotional impact in the drivers with properties. So we're trying to go wide, trying to do things a lot earlier in our process. Rather than having played sitting in the, in the studio, sitting there working for the good part of two years shaping play. Without having a clue what impact it has, on my experience in my life, I think I thought there, were really breaking and bottling things a lot differently. And really making sure we're treating these spaces differently. And I know this looks like an IP conference. But this

process has led up to many more, much more interesting solutions, which were actually struggling with, we donated my what I call the things with made because the net of consulting, and it is something new, and we're having to go through how are we going to decide these things.

The next beta we have,

we have

things are sort of like architectural items are are really working on lovely things that take a lot of engineering and try to get them really quickly out of the process. So we can start shifting the entire

way up layoffs.

But also planning to apply different than three building blocks and starting to look at how they impact one perception of the space. So you can see us replacing them with living space by changing how was the the bad news, inventing the interior feeling here with an example where they felt the volume is very low, because of the added materials, all that up. And it is a seamless interaction, they're really starting to look at what was said because actually has some intelligence and things like that. And maybe as quickly as we can, bringing all these our them together. So again, really clear how a process with today, you would build an interior, you would spray for a the shapes of the IP. And in some way, lighting the process that would say, Stop putting a sequence on the screen. And we have to change that, that you know, if residual experience is something and it sounds really low level, but it doesn't fit in that process, you're not going to build a whole new hatred by very period. And you're not going to get imposed on all the shapes, but it has to be done simultaneously.

Placement cereal, this was some incredible stuff. But

why we stuck in this world where it's all the same material,

decorative panel or things, really trying to challenge our material to identify what the material communicate. Again, we're really looking at, we were going out to research time, but we were shining them with the simple set of materials and by requires how you could actually give one a totally different entire experience the exact same material set, and how powerful that is, just by changing the volume of proportions of it, you could go from someone thinking something was professional and

to relax

leisurely

with the types of materials just by the way you are reporting. This is another added level of complexity that you're gonna have to deal with. So, again, we're really expecting spend most of your time in clay the process. And then at some point late in the process, you would start actually adding Capri materials. And what we're trying to

do here is actually start with the materials and get the materials to take take shape and atmosphere in space. In some respects, not getting terribly high five, but getting back to really good basic

reintroducing material invite

to our

unique selling point, innovations that they go using. So consider. So again, everything got sensitise, who introduced in the usability point, helping spaces shift, depending on new and different use cases, and then even just levelling out interactions and think about the way people interacting that daily lives. keep on telling the storey that today I think we did Excel to get your vehicle started. An average about five to eight things you need to do before your car wins.

And the idea

is that is that happened on any other products in your life. I don't think anyone would tolerate pressing or doing a thing before you could get into your phone for phone calls. Yes, we do that we expect that if people if they have so just listening, the way people talk and literally hit up with their whole lives. It's really, really important. This was an example where you want young people in your car, use the capillary interaction that they understand and that is relevant to them. Like do you

think we're creating value relevant to the customer, again,

looking at emotional approach to quality and identify what's important, we're adding value without realising it Q is essential from exactly where and I think with a library, from, from teachings, integrated materials integrity, facilitate quality tech touches on a steady activity, whether you're appreciate it. At that point in time, we were really talking about the money when the customer walks that don't give them stuff they don't want. And really work with them on. Does this make sense in your life, be my value in it. You know, we had this mental bottle, you know, if you gave you can work on like if you take the iPad as an example. Yeah.

We

respect without like, you can refine that such a beautiful piece of refined engineering. But if you think of that, I say to an eight year old woman without the internet, the matter how good that that piece of equipment, if she can't use it or find value in it, then she ain't going to pay the thousand dollars for it. So this was a an attempt that somebody to talk about that to our leadership. And ultimately, lights is a complete interior experience, which is the video that at the end of all the within developing various need to communicate holistic experience. And then what you can see here in the building bottles that are connected, this is still about five years old now that we've got a lot more but how we talk to people about you know how things work, how it integrates into your life, as I've been working on vision models, innovation, projects, movies, VR experiences, so really getting multi dimensional, rather than just sitting in

front of a claim that's draughts. And we have all sorts of challenges that appeal to us experience that keep costs down. And, and really work between the developers they modelled a lot of money, outcome with the outset experiencing key costs. And, you know, getting reminding, like how do we get to experience little human senses. As, for me, a lot of this work was about providing the direction and the line vision programme, to will be trying to shift a lot of this work out of the programmes that we do creative development, our programme to work, and then we basically blow a go at, we got a blistering speed each. So the actual products and once we we have solutions. And we have that system working, we then start building out products that that we reduce time to market. And we try and get them out into the marketplace that on the 24 months, which is basically

Robert Dooley 50:54
Yeah,

Design Director, ex Ford 50:56
with develop the system. So huge shift, because as we said all the time is the single programme today. And what we want to do is really, you know, get working at a system level and get these things out as quickly as we have. And also continue it in the marketplace. And then I think just going back and doing a loop back to what really important here is, let's start asking ourselves questions for the very first time so that we can fly treat solution. So this is a bit of a tongue in cheek. But I think it goes back to the idea of it comes and goes for 100 years. Come on, let's really ask ourselves some real questions. And let's use these tools. So that we can actually get to the solution, though about solutions that help. And I'm going to stop there. So that was been a lot about how the thing involving yet and there's actually a lot more that we've been doing since then your technique.

Robert Dooley 52:04
Yeah. Okay. That's, that's really, really interesting that thank you so much for taking me through that that was really, really eye opening to see.

Okay, let me just, there's been quite a bit. Let me just give me two seconds to get back out. Because I've got some notes. And there's one there's a few things I wanted to ask you about. Um, yeah. So

Design Director, ex Ford 52:23
I do have a hard stop at 130. But I'm okay.

We need to get back on the phone. I'm free to do that.

Robert Dooley 52:31
It's okay. Don't worry that that's fine. I'm okay. You're pretty much pretty much done. And I think is it one third of your time now?

Design Director, ex Ford 52:37
I've been to a couple of questions.

Robert Dooley 52:40
Yeah. Okay. I mean, for migration. I mean, that's that's what everything The only question I was going to really ask it's important is what's your timescale for this was done five years ago or timescale for adopting this new these new sort of techniques or methods or however you want to frame them?

Design Director, ex Ford 52:57
I think

I think the, the analogy I use is, you know, how do you develop and sort of like one bite at a time? So I think just in my capacity, I've been just rolling out. I wouldn't say like, it's it's a soft, soft, are, you know, it's implemented through

a lot of these techniques are being

being brought on

by this inviting Jason white teeth and, you know, they're implementing and moving, I think corporately the biggest move was to really acknowledging the need of interior design to evolve. So, they are really implementing techniques to look at sort of like a module a lot more.

We are trying to reduce types of market

failure rejection, the now thank programme timing. So, there, there are a lot of these in place as an apostrophe s that help us get there. But from a design perspective, I continually assault this process and gave the example that they get taken on by the programme team as they come through that I say it's been a very fluid process. Your question and when in a country with it.

Unknown Speaker 54:40
Okay, yep.

Unknown Speaker 54:42
Okay, I'm brilliant. I'm just gonna

Appendix ii – Interview transcription and summaries

ii.c. 2019-05-17 EX GEELY DESIGN DIRECTOR - summary

The conversation was between Robert Dooley and Ex Geely Design Director, an interior design director at Geely. Robert explained that he is doing a PhD on vehicle interior design methodology for autonomous vehicles.

Ex Geely Design Director discussed his background in automotive design and explained that interior design processes typically start with the driver position and front seats. He described how exterior and platform designs constrain interiors. Ex Geely Design Director also talked about using customer profiles and personas in design, but found them vague. He discussed some projects where deeper customer research was done.

The conversation touched on how autonomy could change vehicle ownership models and interiors. Both agreed the design process would need to adapt but concepts often just add screens without considering new use cases. Ex Geely Design Director felt autonomy freed up ergonomics but vehicles remain small spaces.

ii.c. Transcript

Robert Dooley 0:02
Brilliant, thanks so much. Let me do that. If it's okay with you afraid because I work for a university, I have to send you a full okay from Egypt recorded you to let you know I'm used to do some research etc etc after that

interview. Okay.

Ex Geely Design Director 0:20
Um, yeah, that's fine. Thank you, Nikki. Just

Robert Dooley 0:24
cool. So I'll just give you a quick introduction to what I'm doing. And why allows you to be in this conversation. And I just got a few questions just to walk through it through and I'd much rather this was a conversation than an interview. That way, I'll find out far more interesting thing proposed, just ask me straight questions. Sure. Cool. So I'm I'm a doctoral researcher at Falmouth University in Cornwall, and I'm a graduate of the Royal College vehicle design, and completing a PhD in my first year of my PhD. The aim of my PhD is to try and come up with a new design methodology for the design of vehicle interiors, when they become fully autonomous. So level five autonomy. And the kind of the reasoning for that and the kind of the hypothesis I've been trying to test throughout my research is that if we look at how vehicle design has evolved, interior design has arguably, arguably, become rather dependent upon there being a driver in order to give the primary functionality for the vehicle. And that's therfore what designers are designing for. So my process is to over the three years is to bring in practice from other design disciplines whereby they give more consideration to what people will do within the space. So for example, architecture,

interior design, urban design, curation, exhibition design, and try and bring in some of those methodologies into a vehicle design methodology and therefore create a new or a hybrid methodology, which might be better suited to the challenges of autonomy. So I'm in the first stage, and as part of the beginning is to try and really get a clear understanding of current automotive design methodology. How do people currently design automotive interiors? So I'm conducting a series of interviews with people like yourself interior design managers, to try and sort of paint a clearer picture of how things currently are. Because to do this via traditional literature review is very difficult, because there's only sort of two or three published books if you like, on process. Does that make sense?

Ex Geely Design Director 2:36
Now, yeah, no, that sounds quite fascinating, actually. Okay, yeah. Of how. Yeah, that sounds like a very interesting subject. So I'm hoping I can contribute a bit. Sure, let let you know what, yeah, what the current processes are like.

Robert Dooley 2:54
That would be great. Yeah. Okay. So I wonder if you could just kick off just because I know you are the interior design director at Geely. And I just wonder what's your what's been your experience and background to date? Were you anywhere before Geely? What's your background?

Ex Geely Design Director 3:09
Yes. I've been in automotive design for 20 plus years, what is it now? 97? 22 years?

Robert Dooley 3:19
Okay.

Ex Geely Design Director 3:21
22 years, basically, did my studies in Detroit.

Robert Dooley 3:25
Okay

Ex Geely Design Director 3:27
I then went to Ford in Germany, actually. But this was primarily doing exteriors.

Robert Dooley 3:35
Okay.

Ex Geely Design Director 3:35
And then I moved to Renault in France and that's where I kind of got my first taste of doing interior design as well. So my first project was a concept car. So which was fun, because it didn't have any constraints of production constraints and safety and what have you, it was just literally, you know, make it, make something cool for an interiors. It was nice, it was just like a holistic view and we just had an idea of what it would look like when you presented at the show. And it kind of had that ecological

recycling sustainability edge to it as well. So it was it was quite interesting as a project.

Robert Dooley 4:17
Sure.

Ex Geely Design Director 4:18
Then I didn't really get into interior design, beyond that til mid 2000s, 2006, or something like that.

Robert Dooley 4:32
Okay.

Ex Geely Design Director 4:33
Where basically, as in most car companies, there's generally a shortage of interior designers, everyone wants to do exteriors because they look cool. And, you know, that's what you go to school for, to go and draw cars, not to go and draw steering wheels and seats and things. So I did that and participated on, you know, a design competition for one of the production cars, and it was chosen, and then I took it into production. And, and actually, after that, I never returned to exterior design, I always remained in interior design. And that's, it's actually what I enjoy now. So I don't mind that kind of shift, from doing exteriors, which I still there fun to do. But designing an interiors, overall, it's quite challenging, it's far more challenging, but as you said, it is geared around the driver quite often, at least from traditional automotive engineering point of view, you know, that's kind of how the, how the interior of the car is set up is where the, the driver position is literally in, and that sets up for the rest of the interior.

Robert Dooley 5:54
Sure

Ex Geely Design Director 5:55
It's all built around that driving position where the steering wheel is.

Robert Dooley 6:00
Okay.

Ex Geely Design Director 6:01
And, and the pedal books and things like that.

Robert Dooley 6:03
Okay, so I wonder, Nikki, that if, sorry, just on that point, then to I wonder if you could give me an example of maybe a recent example. I mean, if for confidentiality reasons you don't want to say what model or anything, please don't feel you have to, I wonder if you could just sort of tell me the story of a time when you've had to do that, where and what was the process from where was the start point? And what was the end point, I guess? In an example of kind of encapsulates that, this kind of you know designing around the person in the package ?

Ex Geely Design Director 6:35
Yes, well, that may be the contrast between the concept car where I was working on where it was much more holistic. And I was rather naive, because I've never done an interior before. So that one, that one I designed around the floor, and the seats, and the fact that the seats folded into the floor. And that was the whole concept of the interior. And it, almost, the instrument panel and the steering wheel were secondary. You know, which was, then when I got into production car design, we were basically, you start the sketch always around the cockpit, basically, which is the front row. So the sketches tend to be, you tend to sketch the instrument panel, the door, the seats and the tunnel, you know, in between. So it's very restricted to this front row cockpit area, as opposed to looking at, let's say, the whole interior, where you're looking at the rear seats and the load space. And so it tends to be very driver centric, or at least first row centric. Even if it's not the driver, it's at least for the driver and his front seat passenger or her front seat passenger. So it's the result of that. So yeah, even in, and I do, try to break away from that and tell people to think about the whole interior. But in general, people do tend to focus on that front part of the car, of the interior.

Robert Dooley 8:14
Okay,

Ex Geely Design Director 8:15
Simply because that's where the technical input is, from. So I would say in general, even an interior is wholly dependent on the exterior. So I would say it's actually driven by the exterior design first, and that's afterwards, they can place where, where you can put the people within the envelope that's been given by the exterior packaging. So I would even take it a step farther back, that it's not necessarily the driver, but the, where the driver is seated is a result of where the exterior have put their constraints of the drive train, the motor and, you know, and where they want to, you know, what kind of shape they want the overall vehicle to be. So it actually is very much exterior driven, because once next year's setup that sets up where your call point is, on the more technical level, where the fire wall is, it almost seems like on, you know, a lot, the car industry is using shared platforms. So one of the main hard points on a vehicle architecture is that firewall, is the division between the engine bay and the interior, basically. And that firewall is pretty much the, that's what's technically been designed by the engineers, if, you know. So even, I would say that even the exterior guys don't have that much freedom, because they've been set up where the engine is and where the firewall is, and then they can design their exterior around. And then the interior follows on from that.

Robert Dooley 10:03
Okay, so I guess then, are there any examples? A couple questions, and from that. So first of all, if your engineers are sort of controlling, if, if you like your vehicle architecture, I don't I don't mean from a proportion point of view, but from a, just aware of where things are going. Is there any, is there any other sort of process, if you like, or conversations or communication, if you like, between yourself and the engineers? Or is it very much top down? Because you're having constraints placed

that you can't move? Or are you, Is there room to push back against those? How does that work?

Ex Geely Design Director 10:42
Yeah, it depends where you are in the development of the platform. So, if you arrive early on, and that the platform does not exist, then design and the other stakeholders are very much involved in, you know, we want to place this element there. So of course, we are involved. But when you get to the point where it's, the second or third or fourth vehicle on the platform, that vehicle architecture is already defined. So the only time we would be involved is in the early phases when that platform is being developed. I think once that platform is in, exists, we can modify it slightly, but it's, you know, it's a question of a few millimetres here or there, rather than a fundamental shift of, you know, we don't want the engine in the front, we'd like it in the back, you know, you obviously can no longer do.

Robert Dooley 11:44
Sure, that makes sense. So in terms of, sorry, you mentioned platforms, a couple of times, and I just wondered when you are creating these platforms, which is I guess, a fairly strategic level. Are there any sort of design drivers there? Or does that all, or maybe design parameters that you're thinking about? Are there any kind of considerations there given to what people will be doing in this vehicle? Or, you know, the type, the demographic for this vehicle? What are the sort of influences there? And again, do interiors, is there a conversation, a two way conversation between interior design and the people specifying that platform?

Ex Geely Design Director 12:24
Yeah, I don't want to make it sound too, too cynical that, you know, we're just, connecting the dots, you know, so we do obviously have a lot of creative freedom within those constraints. And that's probably the challenge of our profession is that, you know, that this is something that, in general, depending on the company you're working with, it's you know, it's a mass produced vehicle that needs to cater to a certain market, you know, and it needs to also respect to the brand image sort of, the type of emotional response you are trying to get. So, you know, one platform can serve as, Volkswagen show, you know, they can pretty much do it, their sportiest brand might share the same platform with one of their more straightforward brands, and it's somehow a customer would never have guessed that, you know, that, that very sleek looking Audi actually is shared with rather frumpy looking Skoda or something like that. So there, you know, that's the art as well, of using those constraints, and even the interiors then can have their own personalities and what you want to achieve, especially, at right now, I would say they were quite, interested in, providing some architectural innovations, you know, seats that full down as tables, or, you know, having a load space underneath the rear seats, or, you know, these type of added features that could be beneficial. So, yeah.

Robert Dooley 14:13
sorry, sorry to interrupt you, Sorry, just so, so just on that then, that's interesting. So, going back to that example, you gave there of Renault's folded down seats, what do you think, led to them saying, we want to explore this?

Ex Geely Design Director 14:32
Yeah, we actually had a very specific team within the design team. That was, that was their whole task was and that was interesting that they were not automotive designers, per se, they came from architecture background, or product design background, so they had a whole different mindset of looking at vehicles and vehicle interiors.

Robert Dooley 14:56
Oh, wow.

Ex Geely Design Director 14:56
So it was actually a conscious decision to not just have petrolheads and, you know, car guys that want to do something sleek, and sexy all the time. Because a lot of the especially on an interior, you know, if you're doing a Reanult Scenic or something? It is very much about, this is a family car, you know, what, will you do? What are what are the kids going to do in the back are they coming too? Do they need little fold up tables? Do have some sliding console that goes between the front and the back? You know, how do the parents communicate with their kids? So, they did have even though there were all these technical constraints, that it was still on an existing platform that there was, a desire, to offer design solutions, beyond just styling a dashboard or something like that.

Robert Dooley 15:55
Okay, that sounds really interesting. Okay, was there a name for that group at Renault or was it just a subgroup? I've never heard of them.

Ex Geely Design Director 16:04
What did we call them? They were literally the guys sitting in the basement. There were just three guys in the basement that worked on it. But I don't know, if we, gave them a specific... they were part of the... at that time we were in the Advanced Design Group. So they were part of the Advanced Design Group, because a lot of their ideas had to be integrated very early on in the design process. So if they came along too far, too late in the process, you know, then the engineers would have already used up that valuable real estate to put batteries, or a driveshaft or something like that. So they made sure that they were involved early on in the process, to make sure that we could liberate space where it was necessary or they, or the other way around, they would look at the technical constraints and see, where there was space that was maybe not being utilised, and how we could use it to benefit the customer.

Robert Dooley 17:14
Sure, okay. You mentioned earlier about, you said that things are quite sort of front row centred within interior design, sort of as a general rule of thumb. And so I wondered, when it comes to thinking about people in the back, in the backseat, what kind of decision making process do you go through to that? How do you end up with the back seats that you do? If you're like.

Ex Geely Design Director 17:45
Well, it's driven by the front seats. So and generally it's constrained, so basically you have the wheel base, you know, looking at car, so you tend to put your rear seats kind of in front or not too far in between the rear wheels. So that kind of sets up, on most, let's say, conventional two row cars, you have your front seat and the slides back and forth. But then when you get to the rear seat that's also constrained, perhaps, by where the fuel tank is. So that's what sets up where you would put the second row environment. Of course, once you start doing, let's say, a mini van or something, which will have three rows of seats, then that changes the scope a bit, because on the minivan, perhaps the seats can slide forward and backwards, some rails or we could even remove them and you know, that liberates that part of the design more. But on let's say, more, you know, 80% of the cars, which are more conventional, two row vehicles, where you have basically front seats and a rear seat, or seats or a bench seat than that's, it's more a result of what space is left available. There's very few projects where you would start with a rear seat first and define that space and then push the whole front compartment forwards or rearwards, depending on how much space you want to turn the rear. The analogy is the dog wagging the tail, not the tail wagging the dog. The second row is seen as sort of the tail.

Robert Dooley 19:47
That makes sense in terms of its placement. So I wonder then in, that sort of describes, I guess the way you physically place it, but I wonder that in terms of design language, or visual language is it the case, again, that's defined with the front seats, and that moves to the back?

Ex Geely Design Director 20:04
Yeah, and that's where you get into the fact that, in general, the majority of interiors are designed from a dashboard, then the doors flowing off the dashboard, or die up. And then generally, that door theme are designed and is carried into the rear doors. So it's very rare that you have a vehicle where the the rear compartment would be designed in isolation from the front. There are exceptions, of course, okay, if you go maybe more to a Rolls Royce or something, where the the owner of the cars most likely going to be sitting in the back and end the show for the driver will be sitting in the front, then the priority? Probably, you know, I would think that that that rear space was designed from the very big, I wouldn't say it was designed before the front part, but the idea is probably that there was a holistic vision of what that whole cabin would look like, more like a yacht or something like that. Okay. Yeah. I didn't know Rolls Royces always give me this sort of a yacht ish feeling, which I shot, not unintentional. What did you see the one they that custom one they've built a year or two ago, which was for a customer who was really into sailing. So there's, there's a yacht inspired one? Yeah. Yeah. So it's very literal interpretation sometimes. But yeah, that, but that is that is part of the brand image. I mean, it's it's coherent with what

it is the yacht on wheels, basically.

Robert Dooley 21:49

Yeah. Okay. So, um, then, I just wonder, when you are designing, and we're saying we're starting with the front of the interior, IP and fantasies, I you do have sort of a persona in mind, the US, you know, personas or any kind of other others, I guess, if you like empathy tools, whilst you're designing

to think about customer type on or that same to users or tools.

Ex Geely Design Director 22:17
Yes, yes, depending on the projects and the brands I suppose you're working on okay. So, when we were working on working on the Twingo And right now, and this was the one where the current generation basically, which is shared with with Daimler, so, the smart So, we we did create, we want to make sure that the two brands were quite differentiated, so that the smart vehicle smart branded vehicle on the same you know, on the same platform had its own distinctive personality, sure, which was appropriate for for for their brand. And then on the red nose side, we tapped into kind of the twin gold persona of of the first gen Twingo which we really appreciate it and which we felt was was lost on the second generation.

So,

I think on the what we really appreciate it on the first generation, Twingo was kind of the versatility of the interior, it was quite a compact car, you know, it was mono volume and kind of a box on wheels, and then it had a sliding rear bench and add a very playful feel to to the interior. So we wanted to keep the spirit of something quite playful and it was also quite intelligent in its almost reduction of some parts to so that you could get quite different interior ambience by changing just a few key key elements of the interior. Okay. Yeah.

Robert Dooley 24:08
So I you using sort of customer profiles, I guess he like in your design process,

Ex Geely Design Director 24:15
we are given those quite often by the the marketing or product planning department. You know, this, okay, here's the new Twingo, it's going to be priced at X amount, and you know, it's going to be roughly these dimensions. And here is our typical, you know, this customer profile. Yeah, she's 32 years old lives in Milan, I didn't know is a professional and something along those lines. Okay. But to be to be honest, we find them to be rather stereotypical. And for designers, we find they're just a little bit too nondescript dead, like so vague, that, you know, it's it's always coming from marketing, it's always the, that seems to be the same customer profile. It's very rare that it? Okay,

Robert Dooley 25:09
so are you are you? Are you pulling from that when you're designing? Or is it? Is there just a disconnect? Is this all you get that and it's kind of Yeah, okay, and it's all put to one side? Or do? Yeah,

Ex Geely Design Director 25:21

sometimes there's a disconnect. I mean, it depends on the projects.

When I was at, right, Landrover, we were working on the Range Rover. So there, they did customer research, which I thought was much more. Yeah, it was much more pertinent. They was literally a much rather than just do a clinic where they invite random customers and go look at a model. And then they disappear. They actually had far more in depth, contact with a few select customers around the world, okay, they visited their homes, and then they're working place and really tried to find out, you know, what attracted him to buy a Range Rover, or what why did they consider to buy Rachel, and how they use their cars. So that was, it was really fascinating, because then you got an insight, not only of how they use the cars, but of their lifestyle, because, you know, the designers are not necessarily Range Rover customers, we can't afford one ourselves. So. So yeah, these were these were high net worth individuals. And it was really fascinating because it varied from, from country to country. So the ones in China were really young, you know, they were basically these 3030 year old millionaires. And then the ones in the US who are maybe a bit more, you know, in their 50s or so. But do you have your even some tech? You know, there was a guy from Google, I think so, you know, they had some tech guys that, that we're a bit younger, and the ones in Russia tended to be also older. Okay. So,

Robert Dooley 27:07
so if you have all those different character types that you're designing for, how do you how does that information flow into your interior design? And how how do you make it interior, which, which is appealing to those presumably, quite different people?

Ex Geely Design Director 27:25
Well, what they had in common is that they, at least in this specific example, is that they really love their Range Rovers. And they said, there's, it's so unique, there is no other vehicle quite, it's quite iconic, in its class, and it's kind of created, it has created this kind of this luxury, four by four segment that never existed before that. And it's actually evolved into that it wasn't so that they really bought into that whole, lower, it was a unique product, which is, then quite, it's quite easy to focus on how you're going to design the car, because they already knew what they liked. And they said, Please don't change it, just make it better, you know. And that that can became the motto, so don't change it just make it better. So that challenge is different if you're not working on an iconic luxury four by four, if you're if you're working on a more mainstream vehicle, which might have lots of competitors, and it's it's not as differentiated and it does become more challenging. And then I think we wouldn't even the buyer profile gets, it tends to always be quite diverse. I don't think it's, it's very easy to pinpoint one particular buyer, but you can always How do you put it, you can have an aspirational, yeah, persona that you designed towards, because it's not necessarily who the customer is, but it's who they aspire to be. So the best example I I was given was, I think, was a Ford and marketing guy. You know, and he said, look at Harley Davidson. And, you know, what, what is their image? It's, it's like rebels and you know, biker gangs. And, you know, it's kind of tough and rough. And then guys, who are their actual customers, they're, they're 50 year old businessman, you

know, who like to go and ride their Harley's on the weekend, and, you know, feel like rebels get away from from their kind of boring day to day things. So he says, you know, you don't design the Harley Davidson for 50 year old businessman, because that'd be boring. Yeah, the whole thing is they want to dream about being these these rough, you know, biker gang, guys, you know, it lets them escape the bit.

Robert Dooley 30:03
So, you know, sort of seems to be an interesting blurring of the lines, I guess, between what you might say, is design and what is marketing is

Ex Geely Design Director 30:10
and isn't there? In that sense? Yeah, but the designs should support the the David they work hand in hand, of course. And yeah, it depends how strong an image you have for your brand. So Harley's probably a very extreme one. So it's called, but it's interesting how they tucked into this. Almost the lower of the rebel. Yeah, rather, rather than this rather more generic marketing, we want to capture, you know, beautiful people who are successful in life and things like that.

Robert Dooley 30:45
Yeah, yes, yes. countries. So I guess it's interesting that the way the role design research is, and it could be described as design research is playing a different role, depending on what you're designing for, I guess, I'm think with, you know, hollywood or Landrover or Rolls Royce, where you've got quite an established brand and brand image and brand feeling an emotional relationship, your your your research is finding ways to kind of refine that, I guess, like you say, make it better define that and to maintain that, whereas perhaps in other examples, for example, with Rhino whereby we are exploring a new typology, the research is being used to to create something quite different, new, new different rather than new refinement. Does that make sense?

Ex Geely Design Director 31:34
Yes, yes, that's probably an accurate way of. Okay.

Robert Dooley 31:38
So in those in those in those consumer customer profiles, you're mentioning Sorry, sorry about this again, but you mentioned a little bit about

Unknown Speaker 31:45
the, is it fair to say those customer

Robert Dooley 31:47
profiles are mainly telling you as a designer information, in terms of, you know, what kind of aesthetics or feeling or emotion that person wants, whether they call it or is it is it too quite a lot about what they want functionally?

Ex Geely Design Director 32:03
I think from a marketing perspective, that they take it further, literally. So, you know, if you have the 32 year old lady living in Milan, they're like, Well, what does she have

in her day to day life? And, you know, you can you can have different scenarios, you know, Where would she put her handbag? I can, you know, where? So that there's functional aspects that relate to their lifestyle?

Unknown Speaker 32:31
Yeah, okay. So

Ex Geely Design Director 32:32
you, if you are given a family of four, you know, then you know, where? How would they use the car, you know, that, okay, they're going to buy an estate, because they've got the dog, and then, you know, they need to easily instal the baby seats in the back and things so it gets into more practical

solutions, of course. Yeah.

Robert Dooley 32:56
That's very interesting. So then, if you know, that took the baby, the dog, for example, is that there? Are their customer profiles that are relating to those back seats, and as well as the front seats?

Ex Geely Design Director 33:06
Yes, yes. It can be. It can be

Yeah. Okay.

Robert Dooley 33:13
Okay, pretty. Well, thanks so much. That's, that's been

really helpful. If there's anything else that you're thinking that I've missed, that would be really, really great.

Unknown Speaker 33:24
I should have asked about.

Ex Geely Design Director 33:26
Yeah, I talked about autonomy. You know, and, yeah, that that that's quite interesting. When, yeah, what happens? Is the elephant in the room? What happens to cars or even vehicles if, if you no longer need to drive them? Sure. It is obviously a question. I really enjoyed. Yeah.

Robert Dooley 33:52
What are your thoughts on that in a summary, then? What are your thoughts then? From an interior design perspective?

Ex Geely Design Director 33:58
It's, it's both live grating and frightening at the same time. Yeah.

Because it's, it's like, well, you know, you know, now you don't have to worry about, you know, ergonomics in the sense of that you're in a fixed position, necessarily, because the fixed position is given by fact, you're sitting behind the steering wheel.

But then it's also

Yeah, then you question the whole?

The whole purpose? I mean, will, will cars have the feature of their autonomous pods? You know, do you still need to own them? You know, is it then what is the profile? Are they more like Robo taxis? them? You know, or is it just a glorified train, a personal train or thing, you know, our personal taxi that just comes and picks you up? And the show, and if you'd no longer on the card, and you might have less of attachment? You know, it literally does become transport? You know, it's it's no more emotional attachment than you would getting in or out of public transport, you know, getting into the tram. Okay, man, it looks kind of nice. I like to travel in Rome or something. But yeah, not not anything more than that. It just gets you, you know, you it is a very different relationship, you would have them potentially owning your own personal vehicle. Sure, yeah. I kind of had mixed feelings about the whole, fully autonomous thing.

Robert Dooley 35:40
So do you feel them that the, there will be a need for design process to change? Do you think the design process of an interior designer in order to create sort of commercially successful autonomous vehicles wouldn't need to change the work GIFs instead, say, what do you think?

Ex Geely Design Director 35:56
Yeah, no, I would definitely need to change because it it. Yeah. And I did it also, again, there depends on the the brand's Yeah, I had Land Rover range rover update, they were actually quite confident that even if you go to full autonomy, it's actually quite, it's not too far removed from the brand values of, let's say, a Range Rover, because it's not so much about driving involvement, as it would be for Porsche or something like that, you know, Porsche be more challenging to, to sell a sports car where you're basically just a passenger. And, and the whole thrill of buying a Porsche or sports cars, that you're controlling it and you're throwing it into corners, and, you know, whereas in a Range Rover, you're actually being transported and you're gliding over very, very terrain. So it's, it actually is not that far removed from what one what one thing they said Range Rover is that you're you're more relaxed when you when you leave the card and when you got into the car. Okay, philosophy in arrangers. Yeah, it's it's like, it's, you know, it's kind of a space of well being. And it's, it's almost a wellness spa, or something, a luxury spa, where you go and just get your clothes off the hectic world outside, and you're just in your own little oasis. So that would actually not be harmed too much if you removed the steering wheel and are driving Park because it's not such a inherent part of the experience. Whereas for you, yeah, for something like a sports car, and then we worried about not worried but we were wondering what would happen to the mainstream manufacturers, you know, that Toyota's and Volkswagen world? Yeah, do they just then become suppliers to

Uber? Or, you know, did he or whoever the ride sharing or chill or mobility providers of the future?

Robert Dooley 38:16
So I'm just interested in then other any, I'm guessing you see a lot of the circle, as well, you see a lot of the autonomous concepts coming out? Are there any that have grabbed your attention for being particularly interesting, or good or bad or

Unknown Speaker 38:31
ridiculous?

Ex Geely Design Director 38:36
They're all quite similar. So that, if anything, it's, it's quite often the kind of a lounge is what I see, you know, that there's the Volvo 360, I believe, yeah. Wherever at least they got into the scenario of it, where they said this could potentially reduce air travel or something, you know, domestic air travel, because because you can get into this pulled, and you can relax and even sleep couldn't and arrived the next, you know, a few hours later, or the next morning and your destination did work a bit more on the scenario, but the actual formal design solutions were somewhat predictable. You know, it's usually kind of a lounge chair. And quite often, I think there's been some Mercedes ones, you know, they quite often have the seats facing each other. So you'd have some of the passengers travelling by air words and other ones just travelling forward. So yeah, which I, I don't know how, of there are a lot of studies being done, you know, with car sickness and to see how, how comfortable that would be to be travelling backwards in, in in a car, because it's, it's not quite comparable to an aeroplane our train, it's much bumpier, and you tend to take tighter corners and things. Yeah.

Robert Dooley 40:04
Yeah. I was that I wonder if there's a problem in your actually, okay, you're, you're freed from the needing to be a driver, a steering wheel, but actually, you're still within the confines in a fairly small box, aren't you? So I wonder, actually, there is a, that we're expecting some sort of massive revolution in in terms of its formal elements, its formal architecture, whereas Actually, it's going to be around like you saying, the more of the scenario of use, which is going to really be changing, which may not be as physically evident. As a designer as a in brackets design, it requires design change.

Ex Geely Design Director 40:43
Yes, it's it's,

it shouldn't be changed for the sake of change, I suppose. Yeah. So. But at the same time, when you when you start mentioning, like, exhibit designers, or you know, that maybe some artists that are doing some spaces and things that that's quite fascinating, what what, what would happen if you basically let the non designer or non product or car designer loose on a space like that, and I think you end up with some pretty creative solutions of what people imagine can be done in a space where

you're, while you're being moved from point A to point B. Yeah. But yeah, I'm not totally convinced that it's going to become a mobile office or something like that. So

Robert Dooley 41:35
yeah, I mean, to me, it always seems to be a real shame, and a reflection of a lack of imagination when it

always ends up being an office on wheels. So you can work more.

Ex Geely Design Director 41:43
Yeah, yes. That was one of the things that one that they're like, Oh, yeah. Well, you don't need the steering wheel, turn it into a keyboard? And like, do you really want to be sitting, you know, behind the keyboard? Or, you know, or do you what are the challenges? And why would you even want that, you know, is, but it just literally came from one of

the top bosses, you know,

so it wasn't there, there was no research into whether it was actually any desire from, from customers or potential users to use it as a mobile office? You know? I was, I guess he really missed not having a keyboard in his car, I suppose. So he insisted that he wanted to keyboard where where we used to have the steering wheel. So yeah. Yeah, it always seems like a rather naive, you kind of these 1980s or 70s concept cars for 2020 is going to look like, yeah, we're all going to have flying cars. And you know, when you have lots of computers everywhere, with, with, with big screens, and keyboards and lots of buttons, didn't realise it was going to be touchscreens in the future.

Robert Dooley 43:04
Yeah, I guess the base itself isn't a little bit that way. That's correct. Yeah.

Ex Geely Design Director 43:07
Yeah. Or a lot of the concepts we see is basically just put a gigantic TV in the car. And that's also rather, I didn't know is that really well, what you want while you're travelling is just to stare at a TV or check your stock prices? Or check your social media and what you want to do it on a gigantic TV? Or would you just use your personal mobile device to do that? You know?

Robert Dooley 43:38
Yeah, one thing that was the decision making process, then in the initial concepts to come up to to result in that sort of point to be that all this is the big TV in here.

Ex Geely Design Director 43:51
I mean, there are probably various use cases of

and maybe it's also coming from the marketing side, they, you know, they want to be seen as relevant. And, you know, we need to look like it's high tech. So what's more high tech than putting a gigantic screen in the vehicle, because that's, that's one way

to show that something is new and fresh, rather than putting, I don't know, a bookshelf there. Although I do believe there was a concept card that did have a bookshelf. I don't know which one it was maybe a Rinspeed or something. I think they always do. I think they always do some off the wall. things, you know, they do cars that turn into jet skis and stuff. But in there, there's something naive about it, but an innocent but you know, maybe that that it's actually a fresher approach. It's and it's a non traditional approach to

what we can do with that space.

Robert Dooley 44:52
Yeah, yeah. Interesting. Okay, look, I'm thinking about DocuSign. I appreciate it. I'm just gonna stop recording them.

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-06-17 SENIOR INTERIOR DESIGNER, STELLANTIS - summary

Senior Interior Designer, Stellantis discussed his background and role leading interior design at FCA Europe. He explained FCA's process for designing interiors, starting with concept definitions and moving through 3D/2D designs. Key aspects are aligning with brands' identities while finding efficiencies. Platforms aim to be flexible for different designs. Trends must respect brands' heritages. Advanced projects test new ideas without guarantees of production. Autonomy will hugely change interior design by removing driving experiences brands are built on. Robert was interested in testing a new methodology for autonomous interiors and working with FCA brands.

ii.c. Transcript

Robert Dooley 0:00
To

send you a little disclaimer just saying you have me to record that, that's okay. I'll send it to you afterwards.

Senior Interior Designer, Stellantis 0:09
Is that okay? All right, there was a lack of connexion. Can you just repeat?

Robert Dooley 0:16
Because I'm recording this call, and I work in academia, which is very, they like paperwork, I just need to send you a document afterwards, just to you to sign say that you're happy with me recording the call. Is that ok? Ok, brilliant. Thanks so much that Sorry, it's a bit of bureaucracy has to be done.

So yeah, that's kind of what I'm doing. And that's why I'm approaching interior design managers to talk to them and understand sort of the methods that they use when they're designing something, but also where that fits within sort of wider automotive product development, that sort of thing. And I wonder if just to get started, if you just have to tell me a little about yourself in your background, just because that really helps me. So put in context, what you tell me. Okay.

Senior Interior Designer, Stellantis 1:02
So my name is Senior Interior Designer, Stellantis scoping around leading the interior design department here in Europe for the FCA group.

As you may know, we have

different regions. So in the four regions, then not the region, which is North America, mainly the APAC region, which is the Asian area. Principle. We have also outcome which is the Brazilian area in May, which is mainly the European and North African area. We have design studio for each of these regions, the biggest one, and the main ones are for sure enough that I'm in Europe, with also very important studio in

in Brazil. And we also have Shanghai studio, which is mainly in doing at the nations of let's say, existing problems for for the Asian market. Sometimes you have to stay on the same competition with our project. So depending on those the workload that we having, based on this separations, division of our design studio, we also have a main task so for example, the European studio is overseeing the European brands, which is mainly a fee at the feet professional brands are from me and mosop Elantra about

me something.

And we also have

when it comes to European project, so for example, when Keith is doing the car washes, especially for European market, we are overseeing all the design for this product. Okay, my role inside of the studio is to oversee the whole design process of interior design. So I transferred her to all the brands. So now, we are working on very different products from a basic city car to commercial vehicles to luxury cars, sports cars, we have all these different brands, we have a very, very wide range of different products between our different regions, this is pro Connexions and so we are in constant interchange programmes, but also about maybe you are more interested in mythology

in order to align How we doing

design, how we do our interior. And also to find synergies between the different programmes and courses interior design, the very complex development we are trying to get, let's say share problems wherever it's possible and birth is good to our customer in order to also create synergy and efficiency for for our company.

Robert Dooley 4:19
Okay, brilliant. I'm sorry, I just watched your background before you are FDA Where were you before there sorry.

Senior Interior Designer, Stellantis 4:28
So I studied industrial design in those truth and was working in a design studio in Munich, Austria presents, can I move to a female or first period afterwards I was in the studio where I was leaving. Where I was studying is a jewellery designer coming up small projects that I went into the Advanced Design Studio of our opening escape where we did programmes like maybe you remember the Dracula, which was the concept car which lead to the 500 project? Yeah, yeah. Afterwards I was in charge of the whole exterior development of the 500 project, which was my first big car and step by step I became more responsible inside of a company so I was in charge of exterior design here and I to go with a whole brand, the brand and the three years now I'm in charge of the whole development of interior design for Europe.

Robert Dooley 5:54
Okay, brilliant. So I have to excuse the hat I've been been cycling this morning. Okay, so you did the 500 side did you work with Flavio then pretty closely

Senior Interior Designer, Stellantis 6:06
and Tony you're talking about

Unknown Speaker 6:08
he's now he's not Ferrari isn't?

Senior Interior Designer, Stellantis 6:12
There wasn't quite the separate studio because Flavio was at the time leaving the brand but the 500 project was done by the team who created the advanced project the tribunal that wasn't quite separate work that was really done by separated Studio 500 project. Of course it was in conflict interchange with Flavio but the main responsibility of the project was in the hand the programmes that really was at the time are responsible for the bus to do in afterwards. month only left and meet of the responsibility of the brand signal by virtue leader and set up with leading Nick Fury

9007 Okay,

I was a little bit we was in parallel. There was that bus design studio in the studios of lava was working in the studio while we were working in my studio and when he left

the boss of

responsibility also for the PSP.

Robert Dooley 7:31
Okay, great. Okay, yeah, I went to I don't know if you saw those the Ferrari exhibition at the Design Museum in London. Two years ago, I went to a talk, he gave the opening of that which was really interesting hearing about his process and it was interesting actually.

So establishing a design department at for

Senior Interior Designer, Stellantis 7:50
sure seen a lot of different

design studios, having also experienced a very different world I would say in interior design exterior design. And of course also now creating the Ferrari studio almost from zero because when he took over the Ferrari studio was a very very it's a small compact studio, which is a lot of external working Pininfarina with now Ferrari became more and more or less a total was studio was quite interesting process that he

had over the time.

Robert Dooley 8:30
Yeah, it's really interesting. Okay, brilliant. Well, thank you. Thanks. For summary. That's really great. Um, okay. So I wonder if to begin with, if you could summarise

your interior design process at FCA. And perhaps, if you've got an example, you can talk about if you can, if you can sort of apply it to an example. Please don't give me anything confidential. But if you've got an example you could do, but that might be really helpful to sort of apply your your process to I guess,

Senior Interior Designer, Stellantis 9:00
yes, it's a huge storey. So it's not very easy to summarise it in. Okay, I'm trying to give a little bit of an idea of what our task

when I took over the studio.

In the time when Lucy came to Europe, he was in charge of interior design in the US. So he's the head of media design.

He had the idea to create, let's say,

it trying studio before the interior design studio was separated with the brand, so the city had appeared interior studio, the alpha had the iPhone, Here's to a demographic they are the future. So three heads are separated studio. And wine in the US was already then the interior studio, one big group, which was quite different from from our reality. So to go, what is this studio, we started to create a different process, let's say where for sure, our main goal was to create synergy between the different developments and create also a strong relationship with all the different students all over the world, as I mentioned at the beginning, in this case, it was very, very important to create common process. So we speaking more or less the same language was very important that we have more or less the same time, depending a little bit on the reality of it region, having multiple, more or less the same methodology, and how to come up with interior design, in order also to have the possibility to align different projects, this became fundamental for two reasons. First of all, with the connexion between pf and Chrysler creating one big group, it was necessary to also stop sharing programmes. So greeting cards in connexion with our colleagues in not there, but also sometimes with our colleagues in the African in lockdown, which are the Brazilian of the Asian studio. So that was very important to create a common methodology and a common process, which was mainly with the goal to create the senior team. Of course, we have a very, very specific environment, we have a lot of brands. So the brands that dimension before, we also have been the American brands. So Dodge, Chrysler cries the studio, the cheap studios, 30 Studios, there is a lot of different rights that are working under the head of its EA, which is also something that we have to guarantee when we develop an interior, that it's not become blinded one into each other that we have to create. Let's say I think before for each of the studio, but it was a little bit difficult all day in the interest in talking to on the one hand side, trying to find efficiency on the other hand, grading, synergy. And all our process and our methodology was a little bit based on this two pillars to create something that on one hand side is much more, let's say compliant with what the company needs, or cost efficiency, efficiency of also timing. resources. On the other hand, creating also big benefit for our customer creating, let's say strong identities for each of our products. without mixing them together.

Okay, okay. Sorry.

Robert Dooley 13:45
Okay, so,

Unknown Speaker 13:47
when you?

Robert Dooley 13:50
Yeah, so somebody just wants to go with from that. Um, so just quickly, you mentioned the brands that you're working with? Are you working on any of the American brands like Chrysler and Jeep in Europe? Are they being dealt with in the USA?

Senior Interior Designer, Stellantis 14:02
Not really. So when it comes to brands, like Chrysler, and torch, which are brands that they have their base in America, we are just, let's say, connecting, when we have, for example, let's bring For

example, when we think for example,

fear project that has a joint platform with a crisis video, because there is a connexion, you know, whenever it comes to a specific product, for example, for for the American market, we are informed, we know what our critics are doing. But we are normally not participating. Participating in that in the design development becomes a different storey, when it comes up for template to product like cheap to be the international brand, which has their products with a spread all over the world. Today, Apple's a specific products, for example, for the Asian market specific products or for the European market. And when it comes to this development, we are stepping into this development, as we of course have the knowledge of our market, we know what are the pillars, which are needed in Europe, I know to get a achieve a successful product.

So when it comes to a

specific development for specific European cheap, then it's our task to develop and, of course, overs with a very strong Connexions with the brand in, in the US, because of course, we want to guarantee the whole war branch loss of here and move the direction of the chief brand. Isn't.

Robert Dooley 15:56
Sure. Okay, that makes sense. Um, okay, brilliant. So, one thing I'm really keen to understand is where, what does the interior design process look like? So what were your starting points? Where did it start? And where does it end? And how do you get from there? And where does that sit within the wider development of a vehicle to say, a fit model? Where would the interior design start to end? How do you how do you know when it starts, how do you know when it ends, and where does that sit within the wider development process.

Senior Interior Designer, Stellantis 16:28
Of course, there is different steps during the design process. Normally, we start to receive first concept from our product department. So first brief, where we inform what our perfect partner wants to do. So what kind of brand kind of platform what kind of customer the horizons over the course of the time when we want to launch this product in place the first this is first information, we are trying to get the approval for the overall concept of the cars of it, we are all aligned inside of the company, what we are talking about, so the engineer knows, okay, we are talking about for example, for me to car, or 2023 or 2024. A customer, I don't know, specifically for a European market or worldwide customer.

Know this kind of applications.

Describe when we have first phase where we study, we tried to figure out which is the best platform in order to achieve requests with the product department trying to get the first idea what kind of components we're using, what kind of base we are using, what are the needs for this timeframe. So kind of fun integrations of new technology, we have to create real for the specialist specific project. And of course, we have to also align what is both left and right. What's going on left and right now our companies of example, we tried to align as well and what is us doing what is Latin doing what is up doing different regions are doing not to also understand if there is a possibility be efficient, trying to use something already, which was developed in other regions. The second component is very important, especially when it comes to more innovative projects or projects that are not just the restyling of an MCA MIT cycle activity, or a project based already on an existing platform when it comes to complete your car. And when it comes to a new platform when it comes to also stepping into new technology. Before you know well, the moment that they the car market is changing drastically in the last years. With autonomous driving with electrification, which has a huge impact for the overall design design process, as well, then we also try to create a common strategy and common directions with the rest of the company. So for sure, it's possible to do developer for example, that someone was driving car only for let's say, one specific field for their product on a specific much rather product that has to be aligned with with bigger pictures. And when we also connecting in creating collaborations with partners outside of our company, you may be no more. So we have Connexions with collected companies with Google, where we try to create let's say bigger pictures for this big challenges that we are facing right now. And that is we also say integrated in the first concept brief, very, you tried to define each of this

very important

pillars, which which are very important for us as designers, in order to understand what we have to freedom, what we can do and how we can develop, become. And once we have this definition of the I would say strategic definition of the project, we also start to

stop the creativity

element. So we start to give the say, and I a picture of how these kind of concepts look like in reality, because it's very easy to write down something, but especially for the management is a very, very, to see, okay, what does that mean, in a concrete way? What, how does it look like in a concrete way. So you start to work on different concepts in early pain in order to test them, and see which one would be best for the specific brief given by the product development. So there are the first steps before you going into the complete design work when you really start to define each detail of the product. So the first step is a concept definition than trying to create a different concept of Oliver bait. And once you have selected in the main directions, you are studying to develop 3d and 2d of the final proposal of the interior.

Robert Dooley 22:12
Okay, so where are your sort of what you saw parameters, I guess, if you like that, in terms of your best customer parameters, if you've got a defined user group, if you've got if you're working on a particular brand, does that have an influence on the process that you're using for different interiors, and then also what are the sort of those company parameters as well,

Senior Interior Designer, Stellantis 22:34
it is a huge difference. Of course, between the different brands, we know exactly that our customer is completely different needs and expectations for an interior than yet customer, one Maserati customer, when it comes to commercial vehicles, for salsa, and they expect expectations are completely different. There's course something that very strong, whether the history knows that the brand is defining what the brand wants to communicate to their customer, and the what are the expectations also from from the customer, towards our cars. Of course, what we are doing in order to guarantee this, let's say, the continue team, inside of our entire city, we have chief designer for each of these brands. So we have of course an alpha chief design and massages. IVF, chief designer, and we have also established the past responsibility for for chief development that is necessary in order to guarantee let's say, I think he wishes for us, of course, very important, as I said at the beginning to two pillars of more company, basically just efficiency, sharing. And creating also a process, which aligns with the rest of the company is one side. But on the other side, the product part, the part of the customer the part of expectation what what the customers wants to see inside of a little bit, the two areas that we have to bring together as designers and try to fulfil those expectations as much as possible. Sure. Okay.

Robert Dooley 24:33
So you mentioned the word platform earlier, could you sort of define that for me?

Senior Interior Designer, Stellantis 24:37
platform? Or Yes,

Robert Dooley 24:39
yeah. Yeah, platform was a platform,

Senior Interior Designer, Stellantis 24:42

the platform is mainly the base structure of a car. So it's a little bit the base of a house

by itself

Cortana take the perimeter, how big is the house. And the goal of the platform should be be very flexible. So let's say if you have a house, you don't want to have already defined how the walls inside of the car looks like and how to separate the house inside, you create trying to create a structure that is very flexible, in order to fulfil different needs. But of course, you need these kind of platforms because they are very, very expensive to develop for a company. And you can't create the let's say a house is for Chrysler house for here the house for cheap house for our for me out for Marathi, tried to create bundled certain kind of cars together. The for sure is that based platform for smaller cars is the key segments, each segment platform and then going to pick a card where, of course you bring together a completely different cast for sure, you will never see MSRP and having the same platform, then I don't know if he had product because they are too far away. But there is a possibility to share, for example, kind of things between an alpha male and the Maasai, because there are philosophies, which are very similar. So we're talking about premium or luxury cars. We're talking about sports broadcast. Today, you try to find to create the it's a base, which could be a useful for more than one development. And that's what we call platform. Okay.

Robert Dooley 26:46
Would it be fair to say that a platform perhaps is more of an impact on how certain things made rather than how it's looked how it looks per se,

Senior Interior Designer, Stellantis 26:55
that's the goal. That's the goal.

For us, is also work to understand how to create something that is flexible enough in order to not be limited in the design expression of each brand. Of course, there are platforms which are much more rigid, where you have to share much more component. And there are more open platforms. This depending also how far the products are, it's a similar or different.

Just give you an example. If you

look at them 500 X and the Jeep Renegade, the same platform, the birds at the end look very, very different. The interior and exterior. So this is a quite good example where if you have the same base, our cars can have a very different look and feel Why of course they're our especially other car companies, they are getting more and more rigid in creating more limits to designer having more shared elements. And that is something that of course, we are evaluating based on each project. So when for example, we have a project, where we feel that the product by itself is very, very similar, we are getting more open to more willing to share things. But when it comes to projects, that has to be very strong brand identity, what customers really expect

certain kind of features, then, which we have to understand much going deep, how we can guarantee this kind of feature. what our goal is, of course, I think customers

they have,

let's see, there is an area, first you will area which is mandatory to be brand specific. So for example, you look at an imperial the see the daily view that the customer having sitting inside of a car, that has to be as much as specific as possible. When it comes to a second view. That is that saying arts which are not so recognisable, they are more able to be, let's say common between different projects, for sure. Below cooking in a lower area of the inferior, we look at the trunk area, it's not doesn't make a lot of sense to create a specific trunk and achieve specific branch trunk area. Because the needs and expectations of customers are very common between these two cars didn't have to develop a specific trying to area which we will act up different cost materials in order to get the overall looking team that has more specific expectations. But especially when it comes to functionality, certain kind of things that works works globally for more than one brand. And we don't have to reinvent the wheel. Every time we design a car

Unknown Speaker 30:27
show, okay,

Robert Dooley 30:29
I just wanted to touch on it slightly.

What kind of impact do trends and I don't, I don't just mean visual trends also sort of cultural or technological, what kind of impact they have when you are designing interior?

Senior Interior Designer, Stellantis 30:46
Sure, we started project, we are doing a lot of research and understand what's going on in the world. So friends, for a drug before for changes, instead of design,

we have to understand is

what kind of trends are, let's say, trends that are coming and going. And what are the trends that are cultural changes, because there is a big difference for us. Friends coming and going is a little bit more like fashion and fashion is very risky, especially when you're talking about cars, where we have life cycles of six, seven years, you can't base your design on fashion, because when it cars coming out maybe after two years, something is also getting out of fashion. So that is for us very important to distinguish between what is a cultural change, what is something is really a change of sigma of design, what is just a fashion neighbour update, especially, I think we have brands instead of our company, which are they have a strong heritage we have I think all of our friends, and for history, Dan for long estate development, which graded kind of expectations inside of the course. So we have also to combine these two, we are not in research, normally, of fact, then we have already a strong identity, we have to integrate with the culture changes with the identity of each of these

friends, the for sure. When it comes to Apollo strike, for example, we have to find out the rules way, which fits to the alpha brand, for example, and we have to pay the Apollo's way which feeds repeat brand. And they are very different one to each other. For sure. The more that you have brands with a strong history, the more you always have to also respect the expectations. We've come from

an example, between up

to 500 you can

start with a white paper because takes the patience of the customer. They want to see it 500 in the new 504 What is our goal, push the boundary as much as possible in order to get the most innovative approach towards the new 500 and so on. For for each chromium authority. Whatever project, there's a little bit the role of the designer, and I think there is maybe the core of the activity of design to understand, say that the philosophy of the brand and integrate with new a new ness and cultural changes in order to create the perfect fit when the car is announced on the market.

Robert Dooley 33:58
Yeah, okay. And just lastly, you obviously we've you've worked both in advance and production and manage them both. And I wonder

Senior Interior Designer, Stellantis 34:06
is, is there

Robert Dooley 34:08
a sort of change in process when you're designing something in an advanced or are you still sort of restricting yourself to platform or you kind of freed from that restriction when you are doing about so

Senior Interior Designer, Stellantis 34:21
depending where much

each that we are giving. So

for example,

after we think about how he expresses it in the best way, managing a project, of course, you have a goal, it's like the doing advanced project, just doing something, you have an expectation of the company, the company wants to test something want to develop something, want to understand something, which is, let's say a bigger change, because you want to add months for on the resigning of the car, you will do advanced project mainly on something that is it's a bigger task a bigger challenge than you want to understand. So for example, introducing a new segment into a brand, introducing a new technology in the development of the car. Understanding how far you can push a boundary, before you're losing, let's say the expectations of a very established customer that maybe has certain expectations built when it comes to car, which has a huge impact on the business of our company, you want to be

quite sure what you're doing. It's not just Okay, the first idea that came into mind to be the perfect fit between let's say, you know what the company's willing to do and what the customer expects from us. Of course, advanced projects, they have two different levels. One is them advanced project that you're doing because of cars, you showing the nozzle and water show, while also there is a very strong communication part, which is necessary to take in consideration because this kind of cost you shouldn't do public, they have also the same interests to communicate something for for the brand, or for the company itself. While I must protect video doing more internally are more, let's say state test fundamentals, I would call them like this, where you can understand, okay, what would happen when what would it look like in this kind of project where in anything quite secure environment, you can try to test something in understand if we are going in the right direction, not all at once projects at the guaranteed to be something that will have the following in production. And that's I think certainly the role of advanced project was a project to say be more free and feel the possibility and changing something and see this kind of changes worth the journey.

Robert Dooley 37:29
Pretty Okay, great. Thank you. Um, I think I'm worth the time. And that's, that's that's actually a really good point, too. So to conclude on, actually,

unless there's anything you feel like I've missed, or anything else you wanted to add

Senior Interior Designer, Stellantis 37:43
my side, I think if you have some more questions and more interest, feel free to cover it up.

Whatever you need.

Robert Dooley 37:52
Yeah, I mean, doesn't that covers everything really? That I yeah, that's sort of covered my main questions. I mean, the basically, sort of so let you know what I'm doing with this. The idea is, after this or first phase of research, I'm going to sort of come up with a new speculative kind of methodology, if you like, for designing automotive interiors for autonomy. And then the intention is to do a few

workshops, or

one to two week workshops with automotive design teams to actually test it and get their feedback and get their thoughts. Think sta and what will one of your sub brands be interested in being involved in then in about six months time, I could get back in touch with you. And we can have a chat about organising something.

Senior Interior Designer, Stellantis 38:41
I will be very curious to see

what your research will lead to. So what will be the result of your research? So whenever you have to do your work, will be very interesting to see what what are your conclusions? What is your astral project?

Robert Dooley 39:03
Yeah, so what I'm actually doing is majority of I'm bringing in methods and processes, probably from architecture, but also from exhibition design, and curation. So all kind of disciplines whereby you think about what people are doing within a space and time. Yeah, bringing methods from there that that would have open vehicle design methodology up a little bit more. So that that's that big sort of challenge, I guess of autonomy, isn't it when you've got that, that freedom of package from electric and you know, most cars are shared? So people aren't there's the ownership model is changed with the autonomy when you're not driving them what you do within that space? And how are you building that relationship between brand and customer when it's no longer based on driving experience, which actually will be really interesting for FCA given, you know, fear. And alfre may have a complete drivers brands out there I mean, in different different markets, but it's still very much a brand led

by driving experience

Senior Interior Designer, Stellantis 40:02
will be a very interesting change for Georgia, the most important change in recording sign. Since the day somebody took away divorces of we call it in Italy, the lockout 30 years. So the reporting widen the structure. You know, once you took away the horses, there was a skill, the ongoing process of designing cars in the same way, then you design it with horses. Now you taking away also the driver will be very interesting how fast cars are changing, and the overall layout and the overall design.

Change. For sure. And that's something that I

think will be stable for for white, long time. That would be an interest in driving cars, our souls in the future. So it won't. It's it's very difficult to imagine, I don't know, for example, a motorbike without the driver losing a lot of it's a

basic sense.

sports car without the driver.

Also maybe a very interesting circumstance, maybe you won't drive anymore on the street, maybe you will try anything on the track, maybe it's reducing importance. Of course, that will be waiting for change. For for mobility is huge. It will have a huge shift by taking away the need to drive.

Robert Dooley 41:50
Yeah, yeah, I think it'll be interesting to see community look at, you know, the impact of Formula One, or other racing programmes on cos schedule I I do sort of, I feel like it's going to be that kind of a relationship people will have was driving but perhaps

rather than people watching the racing that doing the racing, and that's on a track on a close road, but then, you know, you're being driven around to the track, and Everett and everywhere else, it's an interesting

Senior Interior Designer, Stellantis 42:18
field believe that as as I mentioned before, horses was not any more necessary to

to go from A to B

hundred than 30 years ago. But horses can disappear. So horses had a new role. Coming a sport becoming a leisure activity. So we're shooting for will be completely different. So maybe I don't have numbers. Of course, man, if 120 years ago, there was I don't know, four times more horses in the world, for sure in the future by autonomous driving, that will be for sure. different numbers of sports come for example, but I can imagine something that the future will prove that will be seen in need certain kinds of things, because it's something very deep inside of our body not only let's say the mobility as you go from A to B, but also to use speed to use power to use this kind of elements, which are completely disconnected with anything that is not okay, going as fast as possible and as comfortable as possible from from one point to the next point. But I think there will be a different separation of mobility and say other activities that right now are very strongly connected in the car industry.

Robert Dooley 43:58
Yeah. I think it'd be really interesting to see what happens. Okay, brilliant address. Thank you very much. Time, real pleasure to meet you and have a chat. And yeah, I'll be in touch. I'm going to stop the recording now.

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-06-19 DESIGN DIRECTOR, SAIC - summary

Design Director, SAIC and Robert Dooley discussed Design Director, SAIC's background and career in automotive design, which spanned over 20 years working at various consultancies and brands. They talked about Design Director, SAIC's current role leading the advanced design studio at MG Motor UK, and how the studio explores new ideas and technologies for interior design through concepts and virtual reality prototypes. Design Director, SAIC explained how projects are handed off from advanced design to production design in China, noting the different priorities and timelines between the two phases. They also discussed designing for both the UK and Chinese markets, and the different cultural sensitivities that must be considered.

ii.c. Transcript

Design Director, SAIC 0:02
Each night, I just send you a little

bomb to say, okay with me ask you the recorded hero sign that was interactive?

Yeah, sure. Yeah. Thanks so much.

Get started a

quick overview

of myself what I'm doing. And then absolutely good to, obviously, I've got a brief idea of your background, but just to have an.

Robert Dooley 0:29
So, I'm a graduate the Royal College. I was graduated last year. So I was that same time as Elliot I think works in your 3ds mode. Yeah.

Design Director, SAIC 0:38
Be The aim is let the spiral project.

But having a PhD funded by counting invested in call centres or part parking, parking with London was quite nice. And my PhD is looking at the future of automotive interior design, and how the design process how we changed or optimised to meet the challenges of autonomy. So that's kind of what I'm looking at the first phase this first year, what I've been doing is trying to really get a deep understanding of current automotive interior design process, and I'm particularly interested is know where that sits in wider context of production. And what are the constraints by interior design from a production point of view, obviously, across brand? It's very interesting as well, I'm also interested in that moving from advanced designer to productions, or how does design process or does it work? And how does it change between a balance and design? So yeah, I mean, if you're able to give me with your background, just to

begin with, I'll be really helpful. Again, I've got a few not like super like interrogating questions, just a few things to guide the conversation. Yeah, that's fine. That's fine number.

Yeah, so my background is I'm also a graduate

From Coventry University in 1999, so 20 years ago this year

And yeah, prior to that, I was doing I was an intern at Lotus cars for a while. So that kind of got me into car design. I mean, like every, you know, typical sort of storey drawing cars and aeroplanes and things. As a child. My dad was a an engineer, mechanical engineer, and and draughtsman. He worked for he ended up getting into computer aided design in the 80s. And then, yeah, worked for Lotus for about 1011 years. And yes, I had a, I had a kind of opportunity to go to the studio there when I was at high school and yeah, you know, within about, I don't know, a few hours. I was like, yeah, this is it. This is a so yeah, this is a pretty, pretty Kind of, yeah, interesting. kind of started things. Yeah, being 15 you know, in a in an environment like that was was was pretty stimulating. So So yeah, so that that was me, I was kind of like fixed on. That's what I wanted to do. So I just focused I put all my efforts into that and then ended up a commentary.

And

yeah, and then since then, I, I ended up working for

mainly consultancies actually around the around the Midlands, of which there were a few assignments. Yeah, doing projects for sorts of grants from obviously from, you know, from Landrover. A lot of the Korean brands were starting up time and pick sketch programmes out. So do lots of sketch programmes for Kia and Hyundai and Lexus and so forth. A lot of those clever What do you see landscape programme, I had that phrase escape the storeys, so basically that so the briefs would come in to the one we were consultancy, and so the my first consultancy was on the design, and

we might get a sketch for a particular vehicle brief.

Where they wanted, you know, a range of like 20 ideas, basically, there was more of a, I guess, at the time, you know, that was a, you know, I didn't really fully understand at the time, I'm honestly understanding now, some brands are starting out and looking to get out to the rest of the world. We're going out to design agencies, to get ideas to get different cultural backgrounds and influences about how they should develop their design. So So basically, yeah, we were just used as a result of,

you know, like sketch monkeys to,

to generate ideas, and they would take those we've never heard back, we'd never get feedback on those projects. But so, yeah, we used

a proxy for internal stimulus, I guess.

And yeah, sorry, actually, prior to that, I had done a bit of work at Codemasters. So,

games company,

I graduated, I managed to so so actually there was, there was two for one, a friend of mine, somebody who graduated the year before me. And a friend of mine who graduated the same time. We ended up working on

Colin McRae ran a game to which was,

yeah, it was pretty good fun actually learned a lot of digital techniques, which were not very prevalent time we were just getting into. You know, there wasn't really any Photoshop when I was graduating, and there wasn't really any, you know, digital kind of techniques and modelling techniques, certainly. So that was an opportunity. I've done a bit of Rhino 3d in a university. And my final project is just a bit of a sort of play. There's a few of us that pick that up. And then yeah, that sort of gave me a chance to get into Codemasters. And, yeah, we spent 11 months doing cars for the game, which is brilliant, got it together, and 3d Max and Photoshop, Illustrator, and then I took those skills back into,

you know, vehicle design, back to the consultancy, so

yeah, so that was that was good. And, yeah, spent a few years working on different brands, like I said, I was a priest for the energy rover before it sort of collapsed. I think I was always a bit more focused on interior design, around and as well, so I was actually an interior designer energy rover. And when that when that finished, I went back to another consultancy. In the Midlands, which was designed q which we did a lot of, again, automotive, but a lot of aircraft interiors, a lot of seats and bold cabins for various airlines. Which can was interesting. And then and then the site opportunity came up as something of rebuilding this company. So I've been here for 14 years. And obviously, it's been it's been a really interesting journey, you know, joining a brand new company that basically had nothing really and some

has been developing,

probably an mg, their products over a decade or so now. And

yeah, starting out with a business it was as there was a lot of opportunities, it was a lot of challenges. It really interesting as a, you know, as a designer to be able to be involved in, obviously, you know, there's opportunities to move into different areas. So again, I was originally an interior designer, then

working on exterior projects, because it was a small team.

Moving through to kind of being a kind of studio chief designer for both interior and exterior projects. And then in recent years, I'd say the last three or four years, I've been more focused on the Advanced end of things and looking at emerging technologies and innovation. So so that's been that was that's been, that's probably been a been a lot of my kind of, like, you know, second wind, if you like in terms of my career, a lot of the things that are happening in the world are incredibly stimulating and challenging for designers to think about. And mobility and, and also social trends as well, which you know, are diversifying all the time. So, so, so a lot of those things have kind of meant that we ended up focusing more into the advanced and and more into that sort of front end

thinking.

And

yeah, when I took over the studio in the middle of 2017 in the UK.

Yeah, I got the opportunity to just reshape the whole thing to make it an advanced of operation in the UK and China is the headquarters doing. They do advanced were there but they're very focused on that delivery, vehicle delivery phase, engineering feasibility, so So here we are, and then yeah, now we've got two studios. Actually, the studio in Birmingham will soon be no more actually. That will not it's not, it's not completely secret knowledge, because some days but the company's having a reorganisation in the UK. So obviously, we've had studio in London open last year. And yeah, reorganisation of the tech centre.

So, yeah, we consolidate design.

Robert Dooley 9:39
Now,

Design Director, SAIC 9:41
again, it's another chapter, you know, it's another it's quite dynamic company, and it is always like a new challenge chapter. So he's

very fresh.

Yeah, okay.

Okay, brilliant. That's really yeah, that's really great. Thank you. contextualise everything. Um, so I guess, I wonder if you can, perhaps, within the context of science in London, what you're doing there, obviously, acknowledging that the wider action design programme happening here in China? Yeah. Can you sort of describe for me? What is that? for interior interior design? Steve, is that similar? Also? What is the process you go through? When you're designing an interior in advance to psychic? What are the steps when? Where do you end? And how do you sort of measure completion? And where does that fit within the wider development process of the vehicle as a whole package? or product?

Okay, I mean, I think it's probably I mean, in the, in the circumstance, where we are, we've been really doing advanced design, or,

you know, focus on doing Advanced Design back two years prior to that we were doing production work as well. So we're taking things from idea. So similar kind of strategy and research with 232 fact, what would have been a surface, sorry, the final

and first release of the final engineering kind of surface director. So that's slowly been reducing, as we've been doing stuff here.

I mean, further forward in the process,

I think we have

asked you, we were doing projects to take an advanced project for an interior

project.

We have an advanced studio, we know we're looking for

things that are new things that are kind of answering questions that maybe aren't necessarily always being asked in the business in the day to day business, because it's, you know, the very far in the process is about selling cars to people making money and, you know, making a successful business. So I think, from a vast design point of view, we need to be spotting trends and thinking about what are the next opportunities for the business. I think interiors are obviously a really interesting area, as we kind of, a lot of technologies are emerging.

And the, the process, if you're

still, it's still broadly the same as it always was, you know, if we've got an idea, and comes from an idea, you know, comes from something, you know, some some moment of inspiration and

some, some reaction in the brain or hapa, this brain as it says,

this is, you know, joins these dots and says that, that would be an interesting thing to take a look at.

So we would start by,

typically, I would start by myself saying, what I think this thing should be, and then designers would then take that, try and expand on those ideas. And, in the case of the advanced, recent advanced project we did on a material was, yeah, basic idea for self about products, which I know feeling about how it relates to the brand, and where some, some trends are going. But each of the areas, so the interior designers, colour materials, and the UX, and UI designers are working very closely together

around that, please add lots of layers to it make it much more, you know, much more interesting than my own idea, that's my very basic remit to the team is,

you know, they have to

have to bring back to me a better idea that I've got in my own head, which is always difficult to see to,

to put out a but some, yeah, it's to

kind of dig a bit deeper in terms of some of those trends and things that are happening, because they've got the time and the space to dedicate challenge souls in those areas. So

the interior

work was, was developed, and it was based around, so we stopped, we based around a package, but it was quite loose, obviously, ergonomics on interiors, you know, you people are people, people, you know, ergonomics are not going to change massively. So still have to fit people and be comfortable, doing be usable. So in terms of that aspect, from an advanced point of view, the layout of a car

still has to function properly,

controls still have to be in the same, you know, in places where

people are familiar and comfortable with.

That mean, you do

have a

platform in mind.

Not necessarily a platform, I think it's just to say, you know, an interior is based around a person, really, so it's, so in terms of the packages that come You know, it's got to come from the person foremost, obviously, it helps if there's a bit of package information to be able to set some criteria in terms of certain fixed points, you know, but generally speaking, they will come around from the positioning of, of the driver or the or the other occupants. And I don't think that really changes from today's environment where people are sat in front of a steering wheel, to the future where it's mobility, you still got to be able to get in if sorry, autonomy, you still got to be able to get in and outside of the car and use controls, has reached out says there's attributes that make things either comfortable or not comfortable, or completely usable, or, or not. So. So some of those things are kind of relatively fixed. Okay,

yeah, we have those on Monday morning at five past eight. So

there's a good stuff.

So yeah, so sorry, obviously,

obviously, this is a big topics I'm trying to I'm trying.

I'm trying to sort of get some sort of specific bits for you. But um, yeah, so we, I think one of the key changes we've made recently is, I think it's an advanced studio, because we're not following a dedicated production programme, it gives us a little bit more scope to try things out, test things out terms of. So say, for example, you know, we've introduced VR into our processes a lot more over the past 18 months. So VR, for us is still an internal design tool. It's not yet a tool that we use with our

management. But

it's a tool that really, you know,

it does, it does, it adds another layer, it doesn't take away from, you know, mobile or another experience, design process, or sketch really, is just another tool to be able to make a decision or to take a judgement. So,

so again, in terms of testing, ergonomics, testing

it out and actually feels useful, because we can make some quick judge,

we might, previously we might take sketch. So yeah, that's tonight, today. So let's start some data. We make the data and then we mill mobile, and we fit the model and say, actually, this is all in the wrong place, this needs to move and these volumes are wrong. You know, this is the section three. It's not, you know, it's not right. And actually, VR allows those, those kind of judgments to be made a little bit sooner, so we can get the data into an environment where I can sit down, and actually, more importantly, the designers can sit down and actually see if so, so. So they're learning a lot more from the VR process

by

getting inside the data earlier, and then

by the time we, you know, we might do three or four loops in VR, before we get to them.

I think that's been a big shift recently, in terms of the process, talk about the process. That's one area where I think that a big advantage

maybe in bringing empathy into the process,

rather than being a purely visual exercise, whereby,

yeah, because I think I think that's the point, you know, I think with with interiors, I think, you know, car design in general, obviously, it's it is a it is a it hasn't been a fairly traditional process for quite a while. And it's always difficult to get, get yourself inside the car, you know, quickly enough. And I think VR does allow that, like you say, it does allow the designer to appreciate what they've done a bit more, the little bit more urgency than maybe when when you'd have to wait for a model, and then even then it's all in place. So you can't really appreciate the kind of the breakup of all the colour and material and texture that goes into an interior in particular,

as I saw it, that I think that's actually the difference with the next year in interior project is,

you know, the medium has been the same, we develop Klay models, for exteriors, we've developed a models for interiors, but the the added layers of definition and texture that come from coloured materials, that adds to the overall design, you know, generally quite far down the process, whereas VR, definitely code starts to bring that in a lot sooner. So you start to get a real feel for what, where we're going and what's the target with this? And actually, are we making some? Are we making some good decisions right now? Or are we going down the wrong? the wrong path? So yeah, so those kind of things have been good. I think, because we're doing that advanced scenario, we can test those kind of processes before they become integrated into more kind of regular working practices. So there's less risk to the programme, because we're ahead of the delivery, or track. So that's what

I mean. I'm ready to talk to you about because when I was at the Royal we actually did a project with Sonic. And I didn't really realise that that had been switched to advanced as well. So it's interesting. You're you're working in a studio, where you're balancing, like you said earlier, and the organisation that could do things very quickly can change very quickly. Yes. Unlike a lot of studios in that way. Right. I know. We're positioning whereby you've got heritage, from a design perspective in terms of the MTV brand. Yeah. And then other brands, which Redis be new in comparison. Yeah. Yeah. And I wonder if,

how, how is that

shift to as that ship to advance? And that, and that's all those two different needs change the process to something you experienced in another company you worked at previously? For example?

Yeah, I mean, I think

I think the shift to happen, I think it's fairly typical that a lot of studio, a lot of organisations have advanced studios, to be able to find spaces to explore different creative solutions that are not so close to the wider system. So I think that the the agility of an advanced studio is really its key asset, its ability to think differently to react differently to be in a be in a completely different environment. So obviously, we're in you know, sat here looking outside the window, Malebo roads, you know, with just traffic all day long, or is it was quite interesting backdrop. And, yeah, to be

able to kind of be in different environments, obviously, you know, Shanghai is, again is another, you know, we have, we have a good advantage that we can go over to Shanghai and get a feel for it, and absorb some of that culture of our colleagues, and then come back to UK and look at it this perspective and kind of bring those things together. So it's interesting in the context of the two brands that we've got, like sale on site, but the very process of heritage of empty, which is 95 years old. And, you know, it's known for certain things, and then probably on the other side, which is a china only brand, you know, just focused on the China market very much focused on technology and quality and value for money. So, yeah, how do we, you know, how do we balance that, that that's what we get to explore, you know, we can we can explore that kind of those kind of questions without being focused on delivery. Because I think once you start trying to do that in a delivery programme, it becomes quite difficult to to achieve, because you just don't have the luxury of time to explore different ways of thinking and different ideas. So much. So.

Yeah, I mean, this is it. So what is it?

Robert Dooley 23:07
What is it like you're designing

Design Director, SAIC 23:09
company for the for global market for London studio, but also for a Chinese market? Yeah. I wanted you to explain to me a little about what's that? Like? What's the personalised coaching sensitivities you need to be aware of? And how, how do you do that effective design? When a you're not from there and be you're, you're distant? Although, obviously there, have you? How do you deal with that?

Well, you know, it's a very good question. I think in the end, it's, in all honesty, it's still a learning process. Because China, I mean, China, if you take China, for example, it's moving so quickly, the car market there is, is, you know, is it, I mean, the mainstream car market is probably 1015 years old, the best. And I'm talking mainstream, you know, where most families and most households have a car, that that really wasn't the situation 2025 years ago in China, so the market is boomed. And the country has developed a huge, huge amount in that time. So it's constantly changing. And to keep up with that, from, from an external perspective, is extremely challenging, is actually quite challenging. Internally, China, in all honesty, it's because it's a big country covers a lot of ground. You know, there's a lot of regions, the cover a lot of geography of the world. So, so tastes are different within China as well. So it's not, it's not a one kind of shape

thing, or one answer fits all.

Unknown Speaker 24:42
We,

Design Director, SAIC 24:44
you know, we have, I think, student year of being a student here,

for a start, we've got a very international team, actually, from across Europe and further afield. We have designers from the China studio, based in our team, pretty much all the, you know, there's always somebody here at any one time throughout the year, so. So we have a bit of an exchange, and we've got designers in Shanghai working on projects. So if things get successful, we we go over to we send people over to, you know, to continue those projects or to transfer them. So we've got two designers there at the moment. And whilst this is happening, of course, there's a, you know, the whether whether it's conscious or subconscious as an exchange of understanding and,

and awareness, from taste,

and environmental trends, and so forth. And obviously, there's the advantage of working with your peers, who are from different parts of the world. So. So there's some of the things that we need to be. It's how we access the information. In terms of what is different. I think that, you know, that there's a lot there's different. A big, big topic. Yeah, I think we were talking about this earlier today that,

you know, there's established norms in the West, which are very established, you know, they've been been going for decades, and people are maybe,

you know, the innovation and the development is there without doubt, you know, it comes it's, it's about quality and refinement, and making the best of the best in China. Quality is there, but actually, it's about what's, what's the new thing, you know, because everything's new, everything is new, nothing is really an established norm. Even car ownership, getting around by cars is still quite novel for lots of people. So, so some of those things mean that, you know, things like technologies and sharing economy and other other aspects, more nor China for people just to pick up and say, Yeah, why not? It's just, it's acceptable from from tomorrow, this is normal, you know, having a big 12 inch screen in the car is like, Yeah, why not? You know, why would be a 12 inch screen in the car, because all all cars have always had touch screens. And whereas in the West opposites, we're not used to that kind of technology in our vehicles. So it's a slower acceptance rate. But I think attitudes definitely changing and things are becoming more global. And there's much more awareness of different trends around the world. So some of those things do start to align. But I think just the speed at which it

it moves in China, and it gets accepted as much faster than it is in the West.

Yeah.

Thank you.

Just to round off,

you mentioned your second handing over production teams in China.

Tell me a bit

about that process. And what

how do you hand over? And how, how does things feed into production? I guess? And also, where the what are the parameters that then emerged? When do you then start designing for production vehicle? And how do you go into the design process?

Yeah. Okay. So um,

yeah, basically, the so there are there is, I guess there are several different scenarios that could happen, are real, you know, our real target is an advanced studio is to, is to shift the you know, is to shift the bar a little bit in business. So basically, add ideas actually create a bit of an impact and offering something new and fresh and relevant. And there will be, you know, in any kind of innovation process, or creative process, there's going to be things that it's going to be hits, hits and misses, basically, there's going to be things that stick, there's gonna be things that just not right, it might not be right, because we've maybe not quite got the answer, right. Actually, if, if we are doing our job correctly, they won't be right, because they're too far ahead of the curve, if we're properly advanced, and actually, the timing probably just isn't right. So. So, you know, some things will be more of a slow burning process, because we, you know, we are trying to get further ahead. So for it to become accepted, and be ready for production, then actually, it'll take time for those things to happen. So. So there is an aspect of that. Typically, in previous projects, we've, you know, hand over processes, basically, I try to, yeah, there's lots of different ways. So we can, normally we would do up to a model final with, we capture that data, and the data would be done to a level of feasibility, where it's maybe not working directly with the suppliers at that point. That's the difference. When you're into that production part, for here phase of the project, you've really got to work, you've got to know your suppliers, to be able to go through the detail about, you know, moving things around be feasible for their processes, and how they go about manufacturing of those components. So whereas obviously, we don't deal with that so much, we rely on the internal engineering intelligence to basically say, to make some judgement about what's possible. And a lot of the time, obviously, we're asking questions, can we do this? Can we do that we're not, we don't want to do the same as we did been doing for the past five or six times we want, we want to do this differently. So that we need to get some answers. Sometimes that calls the internal design, internal engineering, also could reach out to consult with, you know, supply basis to say, Is this possible? Is this a technology that maybe a supplier is thinking about implementing at some point in the future?

And

yeah, taking guidance on that kind of thing. So yeah, so we would hand over previously, which typically handover you know, a complete data set, which which has every component has a level of feasibility behind everything. That is more, that's more the sort of crossover between the advance and the production. So I think now, when we're in fully advance really what our objective is to put things on the table,

which are inspiring. And they may be not, not that it's not the solution you're going to see on the road, probably. But certainly, you should be able to trace it back to

where

the idea came from. Last year, so

yeah, sure.

Okay. And I think there's production differences really accepted, or it's the minute in terms of the, the,

you know, the, the quality of

the information has to be ready for, you know, engineering to sign off and for the supplier to pick it up and say, Yep, we can make that exactly as you've described in the in the drawing of the data, there's going to be no change to it. So.

And

I think what we've seen in recent years is that process because there's more, there's more scrutiny is more, it's more quality in the early phases of the design process, which mean that end phase can be shorter. Because actually, ultimately, what we want to do is get our designs as close to launch as possible. So there is fresh and as relevant as they possibly can be. Obviously, if we finish a, we finish it design projects, proposal, and it's engineering ready, and then it takes, I don't know, 18 months, two years to actually reach the market, and there's a very good chance that in those two years, things would have moved on or, or, or a competitor could have come in and done something similar or, you know, particular design trend. You know, may may may have kind of become a bit dated or somebody, somebody who's done a you know, very similar, followed a very similar path. So you want to really want to get the design release of the design as close to the finalised as close to the launch date as possible. So,

okay.

That's a that's an interesting

point to conclude on that.

It is anything you feel like I've missed them, please let me I'm worth the time. And let me 330.

So once again,

I missed out in our see you.

Yeah, Venus. Yeah. So there's always a lot to talk about around these topics. Yeah. I think they're probably the I guess the we haven't really talked about the sort of, you know, in terms of, I think one of your points of the start was about autonomy, for example, and how that might affect design in the future. But I think some of that comes back to the point on empathy and being able to, I think, you know, designers, obviously, imagine lots of things and create things of, you know, nothing, you know, we've all got sketchbooks, and we'll sit there in meetings, doodling cars and things. I think, you know, the world of autonomy is quite new, and it warrants a level of, you know, venturing into the unknown.

And yeah,

the empathy aspect of hat, you know, getting some experience in that is quite difficult. It's good, it's difficult to sort of get into it and experience it to then say, Well, actually, this is what's good about it, this is what's bad about it, this is what we need to fix, you know, this is these are the problems that we need to address. So. So I think there are some there are some big question marks, I think, from an interior point of view that does put more emphasis on the interior when people aren't obviously, using cars for the same purpose, if we're not driving our cars, and we're sitting around doing other activities. And sure, we have to think about interior layouts and the, you know, materials, the ambience, I think the opportunities are much more broad, obviously, I think we probably skim the surface in terms of ideas at the moment. But yeah, maybe that's where things like VR come in terms of offering those opportunities to get into those kind of spaces. We are we have got to think about how we, how we get more empathy for the designers to understand what those problems and those experiences.

We hear a lot. We hear a lot about user experience.

Which probably I think it's become a buzzword. It's

always been you know, it's always been a nice user experience is just about what you know what emotions, what what kind of emotions you try what kind of things the experiences you trying to deliver in your particular product or service. And it's become a real buzzword now, because there's so much complexity around car. That means that actually there are multiple facets to the overall experience that make it much more of a recognised skill set that needs to be present in the design team. So So that's something that we've we've been developing over the past two or three years.

User Experience kind of areas.

Interesting. Okay.

Excellent. I'm going to stop the recording now.

You shoot off

that's pretty intense.

Appendix ii – Interview transcription and summaries

ii.c. 2019-06-26 UX DESIGN MANAGER, BENTLEY - summary

Robert and UX Design Manager, Bentley discussed Robert's PhD research on developing a new design process for autonomous vehicles. Some key points discussed:
- Current vehicle design is constrained by production models and a focus on the driver
- Robert wants to apply methods from architecture and other fields to create a new methodology
- Discrete construction using single block elements could enable flexibility and escape production constraints
- They discussed applying this approach to Bentley and having different brands collaborate on exhibition projects to test the new methodology.

ii.c. Transcript

UX Design Manager, Bentley 0:00
It's gonna change.

Unknown Speaker 0:04
Yeah. So into design becomes much more functionally based

UX Design Manager, Bentley 0:10
going forward because of that seamless interaction. So influences a lot of what designers will work with, but with the freedoms that are getting in other technological advances, you know, curved screens and a lot less space taken up by what we're computers now, microchips, and it's a very disruptive time, a lot, people aren't really engaging with it, because they're still designing the same shapes and forms. But actually, they should be pushing forward. And what's great about UX Design Manager, Bentley, is he's he's very engaged in the technology advancement, so he's always looking and pushing the boundaries with how you might do differently. things he did. God can use them. Sure. Okay. So

Robert Dooley 0:58
that's like that. So

My interests, it's my interest. It's and currently at the moment, first off, how wide that's that could be a massive scope. Yeah, it's gonna go pretty wide. But I mean, I don't want to prejudice anything you might say now. So I've got offers on radio to have Thomas, talk to us about that. But basically what I'm looking at is my PhD is looking at automotive interior design process and how it's going to need to change adapt to meet the challenges of autonomy.

The first year is trying to get a benchmark and an understanding of current process. I got

Unknown Speaker 1:30
this wrong. I thought you were chatting factories? No.

Unknown Speaker 1:33
Okay. And we like the RCA. Okay.

Unknown Speaker 1:39
Sorry about that.

Robert Dooley 1:40
So I'm a graduate of the Royal College last year and now not doing a PhD.

Unknown Speaker 1:46
And that was the mobility.

Robert Dooley 1:48
I was the last year vehicle design. Yeah. Which is now ability. Yeah.

Unknown Speaker 1:51
Okay. Understood. Cool. So wipe out of your memory, everything I was talking on the way

UX Design Manager, Bentley 1:56
That's right.

I thought it was more work used? Yes. Good. We're on the same page

Robert Dooley 2:03
for me and UX Design Manager, Bentley met the show.

Unknown Speaker 2:06
You don't need me, man. I'm happy. I

UX Design Manager, Bentley 2:09
didn't didn't talk to. Yeah.

There was a lot in common and a lot to talk about. Yeah.

So yeah, you want to

interesting students.

Robert Dooley 2:28
But so the first year who's ready to try to understand Carlotta website process, because it's not actually that much literature on it. There's not much written about characters go to thought process, terrific. You don't want to know anything.

UX Design Manager, Bentley 2:39

I treat I think of it to stay. Okay. It's everything that you learn on how to be creative in in college is not what people do anyway. I can talk about this. Great.

Robert Dooley 2:55
If you could, if you're able to then just to summarise or talk about the sort of the interior design process? And I

UX Design Manager, Bentley 3:02
don't I

think it's I think it's almost I think the future is to not think of interior exterior users. Yeah, I think the future is to think about, think about it holistically, have a process that allows you to think about it holistically, and an organic process as opposed to a linear process that chops it into blocks and thinks about it in power in linearly. So yeah, I think even calling interior should be more.

Robert Dooley 3:34
Yeah. Yeah. That makes sense. But I wonder if you can see how things a character have been that I want to be able to give an example of that. So talk me through that process.

UX Design Manager, Bentley 3:45
to negative Yeah.

Yes, I can tell you

Robert Dooley 3:53
that you can apply it to that would be

UX Design Manager, Bentley 3:54
Yeah, so I think you're, you're actually talking about the in automation. So my backgrounds product design, before I went into automotive.

So

in automotive, you're almost talking about the transition between a styling department moving into a design and user experience department. And in a styling department.

They take inputs from they take technical inputs,

from will based segment to ergonomic input, different technical inputs, and they create a covering over that, too. It sounds terrible, but to make the previous model obsolete, and make a different product, not necessarily a better product. This is very much a styling is a fashion statement almost.

But in a

I think there's a reorientation of the role of design in automotive, from a department that decorates if you like to department that has the central empathy with the way customers feel, you the way objects make them feel and the way that they use objects around them. And this is going to require a complete, different approach. So the car industry is very much is the scale is huge. So it's not designing a toothbrush and a product design company. It's a huge complex, probably one of the most complex products. So the way

hundred years ago, cars were invented, they

haven't changed a lot.

They came up with a formula, which was the car. And these were pioneers, the origins of Bentley, these were amazing, passionate pioneers, pushing the boundaries are driven by not driven by business cases, just driven by the love of doing it. And we've always got to go back to that mindset. Hundred Years later, because the last hundred years has been the motor vehicle came into into society. And and the business people took over, there's a formula there to make money. And then we've just been the company structure, the creative process, the design department being part of that is a process to repeat over and over again, which and it cuts the process into lots of blocks, it throws, it creates a linear process that throws down the chain of blocks. And over over year on year on year, they they improve the efficiency, they make the metal thinner, they can we can still achieve the same. So it becomes analytical about improving the process. But basically it's repeating the whole organisation processes. structure is, is around repeating the same thing, which is the absolute opposite of innovation. So when now in an area era of disruption, and panic about new technologies and self driving cars and connected cars, the industry is panicking. And it kind of knows it needs to innovate its way out of this. But it actually hasn't got the toolset. It's actually spent the last 50 years honing approach is that with the opposite of innovation,

Robert Dooley 8:03
okay, I think you touched me to stay there. So we want to push you on. What are the sort of parameters when you're designing an interior that you're designing within and perhaps within the context of Bentley, what impact does that mean being part of a wider group might be w what impact that have on your design process here at Burnley? This?

UX Design Manager, Bentley 8:24
There's pluses and minuses.

Obviously, being in the key for brands in the VW Group is to play to the strengths of being part of a big group, but also have the have the ability to say, to tap into the strengths of being independent as well. And not confusing the two, because there's a lot of confusion. So obviously, you're tapping, tapping being part of the Volkswagen Group, you're tapping into a huge research and development machine, we with global capacity, if they want to, if they want to buy, buy a new technology, they can buy the company and then they can share it amongst the brand. Family probably, as

a peripheral brand probably couldn't exist without the IP and innovation and technologies that can be developed through a larger organisation.

Speaker 1 9:24
Not in the conventional sense. But we see brands of the same size, are adapting their business model. So that's the Martin, part of a large group, but they're engaging in collaborations with larger technology suppliers. So

Unknown Speaker 9:40
you could argue that could be a more cost effective way of doing things.

Unknown Speaker 9:45
But the longevity of it is yet to be seen. Okay.

UX Design Manager, Bentley 9:50
Yeah, and it but ultimately,

Bentley needs to do express itself completely differently in it. Again, going back to what I was saying before. Previously, historically, we've taken group components we've taken I always say we've taken a gear lever from an Audi, we put it in a Bentley, we put leather on it. And we've said that's the Bentley experience. And in the past, Bentley has been defined by the, by the physical craftsmanship on the car, other cars didn't put that leather in other cars didn't pay that much attention to word. But over the recent years, they have been and

bent the needs to

change that that styling approach. Because ultimately, that isn't about the experience for selecting drive. That's an Audi experience. That will bend the and you could you can translate that digitally. So if we take an interface from an Audi, and we put it in a Bentley, and we change the colour of the font, it that is not a Bentley experience.

Speaker 1 10:59
So just to add to that, the Amazon platform is not the same as the Integra platform. It's not the same as the new GT GCC employees. But if we had a view, before we start doing all those, which was we need one Bentley experience and we're going to invest in it. And we didn't do the rework, we wouldn't have three different jobs, of course, those bitcoins will have one with adaptive electronics between them. So that's where we have to evolve, to be doing our own jewellery items, which bring a greater experience than just, you know, repackaging somebody else's.

UX Design Manager, Bentley 11:33
So in the shift from mechanical mechanically, it was a linkage going to the gearbox in the liberation of the design and the electronic revolution. And now beyond that, we've actually, as design department, we've not we've not evolved, because that's just a switch that goes to electronics, that changes the gear, yet, we're still replicating. So it's about tapping in it's about understanding those opportunities to create unique brand. experience.

Robert Dooley 12:11
So how do you think what, is there an impact, then? What is the impact of trends, and that's where things fit within the design process, took about it as a linear kind of thing, which moves along each year. And that's in terms of a technical limitation parameters, pullback trends, where do they fit within that model?

UX Design Manager, Bentley 12:28
So as a styling department, you don't

you don't do

a shame to say that we we don't do any trend research, we don't do any customer research, we don't do any design research, which is the fundamentals of any design exercise, you don't sit in a white box and look at a white bit of paper, you understand you have to ask why. And everything you're doing, and you have to go into

feed of inspiration,

Speaker 1 13:03
I think, are just starting to do some research we don't do is continuous process, which is what we should be doing. Because then you see our trends start a winner, you see them

UX Design Manager, Bentley 13:15
disagree as a company. So

Unknown Speaker 13:17
we're looking through portals that we now again,

UX Design Manager, Bentley 13:19
yes, marketing, drive a lot of market research, trend research. But again, traditionally, because they sit in a silo and design sits in another silo that there isn't a good link between so company wise, there is an element of research is kind of connected,

Speaker 1 13:41
punctuated by the process we have to go through. So there's emergent product emergence process called Pep, and at the start of that, and needs to be some research, which inspires us all. Yeah, but we only see it usually late and these car programmes take four years. So depends on how many car programmes we've got coming through as to how many times we look through the board isn't an ongoing piece of work, I did implement something in my previous role, looking into design and trends, affected it and report that to

Unknown Speaker 14:13
the board.

Robert Dooley 14:17
I'm so

what then is the the spoken sort of more, I would say perhaps the production design perspective. So what is the role of the advanced design department here at Bentley? And how do you feed from that into production?

Unknown Speaker 14:37
Is there an advanced design? Hello,

UX Design Manager, Bentley 14:39
God, why do you need Okay, so if you run a styling department, why do you need an advanced design department? So the I would say negative that the whole culture of the previous automotive classic culture is reactionary. So we sit, we do a production programme. We sit and wait to get the next programme come from group and then we decorate it. Why would you need advanced design? So, I mean, that's why that's why I came to the end to be honest, because I totally believe that in a strategic approach where you you put a compass on where you're putting your investment to define the brand in the future. And that's there's the design decision making. Otherwise, how do you steer the design set decision making? If it's styling, you just get 50? sketches? You put them on the wall, and you asked for a consensus of opinion? And then the CEO says I like that one. And then you make it into a car. Do you

Unknown Speaker 15:50
have led to the demo? I can see if I don't know if I'm otherwise. Yeah, cool. Thanks.

UX Design Manager, Bentley 16:00
And life

Robert Dooley 16:01
is a busy busy. Week.

UX Design Manager, Bentley 16:08
Yeah, how is this? Is this the sort of thing this is useful?

I'm afraid that I am.

I think be being a designer is about being honest. I'm afraid I'm brutally honest. It's good.

Robert Dooley 16:23
So you don't have a problem here about me? You say?

UX Design Manager, Bentley 16:28
Yes. Now. So?

Yes, there is. So it is evolving, you're coming at a point and asking these questions. Literally in the middle of the flux of of a track of the trend of transition within the so there there is, and we're almost the exterior team is going to split into advanced activities and production activities. Interior will should be the same.

Robert Dooley 17:08
So that's how you want it to be how it is

UX Design Manager, Bentley 17:10
no, it is how it is. So there is so within the structure there is advanced exterior manager and there is a production exterior manager and above that is head of exterior. It's it's not quite as clear on interior, but it in effect, it should be like that, and user experience. So I

took me but

basically, I came into Bentley created my own role around innovation that didn't exist before, which cross the boundaries of colour and materials exterior and interior, which was very awkward, because it does, it's hard to put me in a box. And now last year, they asked me to set up what they want to call the user experience, part of design, and very much that fits around the previous innovation package. So it's very much UX and innovation team. And and really that's that's really to be the glue not only between interior exterior materials, but the glue across the whole organisation that to website design, app design connected car feature luxury services, and, you know, future mobility tactics.

Robert Dooley 18:40
So how are you sitting? How's that that role than sitting across the production schedule, if you like? Because sounds really think about who different points show your chart, but

UX Design Manager, Bentley 18:48
I think so

we have absolutely deliberately put all of our efforts, I'd say 95% of my of our effort as a new, new growing innovation and UX team is this to work in pre development on developing strategies, showing how we can execute using new technologies, something unique in the market as Bentley experience based around our core Bentley brand values, and front loading those strategies into production programmes. So that during the production programme, we can have that compass on where we're going, we can understand what is important what to cherish through that production programme. Because without it, there is no point in US engaging in the production programme meetings where you've got accountants, engineers feasibility, and there's no compass in the room, and it's just the loudest voice. So it's a waste of our time to engage in the now. And it's much better to invest in the next generation products, where we can have very clear conversations in those production meetings. So there's a very new element of design, this is this is 90, you know, least 90% of the effort is strategic based. Okay.

Um, and you'll see this,

you see a lot of this. So a lot. So

you see a lot of this work that next month, in the concept that will be shown to celebrate hundred years of Bentley. And it's really a vision of why Bentley will be relevant for the next hundred years, which is built around

not just talking about

pods that drive you around, then you can go to sleep in and you can look at a huge TV, monitor and go on the internet, but about how you can still celebrate the journey. And how you can use the car intelligence is not to just create this solace mobility system, but to actually enhance the human experience of celebrating the journey.

Tell me when I'm going off topic.

Robert Dooley 21:38
Okay, I just for me, it'd be really helpful if we could just go back to the things we've mentioned briefly about platforms, we have to be interested in these platforms. And I'm really interested to hear if you got any examples from the recent production vehicle, just a few recent or, you know, come up here last five to 10 years, the production vehicle and how that where perhaps that vehicle where his platform came from, and the impact that platform using the platform had on on the on the design decisions made. So how that if that platform has on and if so how it's dictated any sort of requirement parameters rather on the design.

UX Design Manager, Bentley 22:20
Yeah, the platform,

the platform, so predominantly, well. Up until now, we very much share platforms with group. So

Robert Dooley 22:34
by group to me and PwC.

UX Design Manager, Bentley 22:37
Know, more in the last year or two. Actually, since diesel gate, there's been a restructuring within the Volkswagen Group. So now we are part of the premium group within within, within bent the group as a whole. So it's Porsche. It's Audi, Porsche, and B, Getty, and Ben. So reshare. And we, we share Allium portion platforms. So it in some ways, it totally dominates the space that occupants, you know, it dominates the volumes and environment within the cabin, but in in other ways. It creates the design boundaries around which you can work and it's it, you can very successfully create a very different looking product from the same platform.

Within those boundaries,

I think what's become more important is less the less of the physical platforms, but more the electronic and electrical architecture. The team dictate the way we actually interface and use the car and what the car can do.

Robert Dooley 24:07
Could you explain a little more about how that's

UX Design Manager, Bentley 24:10
Yes, so

you can the same, the same scenario is taking a gear lever from an Audi and putting it in a Bentley and putting leather on it and calling that event experience. We if you take an interface from from an Audi, and you put it in a screen in a Bentley and you it's a lot harder to disguise that then creating an exterior press metal visual differentiation, you basically get out of an Audi into you can. So to create a brand experience this architecture is in fact, the whole group is is this is a massive question that is currently in flux in group about the future of cars future mobility, what the future customer needs are, I believe the group should be as part of the generation of next, electrical architectures, they should be creating enablers for the brands to express themselves in different ways. So creating envelopes that the brands can take away and be creative around, what they're doing at the moment is creating one one size fits all and creatively to

Robert Dooley 25:47
boardroom by an envelope, what would

UX Design Manager, Bentley 25:49
so

it it costs multi million pounds to create. So an envelope is is the flexibility to create a unique branding brand experience in the car brand interface. So

Robert Dooley 26:07
we're talking about user interface. So a digital user interface on the screen here.

UX Design Manager, Bentley 26:11
Yes, but also the level of connectivity, if you're if you're using the, in the future, the car will be a lot more part of a digital network. And if your brand is around the luxury network, you need the flexibility to plug things into that. And if you haven't got that flexibility, so I mean, it's the car world works in four year cycles are from product development. It you bought you buy a car, at the end of that, and the longer you own it, the more it's deteriorated, it gets worse and worse. But we're used to products, we buy a product and it starts to learn our behaviours and it gets better the more we use it. And the cycles of reading fresh are not for years, they're there for months, four weeks, we as consumers are expecting this sort of enhancement from from the things we use we expect them this respect to listen to music in the house and then listen to music same song in the car. And that's that's the envelope that we're it's

being forced on every brand and we're we're we need a creative, bigger creative envelope to express the brand in a in a in a better way that goes beyond an exterior styling surface.

Robert Dooley 27:45
Okay, so what So you said the envelope is restricting you how's the envelope restricting you from delivering those those new experiences

UX Design Manager, Bentley 27:57
because

that the car is locked in the car, basically those architectures to start from scratch and for a company like Bentley to create its own electronic architectures costs, huge amount of millions. So there's an element of the deep programming that is involved in that, that that probably should be done centrally. But the bit the brand experience, there's a level of expertise that sits on the top layer of that, that is currently done centrally within group, but needs to be liberated into the brands to and we need to employ a new generation of digital experts, craftsmen, gamers, expertise that we currently don't have to decentralise that brand, that element that sits on top to give brand brand experience. Okay. Okay.

Robert Dooley 29:14
Um, is there anything you feel like I've missed out asking the RTD that I've asked that maybe they all wants to cry that

UX Design Manager, Bentley 29:23
question.

Robert Dooley 29:26
was worried that the questions I asked might not be exactly the right question. So if I do that responsibility on your question, it's

UX Design Manager, Bentley 29:41
I think

that's been very retrospective sort of orientated. But I think this, there's some interesting discussions about where this is going. And as an industry, and I think it is, it's almost like the dinosaurs, some are going to change that some companies will change and some will go it's become extinct. And I think I actually think we're to we're to V in the road. In fact, the whole car industry is a fork in the road. And either either the brands are going to get to grips with are actually going to change the way they work. Which is very arrogant, we know everything we know what a car is, we will give you that take it or leave it to a more more collaborative approach, both within internally working practices and externally in the way that we engage with customers and the new collaborations. So the ones that will be able to make this change will survive, but I think it I actually wonder if the whole industry is engaged full of doing that. And actually what will happen, what will you will see happen is

large companies like Apple or Microsoft, come in and create a single platform that is just adopted by the car companies, because they haven't made that change.

Robert Dooley 31:18
So what what do you think makes them incapable to

UX Design Manager, Bentley 31:20
make that change? Everything I've previously said they, their scale isn't their large diet, they're large animals, the same reason dinosaurs couldn't change, because they were very

Robert Dooley 31:36
Have you had that come back?

UX Design Manager, Bentley 31:40
And you're talking about 50.

You're talking about a mindset, really, and you're talking and the people running these automotive organisations have spent 30 years of their careers doing this one way, and they feel stepping out of their comfort zone after 30 or 40 years of a career in doing it one way doesn't happen naturally.

And humans, you know, there's, there's

people like management structures and hierarchies and careers. And you know, they it works well, for people to have boxes, you can have more money, if you more boxes and more managers, you can have people, there's a resistance to change.

Robert Dooley 32:31
Okay. Brilliant. Okay. And that's usually that's a good point for me to present out rather than questioning in our present where I am, this is, this is going to be the first paper from my work. And I was the

UX Design Manager, Bentley 32:45
output.

Robert Dooley 32:47
So that's good. Yeah. So first, you have this PhD is to understand current automation design process. Yeah. But the intention of this whole thing is to establishing best practice principles through process experimentation there throughout PhD, the pit, the title constantly changes. This is an actual working title. What I'm trying to do more at my starting point is, is that if you look at Ford Model A Yeah. and modern day for focus, their model is the first real production car. Not that much has changed. The formal elements and architectural terms are the exact same,

UX Design Manager, Bentley 33:17
right? Yes. There you go.

Robert Dooley 33:19
And I think this is this is a bit of a long winded thing for an academic cause. But there's a few images here, I'll show you. And I think that there is a fundamental problem. And if we look at what is happening within your parents, we look at the concepts that are coming out. Yeah. People have this driver first mentalities, yes said they are stuck. And designers don't know how to design a space with what people are going to do with it. They design for the driver first passion is that so Jackie, was future type of the hangover, that they're still designing steering wheels?

UX Design Manager, Bentley 33:44
2040? What's the point? I say this one thing I've forgotten to say? Yeah.

I, which I think is important. And there is a lot of panic, and a lot of Quick, quick new technologies, or what's the future of luxury? What's the future this what's the future members. And actually, I think we should be calm, because there are some constants, and the Constance is the way we feel about things. And as humans, we have hands on the end of sticks. And the way we are physically is a constant throughout history. And the way we respond to beautiful environments and situations that touches something in us, which is around the luxury experience is a constant throughout history. So what we should do is understand these changes and technologies and apply them to these constants, not try and reinvent everything.

Robert Dooley 34:45
Sounds so okay, I shall give you the full full spiel, this this things that he has been thinking of interesting, too, that there's either that positioning of the hangover from the driver, first of all, the other thing is this idea of a, a, you the default positioning is business people in their suits. In the vehicle space, both feeling uninspired and the reflection about the codified aren't trained to think about who do is in the space. So my PhD is to bring in practice and methodology from disciplines which do think about that. So architecture, interior design, also, exhibition and curation. And I know they're designed to bring in methods from them and try and create a new design to a new design technology, which is better suited for the challenge of autonomy. Volvo kind of interesting. And I think what's really good about this is the fact that they've signed this from scenarios. So they took, they took a group of scenarios. And and that's, that's what that's what inspired the sea 360 concept. They actually came from a set of scenarios, which is interesting. However, what they're not doing, there's two things they're not doing. One is, and this is the constant theme throughout my work at the moment. One, they are using the same production methods and models of production. And secondly, they are not reflecting on practice, because they're not academics. They're not reflecting on their practice. And that's the problem. So my, this is my two year scheduled. So usually for an academic, Yeah, I think so. But that's sort of where I am. And so basically, I'm here at the moment, understanding current process and then developing a new methodology and then working with design teams to test the methodology and develop it. That's the three year programme, and then writing up. So this was because I was introducing this idea of, of self driving autonomous he Thomas vehicles as

UX Design Manager, Bentley 36:27

you can how many people you're going to talk to

Robert Dooley 36:29
about 20 different brands, and I'll show you in a second.

So don't say Dr. lyst is one life. So big things, because that kind of keeps this driver focus, which is what it shouldn't be. But it's without autonomy, because about autonomous and connected vehicles. And I'm focused very much on level five full autonomy. Really important thing to remember is that autonomy doesn't happen on its own. And it's part of the Holy Trinity, which is shared, electric and autonomous. Obviously, as you know, shared means new ownership models. Electric means radically new packaging. And autonomous means new new purposes, why we're designing and how we're designing. So I started literature review. Now this is I've actually been going through this thing where I I've almost got two PhDs. And the title of this presentation was I didn't reference a single book in my dissertation, which is a quote from someone I studied at the Royal with three interest who didn't quite a single book and card. So yeah, so when I started my literature of you looking at the Royal College of Art website, for example, in volunteer design, no search results. And there is a problem in vehicle design that we have no critical discourse, there are there are very few vehicle that academics and the books that are out there, they either come from an engineering perspective, which are economics focused, they come from a historical enthusiast perspective, the car book was done in the critical depth or they come from how to sketching how to how to process Yeah. And Greg rafal, Arthur, whose will make you to the world he was one of the few academics in the equivalent again, he comes not from a perspective of a designer, he comes from a design his storey to tell the storey and like theories. So he's not reflecting on practice. He's reflecting on the car and his political, social economic implications, but not on process. And but he describes it as a relatively close shop, which ultimately is it is it's a very it's a conservative industries, it's mostly conservative, because we look at it on terms of risk and complexity. Yeah, you've got it's it's a, it's a relatively high risk. And it's a relatively complex thing. I mean, underneath aerospace, and perhaps some construction, although I think those two can be interchangeable. And I think what happens is, is this this, there's this lack of critical discourse, because we have a car design studio, but it generally looks at it's fairly white, male and female. And

it's a

card that is that right? Credit architecture, for example, where the heads of studio they write, and they reflecting their

UX Design Manager, Bentley 38:47
work trusting the Yeah, to analyse a car designer to become. Yeah, it is really interesting. Yeah, the type of people that they are. Absolutely,

Robert Dooley 38:59
I know, a growing trend to compare automotive to architecture, as I come on to in a minute. But this, I there is a problem, I think, which is the models of production that we are within, actually, and this is coming from UX Design Manager, Bentley noble,

Mr. Britain, late 70s, there is a problem that because of this risk in this complexity, there is an aversion to risk. And then therefore,

UX Design Manager, Bentley 39:22
risk is another word for innovation. Yeah. And what I described with an absolute low risk strategy, and within that low risk strategy, how to make without probably changing it, how to make the business cycle work. Yeah, low rates. So

Robert Dooley 39:37
anything that seems critical, a critical reflection is seen as risky. Yeah. So it's not done. And that's not done. That's now embedded itself, because within design education, yeah, people aren't representing books that are station people aren't reading and thinking, it's now becoming, and that's also replicating itself throughout the process, whether it's from design schools to studios. And that's one thing, I've actually got a number of ideas that I'm working on to try and solve this. And one of the is thought that translates into a journal, but other cartoons aren't really going to read it. So we're going to start doing a podcast. And the idea is that is that basing it upon the Socratic method whereby you have three people talking about something, and the idea is to take to say for example, in the idea of selling it is mentioned Jamie's who's very well known for his love of rhetoric features and, and Chris bangle, who absolutely hates that. Yeah. And giving them both an essay, there's a mistake by Elizabeth Dixon called on the stage, which is a really interesting sort of examination of nostalgia within art and design, and also art, getting the most to read that and then interviewing them and reflecting on their practice, and then using that as the basis for a podcast. Sounds interesting. So yeah, going to start working on that. And I'll keep it based on that. There is one book about auto design process, Jordan meadows, vehicle design breaks it into 12 steps, this came out last year. But what Jordan fails to do is he fails to look at the wider and this is why he basket platforms and production models fails to consider the the impact they have as parameter design process.

UX Design Manager, Bentley 41:00
And then they're there. It's such a locked, they're such locked in cycles. It it's hard to break out of that. Yes, they they've created their own monsters precisely then. Yeah. Yeah.

Robert Dooley 41:15
Yeah. So these are the guys I've interviewed. And these are the guys I have to interview. Hopefully, you guys can now move over to that side. And again, this is what these guys say. I had said all the same stuff at really, school not not that not i'm not saying there was quite as I'm very careful what I'm sharing between them. But yeah, people get very sensitive. But all I can say is that the big the big theme is this idea of platforms and this idea of that, that that model of production, which is for lyst. Yeah. Which is constrained in the design series. Me. Yeah, we

UX Design Manager, Bentley 41:45
know platform platform. lyst.

Robert Dooley 41:47
Yeah.

UX Design Manager, Bentley 41:48
World. Yeah. But

Robert Dooley 41:50
what happens then, so again, you know, we've got a platform, what I found

UX Design Manager, Bentley 41:57
it, there's there, even with it, the design department, the people are so locked into this way of working for so many years, if you gave them a blank sheet of paper in a complete freedom, they be scared.

Robert Dooley 42:16
And that is because, you know, we have some availability of customization. She's using you guys as an example. Because the VW Bentley is an interesting example, both of the high end and the low end, you have options to customization. However, both things rely on production lines. So production, I'm from Ford, nearly 20 century production line today, what we have done is we've automated what those people were doing. Yeah, and we are locked into these models and these modes of production. So it's no surprise, they're doing the same thing we're doing this is all about repeat doing the same thing, it's no wonder that the the outputs look the same as well. And that's sort of the crux of my thesis at the moment is that these models of production are what is slowing us down. Now, to get out of that I sort of began this turn toward architecture and gets this fairly quickly. But I mean architecture there's a growing trend to compare things on an architect you seeing it in production with things like the villa and also seeing with IKEA the future kind of this boxy thing and by by architecture people me unboxing that's about as far as the critique goes. And I mean, that's that's been happening for years. Look, if you see a was with his watch minimum was influenced by Adam planning requirements, but actually also adults lose really interestingly started sketching floor plans. So this idea of thinking about what people will do within a vehicle isn't that new, he's been doing that that's been happening for quite a long time. We look at what like the Jackie we're doing is kind of this sort of surface superficial architecture, it's not particularly deep. In terms of who actually doing architecture has been through its first digital turn. So architectures are generally had fairly traditional construction methods, whether that's through modernism, post modernism, and three, the first digital 10 commandments 90s, and it's all represented by this zahar style, every panel different parametric

design.

Yeah. But if you actually look at this, and even participating, we've got this fantastic art, this exterior of actually the construction methods of the same film scaffolding. So you have digital design, but you haven't got digital manufacturing. And you sort of see these these digital elements starting to pick up as trends within visual design, but not actually having any impact on the way they're fundamentally designed, but legit place to put in place. And there's a big critique of that as well, which is going on

which is led by the Bartlet. So, the second digital term, which is termed by this guy, Marissa capo, who's at the Bartlett and there is now this growing movement towards something called discrete architecture, which is, I was at the bar yesterday and this is this is very, very current, which is coming out. And what they do is, which is a design process, which is funded, fundamentally digital, not just in process, but also in construction. Yes, this relies on these single block elements, which then use robots to, to assemble them. So rather than having robots taking a tool part and putting on you have robots taking a discrete which means a single block element, and building from that, yeah, what this allows what enables a number of things enables an escape from for this models of production, which escape you from that risk averse strategy, first of all, is secondly enables you to be flexible, you can create spaces, which can be created and then can be reconfigured. And that then means that you can really design for autonomy, which is the the essence is we don't know what someone's going to do with the space. This gives you the flexibility to escape from this idea of buying a car, and then it lasting forever. And actually, this brings into a model more of buying a car and it came back and using it. So this is john Robertson, who is one of the leading proponents this isn't exactly he's doing this, these are all discrete elements, elements and put together to build this

UX Design Manager, Bentley 45:38
you know what, Gina, if there's any brand that should be harmonising, with this and seeing it should be Bentley, which, you know, the idea of bespoke it should be it should be all over there.

Robert Dooley 45:51
Yeah, I saw this was I'm the latest thing of

version of Africa digest which I can send you some introductory article by Joe was like, I really like that. Yeah, I was gonna write it down. But I'll send it to you. Because we get to get some of those charts you mentioned. So I'll send this to you, and have a read of it. And it's really interesting. It's very, very current as it was from their credits yesterday. And I'm going to be sort of working quite face with them to develop this. So I'm trying to do with my PhD. This is kind of the end of the first year that writing this up into paper. But then what I'm doing is I'm taking these methodologies. And my background is I do a lot of CNC machining, a lot of making and that's something I'm quite well versed, that's something developing a methodology around taking this kind of process and apply it to vehicle because what this doesn't quite do, it didn't quite allow at the moment, this level of finesse and detail which is needed vehicle.

And because I was still but that's just resolution, it is it is

exactly the question resolution. So I think a question of fundamentally understanding how to design with it as well. And I'm not, I'm not advocating. And I've been quite clear one of my cousins, customers, jails and some other people, that it's not about just adopting this, it's about taking this approach and making it suitable for the attendees, because it is distinct from industrial design. It's distinct from architecture, and it needs to have its own process. Because even when we're not owning,

because it deals with a big will be the second biggest outlet you have. Yes. And so it's still important to have that deeply emotional connexion, which just rely on this won't necessarily be as interesting as I

UX Design Manager, Bentley 47:26
know. Yeah, really good. would be good to stay connected. And yeah, definitely keep.

Yeah, what do you want from us? In this interview?

Robert Dooley 47:35
So? So yeah, it's good to have an interview? I mean, if that's okay, that's fine. But what I'm really keen to do now, in a nice way, yeah, yeah, yeah, it'd be interesting. In the next six to nine months, I'm doing this now where I'm actually creating this methodology. So doing it myself in the studio, in the workshops, testing it, developing, taking a few interior elements and working out ways to design it, then want to take that methodology. And I'm really interested in personally going into sort of strategy and commercial research of my PhD. That's exactly what I've done it to sort of position myself to, to move on from that into that area.

And so what I'd like to do is then connect

UX Design Manager, Bentley 48:12
you do you see yourself working independently then or being part of, I don't know, if

Robert Dooley 48:19
you're planning my life, that means you have to see it, see where that where that ends up. But I'm actually either ready.

My plan is to then design methodology, pack it up, and then work with several different car teams different and go to different brands, and work with a month or week to week exercise, to get some of the designers using this process to test the methodology to see how it works. My vision is that the end of the project is accepted. And at the end of the three years, I'm trying to organise and I haven't covered that yet. But why would someone like the Design Museum or somewhere like VNA have an exhibition, a temporary exhibition, demonstrating sort of three or four universities because you never have apart from in conference shows, you never have car design companies experts executing together because of this thing about all we want to hide it, because this is my methodology. I can say I want to get hardline companies involved, but with a caveat they have to then exhibit alongside of the other carlon companies. And it makes way more interesting discussion, and then it starts a community of people.

UX Design Manager, Bentley 49:23
Yes.

Robert Dooley 49:25

And if you mentioned to see what people didn't think, and I've got ideas for like a set of maybe five or six brief you.

UX Design Manager, Bentley 49:33
Is that around the physical architecture for the physical execution? Or could that could you take could you do that as a suite of that? So we you know, you could put illumination into that interface digitas thought you could apply all the layers that make up the experience, or is that is this just the physical,

Robert Dooley 49:57
so I'd like to do a set of three switch. So the idea being ideal, I'd have five conference I work with and produce maybe 10 briefs to give a bit of flexibility to choose the ones right for them, the idea would be a set of five different briefs. So one brief might be looking at something quite physical, I'm thinking a seat because it's very relatable. So one brief looking at a seat, you know, designing a seat for that brand, using this methodology and how that could work as a life cycle, and then design that object artefact, but then having system behind it and doing the same thing for something like a centre console, or a call centre console within an autonomous vehicle for this that's right for that brand. But then I also want to look at other things like I want to do another brief based upon the how, what's the purchasing process going on behind here? How do people find them? Because a lot of interesting working recently, in terms about how do you What's the experience when you are choosing a customers in that vehicle? How do you visualise that? And how do you communicate that, so that's nothing that's another that's a whole other brief. And going beyond just an online, you know, greater actually going much deeper. That's another brief. And there's various other reasons. teasing out again, I've got six to nine months to actually get my head around this

UX Design Manager, Bentley 51:04
account with with companies collaborate on that one, or pick one, pick one,

Robert Dooley 51:09
what I might do is I'd like, I'd like them all to choose one. And they work on one brief, but they're all under this theme of developing a new methodology, a new process.

UX Design Manager, Bentley 51:17
I mean, if you know, seat, for example.

I mean, there's so many different to, you know, it's almost a philosophy, if you apply that the manufacturing process that then enables you to not just make a seat, but make a completely different seat for every single bottom. Yep. And you know, in actually a seat, the most comfortable seat if you have to sit in a seat for a long time. The seat is actually the most competency is one that adapts to the different positions that you want to. And then you've got how you measure these things, physically how you measure behaviour, how it responds to behaviours,

Robert Dooley 52:01

I actually did that as a concept for my belly project off it was in a flat flexible seating system, which use pizza electrics to do that, so the idea was it learned your movements, and then it went from upright to line down and move with you throughout the journey.

UX Design Manager, Bentley 52:14
And then you know, so it's kind of it goes beyond flexible manufacturing into a flexible life and then how it evolved, you know, and then it could be you actually carry around your seat profile as you age and into every seat in the United States just that could go. So to take that it would seem a shame just to have the strategy as a physical thing that we really want. It can be so many layers

Robert Dooley 52:44
to this thing, it can't just be about designing a seat, it's about designing a seating system it's about designing a console design system is about designing a digital configuration system and all these other things which

UX Design Manager, Bentley 52:55
and then if you got but that would be if if you got 3d from brands saying the same thing on a seat and why shouldn't a customer take his profile across different brands in the seat learn to adapt to different to the same person stepping into a higher car which he doesn't you know and then what is the ownership experience anyway and yeah, yeah you know maybe that's maybe for Bentley you know, maybe maybe for some brands that's a bicycle and a car and whatever and for Bentley, it's the seating in your private jet and the seating in your got to sit down in all of them. Yeah. All disconnected and siloed.

Robert Dooley 53:42
So yeah. And that's that that's why the related have it across five different brands that have had indications from a couple of the brands that they're interested in doing that. And I'm trying to get a cross section from Yes, or premium and premium luxury, and then some more kind of economy tactics to see where the different things sit. But what I'm really interested in doing is getting these different brands to do things that to exhibit together but to show a shared, not shared, but like a methodology that they're all using. And to sort of try and demystify that process and also to open up the industry and doing so into communicating and talking to each other about what they're doing. Because this idea of having site different brands do things on their own won't work in the future now, just as you're saying,

Yeah, I yes. To try.

UX Design Manager, Bentley 54:27
It will be great fun to be working with you.

Robert Dooley 54:30
Yeah, great. Okay, great. Well, I mean, what I'll do is I'll keep you updated when I've written this paper, which will be in about two months time. I will Yeah, you've got my Sunday school you must move to and I'll send you this stuff tonight. Yes, sorry, this

country gym. No, it's fine. It's fine. You know, it's been it's funny as things well, I gained touch people to interviews really hard because

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-06-28 SENIOR DESIGNER, NISSAN AMERICA - summary

This conversation was between Robert Dooley, a PhD student researching automotive design processes, and Senior Designer, Nissan America, a designer at Nissan. Senior Designer, Nissan America provided insights into how the interior design process has evolved over time from a styling-focused approach to a more functional, analytical approach driven by new technologies and market uncertainties. He described the product development cycle and different roles of advanced versus production design teams. Senior Designer, Nissan America also discussed the challenges of managing creative teams to hit deadlines within structured processes.

ii.c. Transcript

Robert Dooley 0:00
Thank you very much.

Senior Designer, Nissan America 0:01
Thanks for letting me know. Yeah, yeah, no, of course, of course. I wonder how many times it's been done without my permission.

Robert Dooley 0:08
Well, being an academic, I have to make sure I ticked all those boxes very well, you know?

Senior Designer, Nissan America 0:14
Yeah.

Okay, brilliant. So what I thought exactly what remind me again, what is what is your what's the study?

Robert Dooley 0:21
Sure. So let me if I just give a brief explanation of me what I'm doing.

And

then if you're able to sort of summarise yourself and what you do, and I will then just go into a few questions. So basically, I'm a graduate of the Royal College of Arts in London of the visual design department. I grant credit for their last year, and I'm now doing a PhD as part of the University of the Arts London, and found with universities University in Cornwall in the southwest of the UK.

And what my my research is looking at

is is looking at automotive design process and typically how automotive design process needs to evolve to meet the challenges of autonomy. I'm so starting from the position that current automotive design process is to drive a focused and is always

driver first mentality. So I'm looking to create a process which can meet the challenge of autonomy better. So what I'm doing is, this first year, I'm basically doing a really clear trying to get really clear picture of current automotive design process, understanding what that looks like. That's through literature review, through case study review, and also through interviews people like yourself, because that's obviously really important to get a clear picture of how things are done. There's another book was always in vehicle design is that there's not that many books written on it as a process. So we should make this primary process even more important. So with that in mind might Yeah, this this, this first year is to sort of get really clear understanding of current process. And then I'm moving into the second phase now, which is to start looking out vehicle design. So other designs depends like architecture, interior design, curation, exhibition, all disciplines really think about what we will do with the space. My job then is to bring in methodologies, processes, techniques from those disciplines, and try and create a new discipline, which is more suited to designing for autonomous vehicle interiors. So and then then the second third year, I sort of intuitively test that and develop that method. And, you know, the final output will be this new method. And then so writing about it, so kind of what I'm doing reasons chat to yourself, obviously, is to yet to try and resolve capture a clear understanding. First of all, just really trying to clear understanding of the of how cars are designed currently is really about the interiors and how carlon interior design what that process looks like as a step by step but also wider, you know, what are the driving parameters whether sit with a wider product development programmes tonight?

Senior Designer, Nissan America 3:03
We're going to cover all that in one in one call.

Robert Dooley 3:06
No, no, no, I'm sure.

Senior Designer, Nissan America 3:08
Yeah, cuz it sounds fascinating. So yeah, for sure. Yeah. I think I can

contribute and help you with this study,

Robert Dooley 3:17
printed. So I'm here Just give me a bit summary of your background.

Senior Designer, Nissan America 3:22
Yeah, certainly. So graduated Art Centre College of Design in the night, Team 94. And immediately got a job with Ford Motor Company in Detroit, us and work for that for two years. And actually, one of the first projects I worked on was a show vehicle, and did the exterior and interior on that project. So speaking specifically about interiors, what was interesting about that project for the in my teen 95, it was for a concept vehicle for 2010. And already at that time, we were talking about, you know, how the material might change and that the use of the and the space and technology and you know, even with a modern Dr. Training, how that would free up space on the interior and with aided driving, I forget exactly what we were calling it at that time.

But we were aware that at some point, there would be some driver aided technologies that would allow that would free up, you know, the time and the attention of the driver and the occupants to use a vehicle for maybe more personal time or as an office space or social space. So that was a number that was being talked about a lot. But getting back to my experience, then in 96, went to Nissan in San Diego and been with them ever since. And I've travelled a lot with them. So actually followed up a project in London and our Pennington studio. been to Japan many times on programmes just finished four years in Brazil starting a new studio down there and have always worked on interiors for production, specifically and then done some show vehicle interiors and exterior work of course. But uh yeah have done a lot of work on the production interiors for ultimate Titan Armada x Tara.

Cheese, what else rogue

quest.

The sun a lot of interiors. Yeah. And in recently now of, you know, moving more and more into business management, design management resources, programme management, still doing divine work, overtime programmes, we have the next ultimate that we're starting on right now, and some other projects coming up. So but yeah, this is always a topic of conversation to how, you know, with, you know, new expectations from the customer. And obviously, what competitors are bringing to the market. You know, the new increased demands and expectations in the, in the marketplace from the customer. what they'd like to see it on interiors is is quickly affecting, you know, the type of design work that we do, and, and the level of investment from the company. Also, you know, these large screens, we've always wanted that we spend a lot of stuff in school, you know, since the 90s, late 80s and 90s. You know, there's always been like, glass displays and touchscreens and all of this stuff, but it seems like now that, you know, the technology is there and the demand is there. So the cup the corporate investment is there for the new technologies and, and incorporating a lot of that stuff in our in our current work. Okay, but basically, that's my experience. So yeah, I've got about 25 years of experience in automotive. Okay, pretty, pretty.

Robert Dooley 7:26
Okay, great. So that's, that's interesting. Thank you very much that that's a good summary. It just helps us all contextualise what you're going to tell me. So okay, I've just got a few questions to go through. And I think just to first of all to go through be really good if you could, perhaps, if you're able to apply it to sort of an example, maybe the car has been out for a few years. So I really want to talk to you anything confidential. But if you a vehicle that's already out there, if you could sort of talk me through it, its design process, he liked the interior design process this all the steps you went through that thing.

Senior Designer, Nissan America 7:57
Okay, so the design process, I guess, the first thing we need to do if you're talking about this is defining that, what are we talking about? Are we talking about style? Are we talking about design? Because you probably already heard this was a bit of

confusion about what our role is, in the product development process. Are we spy on this? Or are we designers? You know, we even see that within the company, different groups, you know, engineering considers themselves designers, and they think that style is that we just put icing on the cake. But I think now with new technology, that we're actually a lot more involved in the actual layout and functionality of the interior and use the interior. So I think, in a funny way, even though the the interiors got maybe a little more simplified setting with consolidating all these features and functions into one, you know, touch screen, that design in a way. And really kind of reassume that role of determining what the layout of the interior is, and how the customer anticipating how the customer will use it, and also anticipating what we could offer to them that they didn't realise they wanted or needed. And I think there was a phase, maybe in the 90s and early 2000s, where there was kind of a set, we got into this rhythm or this pattern of just like cranking out cool interior. So it was much more styling driven. You know, like, we were just coming up with games, and, you know, you know, cockpit seal and all of this and like the wraparound interior and everything was like screwed up. And, you know, it was very ornate and stylish. I think now, I don't know if that is so much a priority with the customer. And that's within their, you know, their cater to expectations for what they want and an interior. I think they, they certainly want much more functionality, like they're buying this product to serve them not to just entertain them. Like, you know, Blitz and, you know, we still want nice materials, I suppose. But even then I think they just want good durable functional materials. They necessarily want everything wrapped in leather with beautiful stitching. You know, you see Sumerians Of course, maybe higher brands offer that but I don't know if that's so necessary, you'll see from other competitors, areas of hybrid type vehicles or electric vehicles look at those interiors are actually quite minimal yet to be customer. It's very appropriate for what they expect, because they're there so much technology, that that's the driver that pardon the pun, yeah, to you know, to

please the customer, you know,

purchasing this vehicle to serve them. And that's basically it. Where's before I think the interior was in the whole vehicle was more to kind of show off to your friends maybe or to pamper yourself in this kind of opulence of like bro walnut and, you know, wash aluminium and stainless finishes and carbon fibre. And, you know, there's a bit of a glitzy by early quality to the, to the interior design process now. Today, it's much more focused on actual functionality, usability, and how it serves the customer. To understand my my point and my main point clear yet. Now, today, I think the interior designer is much more of a designer and less of a style.

Robert Dooley 12:35
That's really interesting definition of distinction. Um, and I haven't heard someone talk break it down as well as that. Sorry, just to clarify, could you because you've mentioned about this sort of moving, you know, traditionally design is being more focused on layout, and then moving to very trend based and now moving back, because you really helped me if you could just give me some dates when you think you saw that happening in Toronto victims, but just take that for me.

Senior Designer, Nissan America 13:04
Yeah, sure. I, you know, I think even as recent for me, as recent as the late 90s, there was still some interest, like you would see that in show vehicles to actually innovate and to create unique layouts, whether it's like three across seating seating that turns the type of room and that's the type of functionality and stores saw that up until maybe the late 90s, early 2000s. And then maybe like 2002 2003 really got into this rhythm of just like just crank out the product, you know, just crank out the next best thing. And what's hilarious is if you look at used cars, just go back a few years and look at the navigation systems in the size of the strings really tiny The graphics are just portable. And most of the focus on the interior was like how much shape and form and you know, how much stitching can we get in there how much letter rapping and wood grain and, and brushed aluminium and Colonel Eminem and you know, all of these like, kind of glitzy finishes and and even surfacing a lot of like, the surfaces, the door flowing into the ice and wrapping around to the centre console and to the, you know, the link to the video is in into the centre console in the armrest. And you know, even the seats, integrating somehow into the door panel into the centre console. So there was like a lot of focus on just this kind of like, very stylish form. And I think that ran from like, I would guess like 2002 2003 up until fairly recently. I mean, some new product, because there's such a delay, there's like a four year delay three or four year delay, when it hits production, and then there's a you know, there's a four year production run. So you're seeing products out there now that kind of exemplify what I'm talking about this, you know, very stylish, heavy focus on interior design and product appeal to now I think the work that's going on, starting to come out, and the work that's going on now in the studio, which won't come out for another few years, you're seeing a much more designed focus, interior layout and interior products for the for the customer. And I think I think our if you're focusing your studies focusing on process, seeing a change in the time, not only like the designers involvement in the product development, but even the type of sketches that they're doing, the level of contribution, the comments that they made, to actually how the final interior layout in architecture and design, actual literal design, how that's going to serve the customer, and less on, you know, what's the size of that still? And what's the size of that greatest? Can we make that softer? And can we blend that in and you know, there's less of that kind of conversation and more the conversation about, like, you know, does it feel roomy? Does this feel comfortable? What is this do if this is here, you know, how does that help the driver because he'll be doing this instead of that it will be focusing on this, this driver aid or head up display will allow us to free up this day. So feel blessed club cluttered. You know, like, there's, there's more of this kind of

consideration to

simplify and help simplify the users life and help them literally navigate through their day in their vehicle. Rather than just like, boom, check it out. Like this is so cool. You know, like this is, you know, super, super, super cool, like different get into Wow, this is awesome. You know, now it's more maybe mature and find work to use the system, the more mature approach to like interior design, to where the the new customer gets in and goes, Wow, this is great. The technology I have, this layout is very nice. It's smart, it's clear, easy to use. Everything's where I needed storage.

Bob, simple to use, very hassle free uncluttered visually, and functionally. Perfect, this is perfect for me. And I think that's what the designers are thinking about now in the studio, rather than just, you know, house movie unquote. Can we make this interior? So okay,

Robert Dooley 18:21
then my next question, then from those, this is really interesting. Thank you, and why why is that change? what's what's made that change away from this kind of styling approach? And what is it? Is there what's driving that? Again? Pardon the bus?

That this this change you're describing?

Senior Designer, Nissan America 18:39
Well, I, I would say I mean to be for as long as I've been doing this, and you can also look at, you know, just automotive design history. And then, you know, with, with anything in life, there's always a pendulum, the wings, I think what we're saying now is literally just our kind of the manifestation of both trying to get our heads around this new technology and also to I think there's maybe a little more philosophical spin on it. But I think it's very tangible. There's a tremendous amount of uncertainty to in the auto industry now. And there's, maybe throughout the history of automotive design, there's more uncertainty than there is certainty. But I have seen the certain phases, and I think the certainty out of those eras, you see a lot more just kind of carefree experimentation with him. What I mean by certainty is certainty in the in the marketplace in business. So hey, let's have fun was still not. Now I think, today, what you're what I think is driving the aesthetics of interiors is, is if it's a combination of the technology, and then also the uncertainty at the marketplace.

Be a punch to our

interior design is much more analytical and methodical. Aesthetically, you're seeing designs that are much more analytical and methodical, function very well. And just to take this a step further and look into the future, I think once we get our heads around this new technology and new use, then I think you're going to see maybe in 10 years, or maybe seven or eight years, from much more fun approach to this new era of interior design, which includes, you know, the new technologies, the hardware, and software and the interior, and vehicle driving. Dragon Age, Thomas, I think once we have designers in the industry and the customer all get kind of comfortable with this new technology that I think you're going to see some maybe breakthrough designs from, from the aliens, in a little show in a nutshell vehicle in Geneva, Frankfurt, Paris auto show, we'll start seeing some more kind of fun takes on this new

interior design.

You understand? Yeah, yeah, performance is basically my theory. And I think that's why today You see, like, even in the studio, basically, I I joke that interior design now is just, it's, it's a two by six of would flip an iPad. And that's basically, there's your IP, you know, yeah, just the point of word, the point of what a steering wheel and an iPad like, and all the sketches. And I'm not talking, and I'm not giving anything away,

you can see this model and design and online and form trends, you see, some of the interior sketches is just it's very graphical. And again, I think that's the result of no criticism of the skill or the talent of the new generation of designers, I think it's just there. reaction to the current stimulus, which is trying to understand the new technology. So that puts you in a more analytical mindset. And then also the uncertainty of the marketplace, which now everything needs to be very measured, controlled, careful, smart.

And then I think once we get comfortable with that, and

you know, the, the car industry kind of sells itself out, and we get a little more confident in the in the business model, then you're going to maybe see some more experimentation with this. With this new technology might start seeing some more experimental experimental, form wise, interior shapes and designs. So right now, it's very Cartesian, like, grid, like, layout two interior designs, and again, you see that in like, you can just go online and see any interior sketch for them. And like, you know, Instagram or form trends or design news. All the interior sketches are very flat screen, you know, yeah, it doesn't mean it's funny. And then plus two, we all in this business, you know, it really isn't in school, the intention is to be stand out in innovative and breakthrough that when we're in the industry, the plan is, is to basically follow and then just add a smooth items. distinction, to set you apart, that it's not to completely stand outside and attack, but just to lead the pack, stay within the pack, and then just kind of let your way to the front. So you're not going to see much variation between both ends and how they approach their interior design. Everybody's kind of doing the same thing right now. Yeah. Okay.

Robert Dooley 24:24
That's really great. Thank you. Um, okay, so just subsisting on the little bit, when you know, this interior design process, what you described is sort of changing its role shifting between different things. But can you describe to me where that sits within a wider product development cycle? I think you mentioned briefly earlier about sort of the the years how many years the cycle takes, could you just talk describe that production cycle to be a little bit and where a vehicle interior design fits within that? And also, how does that process cross different platforms?

Senior Designer, Nissan America 24:57
And how that process does what,

Robert Dooley 24:59
how that process crosses different platforms across these platforms?

Senior Designer, Nissan America 25:05
across platforms?

Well, I think, you know,

I can speak, of course, from experience within my current company, but then also speaking with President King, go and just following

projects,

from what you can gather, and automotive news and auto blog, and from the other sites, basically, kind of following the same kind of time frame. And internally, our interior design process, it really depends on what the, the level of changes, but I guess, for the purpose of your study, we're talking about an all new interior. I've always said, here's a here's a side comment. But more than sketches, what's even more confidential within her within a car company is their timing. So I'm not going to speak about, like specific, you know, time frames. Because if you lose a sketch, or an image leaks out to the press, it's like, so like, like, anybody can get anything, but it's the timing, that's the most critical, like, How fast can Company A bring out bring a new product to market? That stuff is like, that's insanely confidential. And so but to to help you out with your study,

dealt with your study,

we do have a very clear

process.

From concept, even pre concept.

Coffee got down the wrong pipe, yeah.

To final production or final data release. And we have specific milestones in that process and give it to me generically, so I'm not giving anything away.

There are

no different levels of design checks, and different levels of design reviews. You know, we have an internal to the studio checks, and and you have different levels of management all the way up to final shows, for designs are selected, there's a lot of input from different groups also. And then even within design, we have different groups. So the design department just isn't, you know, a bunch of guys sitting around sketching stuff like the styling rehab, packaging teams and layout teams and actually doing seating and mockups. and determining, like, what is in these teams, in design, overlapping teams and engineering, so that, you know, engineering isn't telling us what to do. And we're not telling engineers that stupid, you gotta do it like this, like, early on, we have specific groups that determine, you know, for a certain platform, what would be a good interior layout, so that by the time the assignment comes to design, that we're not surprised with, like, you know, some packaging requirements, or spec requirements for the vehicle. And that also starts with product planning, too. So that planning very early on, is involved in the design process. And we're also involved in the design in the, in the spec process, we have groups that benchmark with the, we have competitor sets. And we benchmark spec content, like oh, they've got that this company has this and we should have something like that, or we should have something better. And so within design, we develop what we think is

specification content for, you know, that vehicle for whatever vehicle working on, so that product planning isn't just telling what the customer wants this, and you're going to do it and then engineering tells us and then it's got to be within this dimension. And then we just do it. Now there's there's groups with in all those departments. Matter of fact, I've got a meeting. So my offices in Detroit, and I have a meeting out in San Diego at the end of next month with product planning on a new project. So there's a barrier, and we're at the very early early stage, this concert doesn't officially Get Started until October. But we're going to have a meeting with the design team in San Diego, we're all going to sit around and just kind of brainstorm on what we think is appropriate for the customer. We know what the vehicle is. And we are going to discuss how to evolve it and how to make it more appropriate for you know, the customers needs. So speaking about process and just decision making, there is you know, I could speak for Nissan specifically that we have a lot of involvement with the other departments in our design development process. We're not just a room that's handed an assignment, and we just style it. It's very collaborative, specifically with engineering and with product planning. And then there's also marketing group, there's also you know, the business and we get a little bit into that, you know, like, whew, that's gonna cost a lot or what's the price point, but that's really not our area of expertise, or much more subjective, tangible, you know, the aesthetic tangibles than we are into like business, although we do sometimes get involved in some business talk, but it's not so much. We work closely with product planning and engineering. Sure,

Robert Dooley 31:23
okay. Yeah, this is interesting things, you

Senior Designer, Nissan America 31:25
know, I'm still I'm still kind of speaking broadly, I'm not, I'm not giving you kind of like, the nuts and bolts. And it's hard to do, because I can't give you like a, you know, there is there is a fixed period of time, from like, pre concept to final data release. And then there's just there's milestones along the way of that I, you know, I'm sorry, but I can't give you like, sure what that timing is done, what I tell you that

Robert Dooley 31:53
that's, that's fine, as easy as the wider the wider picture is, is really helpful. And you mentioned it, you mentioned this idea of product planning and new concepts and that sort of thing, and I wanted a few be able to describe to me. So what's the role of a Do you have an advanced design team? What's the role of advanced versus production design within your organisation? And how the concepts move between? assume they move from advanced to production? But how do they move between the two departments? And

Senior Designer, Nissan America 32:24
that is a good question.

We have you know, there are

we have design programme managers. And this is, maybe this person came from design, but they know, all departments involved in a project. So they're the ones who coordinate

the

the

design scheduling, and all the feedback loops with with engineering. So they coordinate all of that even like, for example, the design manager, design director might know, the details of that timing that, like, is so involved, that we've delegated that to one person. So we have BPM in the, in the teams design programme managers that know, inside and out down the last minute, like where the project should be on the calendar. And they know all the teams involved and when they should get involved and what information should be relayed? And that's all they do. They're dedicated to that. And then design directors freed up to manage the direction of the project and the design manager and then all the designers kind of forgot your your, how does it How does this move between?

Robert Dooley 34:03
My interest is and if you have it within design, or you know, within the design group, do you have sort of an advanced design and a production design? do you differentiate or between teams? And yeah, we do.

Senior Designer, Nissan America 34:16
Yeah, I do. Okay, yeah. Let's take a question. My question. Yeah, sorry. Like, for example, for us, the studio in San Diego is more what we call upstream design. And then they'll take a concept to design decision, which is, Hey, this is what we're making. And at that point, the design should be like 85, or 90%. Done. And then it gets handed off to us in the studio in Detroit, which were right next to the Nissan technical centre. And we put in all the last little bits of engineering requirements. So to make sure that Paul has lamps daily, and sheet metal stamping, headers, referrals, all that stuff, his points, everything, ramping angle, civilization, all of that stuff is like dead on perfect for production. And so that's what our studio does. So that isn't so clear. That's one of the things I'm working on, as the head of the studio here in Detroit, is to put that into the programme, that there's a clear distinction between when a project is done in finished in California, and when it moves to Detroit. Because even right now, it's still not that clear. They're still trying to do some production work in San Diego, and we're trying to do some styling work here. And it's a little confusing. It's even all through because all the different departments have, you know, their areas of responsibility and trying to communicate with us. Should they talk to me talk to us here in Detroit? Or should they talk to San Diego who's got it? Where is it was a project was the milestones mile there's a year. So I got here a year ago. And I there's a lot of this confusion that I see. So I'm trying to that's one of the biggest things I'm trying to do right now is to make a clear, very clear handoff date in the programme between the California studio and the Detroit studio.

Robert Dooley 36:22

I'm what's your reasoning for wanting to sort of make that clearer?

Senior Designer, Nissan America 36:27
Just for that reason, because one, you need to like get the desires to put down the pencils. Stop settling with stuff that you have, you know, what you're up against, up against is didn't write this down. And I think a lot of companies have this sob they started production date. Yeah, and started production days that is tied in with the plant. And that's tied in with one supply chain like to your supplies and factory operating hours and man hours in the plant. I mean, like these are critical critical dates and so P dates are set. Those are set in steel, not even stone like those are Exton feel like that date does not change. And so

you know, you have unknown unknowns, and

I guess you could argue that engineering is more of unknown, they work more in the objective in that design is more of the unknown. And that's more subjective. And then you'll have a lot of what we're trying to do is cut down on the variables on the design side, and you're trying to put in a more structured, and that's, you know, that's the biggest challenge of creatives, right? Like, how do you create a masterpiece within a six time frame? Because usually, you know, can you make a master peace overnight working online or to the masterpiece take 1010 years? Yeah, you know, I, you know what I mean? Like you're dealing with such a, and that's where we, you know, in automotive design, and probably product design to like, you're up against it, like you've got a clear, specific deadline. And you need to hit that and believe it or not, as a Japanese company, with, you know, in America with American can do attitude, it's like, it's still difficult for us to like, not, not to keep mucking about as, as the Brits would say, yeah, with design, you know, like, just put your pencils down, you're done. This is it, we need to like get it into final data and like, hit that deadline. And we missed the mark on a few projects in the past 10 years. And that's another reason why I'm here now is to try to like, you know, there needs to be a little bit discipline with the design team, it just can't be a bunch of kids in the sandbox, like, you know, just do whatever they want, whatever they want, like there is a bit of a structure to this. So how do you, that's the challenge and management and how do you structure it in a way that they have the freedom to create whatever they want to come up with cool stuff, and also the deadline?

Robert Dooley 39:24
Yeah, that sounds like quite a challenge. You got that? Okay, look, brilliant. I mean, that is that's, that's, that's brilliant. And thank you very much for your time you have you got Is there anything I've missed, missed asking about the things really important.

Senior Designer, Nissan America 39:38
But I think we've been speaking, you know, or I've been speaking, good. And thanks for listening, I've been rambling on in for an hour. A kind of broad topic. So maybe two on this. And I just like to say I'm, you want to because I don't really ever articulate there's so much, you know, we just give a nine to five. work, it's rarely do we stop and like, you know, listen to what I've talked about. And if you have any

other questions, you want to get some more specifics as best I can, I can certainly talk to you again and let me know, by email or

Robert Dooley 40:17
over the next few months,

Senior Designer, Nissan America 40:19
you're gonna you're gonna be you're gonna be speaking with a lot of other

people from different companies. Yeah,

Robert Dooley 40:25
yeah, I am. But I'm keeping. Obviously, there's no nothing being shared between between any anyone.

Senior Designer, Nissan America 40:32
But I'm saying from your point of view, though, I think it's fascinating to see if you're discover any patterns, or if you're here, you know, any overlap in the in the comments or how things are done. Yeah, the final report, will that be published? Or? Yes, it will be able to see that.

Robert Dooley 40:52
Yeah. And I'm very happy to share it with your see with a PhD in the UK. It's a minimum of three years. However, I will be publishing papers throughout that three years. So our first first paper ready in about three months. And I'll definitely share it with you and I if it's okay, when I go through these the transcript know if I've got any sort of further questions, if that's okay, that I will drop you an email on those sub really appreciate that. And I'm not quite yet but I'm actually partnering up with I don't know if you know, the Bartlett School, which is one of the leading architect schools in the UK based at UCLA. And I'm actually partnering probably with some of their researchers who are doing some really interesting work in digital architecture, digital design and manufacturing of architecture, and probably gonna be boring quite well, their methodologies. So that's, that's very early days. At the moment, when I've completed this phase, Nestle's moved on to start working with them. I'll again, I'll keep sharing as I'm going, because I'm really keen to get get feedback from the right yourself and that sort of thing. So I will definitely share that as well. Because I think you'll find that really interesting.

Senior Designer, Nissan America 42:01
Yeah, you're, you're you're, you're digging into something that's, that's 100% Art 100% engineering 100% business. Like, it's, it's a fascinating study. You're dealing with, you know, a lot of different disciplines and into one into one goal, you know, making making a cool car. Yeah,

Robert Dooley 42:26
yeah. Very lucky to do it. It's really, it's really interesting. Research. I, I love doing it.

Senior Designer, Nissan America 42:34

You know, like, for example, if you if you talk to somebody at SpaceX, that's it. To me, that seems like that's extremely linear. It's like, how do you get a rocket into space? Right? There's not so much, you know, that that's all engineering, you know, and that's a very clear goal. But, you know, there's no subjective subjectivity. It's all objective work. Yeah, boy, you get into like automotive and it's just, you're trying to create art, you're trying to create something that like, touches somebody's soul. But then, you know, also, you know, something that they can afford something that beats the competition and something that serves their lives, you know, like you're trying to hit all these different targets in the one product. Yeah,

Robert Dooley 43:18
I think I think it's always because it's very unique in where it sits in terms of it's much more complex than product design. It's Yeah, there's a real differentiation from industrial design.

Yeah, and there's also there's things from architecture, but

Senior Designer, Nissan America 43:31
you know, and the scale of it, too. Yeah. Yeah. hundred thousand units. 200,000 units, like cheese. Yeah. It's a fascinating business. Well, good luck with your study, man. I hope this was helpful for you. Really, really helpful. Thanks for

Robert Dooley 43:46
Thanks very much, and have a good rest of the day. I'll be

Senior Designer, Nissan America 43:50
and feel free to contact me again. Sorry, it was so long from the time you first contacted me but I've been

Robert Dooley 43:58
told instead and when you get to the end of the day,

alright. Alright man. Take care.

Unknown Speaker 44:08
Bye bye.

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-07-23 EX SENIOR DESIGNER, JLR - summary

Ex Senior Designer, JLR and Robert discussed Robert's PhD research, which is looking at applying architectural and discrete manufacturing methodologies to automotive design processes. They debated whether vehicle design truly engages with architectural principles structurally or just aesthetically. Ex Senior Designer, JLR emphasized the importance of emotional connection to products, while Robert argued this perspective comes from a driver mentality. They also discussed how electrification and new mobility trends could disrupt current vehicle and manufacturing models. Robert outlined his plans to further develop discrete design tools and demonstrate them through industry collaborations.

ii.c. Transcript

Ex Senior Designer, JLR 0:33
Great, we'll see. Right,

good. So what do you want to discuss today? Where we were thinking? Yeah.

Robert Dooley 0:48
So perhaps it would be great to talk about is very quick to three level, HD professional looking at. And then that perhaps just to know a little about your background. So having problems understanding where you're coming from, and then got a few questions we can run through these, perhaps slightly more focused upon interviewing a interior designer. Okay, again, once we've had more about your background, again, we'll tailor those deals that will then integrate to this and I will see ya. So my research is looking at the design process and the future of automotive design process and how is to change and evolve to me the challenges of the world being atomic Victor ology. See, that's what I'm looking at. And the idea is, I kind of stopped my start point is that kernel design process isn't suitable for the challenges of the future. And there needs to change. And the original proposal was to bring in practice methodologies processes to from other disciplines, so disciplines like architecture, interior curation, exhibition, well, people do think about what we'll do with in a space and bring those in create a new methodology, because kind of more more suited to those challenges. Atomic,

Ex Senior Designer, JLR 2:13
you could include industrial design process. Yeah, I think that iterative design, I think so. I mean, that's, that's,

Robert Dooley 2:22
yeah, it's definitely a, it's taking, taking, taking a step back from what website of New York with the other methods that are used and bringing those in. So that was definitely part of it. consultant at the end of my first year, so going to the end of the literature review, and one of the problems with the pleasure is not much literature. So most of my research is through primary research. Yeah, hence why I'm doing these

interviews here. And yeah, now colour, UV phase, and I've probably found a methodology I'm going to be using uses something called discrete architecture. So we have the Butler, unit 19 of the Butler, which one of us does that, and up to three little elevator bags. So what I'm doing on the phone, the first part of PhD is to get a really clear understanding of voice current design process, because that's something very important hadn't even written about, and it has been documented and analysed and considered. So that's the first part which by doing these disparities, I wonder if you're able to give me a introduction to yourself in your background.

Ex Senior Designer, JLR 3:26
Yeah, so I graduated from the Royal College again, probably 1996 9596.

For that was at come to university.

And I went straight from college to work in Italy to across to

Syria, okay, which is named dear, dear GNZHIA. And that criteria was Polian but for the time, and it was a kind of advanced science studio for Ford within Europe. Is that

Robert Dooley 4:07
where the name for their gear most? And yeah, they did. That's exactly the same. My parents had the galaxy. big one. Yeah, yeah.

Ex Senior Designer, JLR 4:18
Okay. So from there I went, I worked in for the year, quite a lot of trouble in Cologne in the States, and then came to work in Shakira in the early 2000s, following some illness. Okay, so what we're doing with gear for us doing experience here design.

Robert Dooley 4:41
And then when you join JLR, you were both Ganga.

Ex Senior Designer, JLR 4:45
And now I'm running the, with this team next door, which is called the basically the design innovation team, but we call it the design hub.

Robert Dooley 4:59
So how do you transition we managing designers, a JLR.

Ex Senior Designer, JLR 5:03
Yeah, was before that. And then having sort of doing a lot more of the more and more of the advanced work and the strategic work. And so then they're running this joint branded team, where we look at the opportunities for both brands

Robert Dooley 5:18
going forwards. So you're working across both Jaguar and under me allowed him to go pretty cool. And so what how did you guys want to design that portal, and also have made the transition to design lab?

Ex Senior Designer, JLR 5:31
Well, we we, for a while now, we be realising the importance of long term strategic work outside the current sort of set next gen cycle plan. Yeah. So it's done to stand, you know, really, the relevancy of our of our brands going forward. And so products and services they should be offering, bearing in mind that we've got changes in customers coming through the customer grades we've got, we've got new technologies, integrating, we've got, you know, that the landscape of my practice is changing out. Right. And we need to understand our place within. Yeah. So it's no longer about, I've got to replace that vehicle with this vehicle. And, you know, the active process that it was, you know, five, if you know, the cycle of next generation products. This is more about, you know, what, what should be up you should be producing, and where are the new opportunities for our brand?

Robert Dooley 6:37
If you don't mind, actually, then I'm assuming this presentation kind of links into that killer summit. Yeah, quickly run through that. Yeah. That's actually really interesting for me. Yeah. Yeah, sure. And then I can, then I can, I can sort of

tailor the questions a little

Ex Senior Designer, JLR 6:51
bit. Yeah. So facing, you know, global challenges, will be quite aware of those those challenges in one of them. But the biggest, the biggest, one of the biggest, overarching one is urbanisation. For mega cities by 2030 60%, of global population living in urban environment. More obviously needs than in the East and in the West. But as a general thing, it's a pretty major consideration when the population is going that way. And we're dealing with new new generations who have evolving lifestyles and values to you know, they no longer have the same relationship to ability that we did. And the way we

grew up with

influences of mobility on our lives is quite different. If you grew up when these ultra urban environments, you know, the, the way you look at ownership, and the usages is completely different from how perhaps someone in the West Midlands looks at it in it to get around its primary.

Robert Dooley 7:52
Yeah, so are you looking at in your research, and you're looking at the drivers, we have,

Ex Senior Designer, JLR 7:57
we have we are looking to drive. We look at the drivers, we look at the influences and aspirations of new generations, we look at a variety of things.

We generally think it breaks down into three things

to do with the information they have they have available teach during your formative years

of formative meaning more sort of 12 years old, on what

information you have available to you, your sort of network, and, and, and yes, of aspirations. And you know, in the 80s, that desperation were pinned up on your wall, and they didn't move for 20 years. Now, you know, all they did for me, you know, and the book and the book she had around you, from what from the library and from from Munich dad's knowledge and instruction manual for you to me, you can choke up the reason I'm mentioning this in everything that you you lived your life by was in your bedroom, or in your in your home, and your friendship circles were in the home, now you're looking at people that are gaming constantly, globally, they might have, they can have multi streams of information coming into their into their bedrooms, they're sourcing information and jumping between things sort of spontaneously. So the whole relationship to to brands and information and and it's completely different from between the 1980s and the 2000, and 20s. And how how these new generations interact with information and friends and build that sells online presence and everything is just completely different. And therefore we had the heart of that. This is when relationships are made with with brands. And what was running with made me going forward is still an opportunity. And you know how we understand that space and understand how people who related information easy, we have to get a grip on that. That's quite different from how used to be conventionally. So you

Robert Dooley 10:05
say still opportunity. Yeah, to connect through the bedroom? I think it's very interesting. Yeah,

Ex Senior Designer, JLR 10:09
Yeah, I do. I do. I do. It's not the only way. But I think how the point is here, understanding how you relate to new generations. Yeah, right. It's in the bedroom or not. The point is, yeah, you know, we need to do that. And you know, pin up the state on your wall for 15 years, already ingrained itself in your, in your mind. And now, that's not the case, it changing every week between things they want to every day, every hour between things they're interested in, they're not seeing the past any different from the current either. It's no longer I you know, I want the night, the latest and greatest new generation of product, there might be much more eclectic about what they want as well. We're sourcing things from all around the world that referencing back on information about it. It's not just how it looked on the pinup anymore. It's about what does that what does that vehicle silver or that brand stand for? What is its messaging? how transparent Is it about it's how it's manufactured? its global footprint? You know, there is lots of information that needs to come forward simultaneously now. Yeah. And that's different from all that was a good looking car on the wall. Yeah, it's, you know, how does how can those brands service me and reflect on my life?

Robert Dooley 11:19

I find that that that that geographical placement of bedroom really interesting. Yeah, and I just I wonder if it's still bedroom?

Ex Senior Designer, JLR 11:32
Yeah. Maybe it's maybe it wasn't even the bedroom, but it was certainly one of the places. Yeah,

Robert Dooley 11:37
I know it Biden bedroom. It does. I mean, if you think about the big picture two bedrooms in 1980s films. That's right. The engine is that that place, they had the first private space, but I wonder going forward, what will then what what what what space Do you have as you grow up?

Ex Senior Designer, JLR 11:54
That you there, then it might be online? Sure. Yeah, maybe that bedroom is more digital bedroom? Maybe it's not even the physical space anymore? Maybe it's the fact that all that information is now within device almost. Yeah, yeah. Plastic up around the room, I don't know whether this still gets over the point that most interesting anyway, the relationship and touch points, brands touch in the a new generation is really difficult, different. And what they stand for is really different. And the way they live and prioritise things that can extend who got that. And along with that, their attitude to mobility, you know, the way they move around and where they want to move around the season. They using, you know what's right for them at any one time. It's not like they don't travel until they're 18 and say, right now I'm going to buy it 500 quid yesterday. They're using you know, mobility services constantly. And they use them for what they are they don't, you know, they're not sort of ownerships no longer really something that's on their radar, necessarily, obviously, some people are, but the media is not. And, you know, again, what is the opportunity for, for our brands in this in this modern world where their mobility has to live alongside all sorts of other connected services? Do you think there's a

Robert Dooley 13:11
trend towards or Nomad ism within merging generations? Perhaps? Yeah, so not living in one place? on the moon? I think in places,

Ex Senior Designer, JLR 13:23
I think I see probably not explored that avenue, quite so much, but will more explore this, he can probably imagine a scenario where

in this current framework, it seems difficult to believe but

if we think of cities, probably competing globally to attract the right talent. Going forward, Robin, you know, again, in the 80s, we were we had to learn our skills and, and, and, and get our careers going in the right way. I think now, it's about you know, the cities will have to sort of compete globally to attract the right talent. And if that'll be all about who's offering the right quality of life, who's got the you know, which places off of that. So I don't know whether nomadic right thing, but I certainly feel that there be much more much more prioritising the quality of life issues, rather than

necessarily what we did go wherever you had to to get the experience we did. Yeah, okay. Okay. So said there are emerging aspects to that. And also, you know, that we're facing a technological revolution. And in terms of both integrated how the how the car integrates into society, and how the technology the car is also developed. So we end up being that you'll be you'll be this will be new news to you at all. The obviously the three the three things that are top of dominated mobility, connectivity and electrification that, so to come together to give the opportunity of shared services, and how they how they use I think you probably probably know that

Robert Dooley 15:09
interesting. I haven't

Ex Senior Designer, JLR 15:14
I that is not confidential.

Robert Dooley 15:17
This is much better. I've been doing is a three is autonomy, autonomous, connected electric. Yeah. But I think actually defining connectivity and share Definitely, yeah, yeah.

Ex Senior Designer, JLR 15:29
Because the Shared Services come out.

And really, these the things, these three, these four things, these three things plus one, they're going to basically allows they allow it, they will allow Jayla to sort of innovate for an emerging marketplace and mobility and they'll allow us and they emerged as an opportunity eventually to find a brand experience that goes with that.

And that's in essence what we're trying to do in this ski they

understand, yes, they

can

say to see live for autonomy

solo film we made, so tell some storey Yeah.

Unknown Speaker 17:00
Come here. Yeah.

Ex Senior Designer, JLR 17:12
So in the ServiceNow, the mission of his TV is to create visionary long term products and service concepts and fuse customer expectations, competitive technical innovation, defining outstanding experiences for customers, your love for life, that's the last bit that's our corporate triangle for life. But, you know, that's in essence, what we have to do in this and we doing it in the studio through three things, collaborating, I dating or cultivating and communication, and we the mixture of those activities are

constantly what we do here. Another way of looking at this is, if you look at, if you look at the activities, we need to do this two things, you know, one understanding the competitive landscape to remember landscape. This is

Jeremiah

saying, but we try to visualise, you know, these chats for for vehicles.

Yeah, so you know, what we're trying to do here is look at

areas of opportunity

that would want us to share this. But basically, we you know, look at vehicles for different things, their own and cherished vehicles, like electricity types, and things that just rely on charm. But there's a place for luxury chauffeured type vehicles like brand, new XEJS, and stuff like that. And then, then performance vehicles is called spells afraid vehicles. So performance based, and then we go through here, we sell two vehicles that are more towards shared services. Vehicle settle for on demand within the industry environment coming. And what we have here is what's in circles, it's big, it's big. What we're saying here is we're trying to just open up the company and say, well, it's no longer just about the vehicles, you know, all the services that go with the services are as important as the vehicles, the digital enablers. Say, you know, you could approach basketball, for example, yeah, support basketball, gives you some flexibility usage on this side. You know, there, you know, we could be doing things where we shared mobility services, but linking to third party mobility providers as well. You know, there's lots of opportunities around it's big things differently. So the bonding is we start to understand our products and services come together. So we're trying to say that, you know, the urban landscapes different from the mobility landscapes different. So that's about big picture, what vehicles what services are relevant. And then the second, the next nature of what we do the flip side of what we do is, what do we have to due to our vehicles themselves to make them relevant, and keep them up to date with the right technology service, integration of autonomous technology connected services, that kind of

Robert Dooley 20:10
thing. KO meetings are

Ex Senior Designer, JLR 20:12
in the pre kickoff stage. So this

week, pre k programme is pre kickoff.

Robert Dooley 20:21
So if you could just

just quickly just

contextualise, what the work you're doing? Where does that sit? I'll show you.

Ex Senior Designer, JLR 20:33
How do we face these challenges.

So we last mentioned is about collaboration. And, you know, what we try and do is bring different teams together. So we can it's building we have the the innovators, the technical research teams. In India, the engagement, we have the product strategy teams, and really our role is to bring these two teams together to be you know, with the visionaries that can sort of bring the market opportunity and the awareness of the customer where we customer trends. And I think it's coming together with the technical innovation coming from the research teams. And that and then, but it's not just about working with them, we need to collaborate and work across different teams as well. So we work with the advanced manufacturing and powertrain team to work with technical specialists around the business who work with legal and IP work. We have been fed, we have infotainment teams, in Shannon and, and Manchester, we have in motion in London, who we work closely with on digital services. So yeah, there's a whole lot of people you need to interact with. But basically, we're the sort of ones that can sort of facilitate bringing that together and looking bringing, they're showing the opportunities out of it. Yeah. And then it's in terms of the team here and the process in terms of the cultivation side of it. You know, if we're doing three, we're doing three things, we're understanding the teams trying to understand this, you know, each generation has expectations for personal mobility, and with the store evolution, sort of, kind of what we've got to understand. And the team we have sort of works together to sort of understand these areas, which is sort of crafted luxury. Well, they're all they're all of the input signals really, to him for making our team and informed and creative team. So understanding the mobility market understanding. Ultimately, market Keith Keith global chains basis is a massive subject. So today was was examples of aces of autonomy connected, and then the shared services.

So you need to sit, you know, Robert, who are industry business scene and

feature blockchains friends, as well. And then we with this team, we also try and innovate in the way we communicate what we do. This is the slide he wants to see. It's not exactly right, there's some afraid, but if you think about it, we were looking at the soul brand vision, technical trends and design innovation. And that feeds through in sort of three phases. We have sort of sown three phase where we can impact the technology and the MMO holistically what vehicles and new mobility opportunities are. Horizon, if it starts in horizon three, we can do that if it starts in horizon two, it's more question of just making getting aligning storeys. And then and then what we're what we're doing is we're basically filtering our work through the advanced teams, which sort of started about a year out from from KO. So we have advanced Thomas teams, we have a graphic design teams. Yeah, but never before this company look more than about six and a half years out.

Okay. You know, depending on the Advanced teams down the road, they might look up to a year here the bit but clearly look up to you. And

then you know, the chances of you getting a new seat or something I've read about just the modification of the exact age tracks the the ventilation system, whether packaging the IP, they might have a years of development time. They put across 16 models. And if you show up here and say, Well, I don't even have an IP in the car, an IPS an instant panel. She said Don't be more than that. from Canada in the car.

I won't turn around see so good. Sorry. Say

that say you know what, if you want if you want to be talking about that stuff, you could be somewhere here.

Robert Dooley 25:14
You listen not

Ex Senior Designer, JLR 25:15
fixed, Tommy, by

the way, they can fluctuate, Sean, how are you? We can share

something more generic, that'd be great. I'll get one of the programme managers to do that. So that's the approach.

Robert Dooley 25:32
The reason for me to have that is obviously what I'm doing. I'm using that to build my own list to understand how things currently are in the DNS generic way. You know, obviously, a diagram itself is

Ex Senior Designer, JLR 25:46
far more powerful than that. Yeah. So basically, we The point is here that we work more than six now.

Robert Dooley 25:54
You're working on average about six?

Ex Senior Designer, JLR 25:56
No, the point is that we need to do we were recommend the white. Yeah. Okay. So and then, you know, in terms of how we communicate work as well, we try me witness team, we try to use new digital tools to help us do things quickly. And, and virtually. So we try to nail so embrace this creativity on levels rather than just traditional growing, we have some really powerful tools we're developing to look at active aerodynamics over physical model over play models.

We obviously use visualisation techniques that can sit over the plate as well.

And we are so big studios of innovations are better this, the next storey doesn't look quite like this. But we're trying to have to get rid of how PC drives everywhere, when screens everywhere, so that people start talking to each other a bit more. And, you know, it's a bit more in an old fashioned way. And, and the other thing is that we

have tools that are correct for their functions, so that they can, you know, for example, I'm on the move quite a lot on my own, you just need a portable device where some of the guys, you know, work in Academy to big screens constantly. But the point being, you know, if we can get rid of visual technology, in studio communication, and talking on the ways to share ideas and be creative. Yeah, yeah. And you have to know it's not just about digital tools, like 365 give you necessarily they help communicate information around, but they don't necessarily stimulate the right answer, then you will be what to do is stimulate the right questions and answers. So but you know, very powerful tools will help to, you know, remotely

digital information like this around remotely nobody wires.

We've got a very interesting space with creative next door

running yet, but it is very close. So

we bring corporate strategy, research, design teams all together for the startup projects. And we can put any information we want on those walls to make these visual collages of new projects. And the idea being that if you don't go into it, and then we can capture that information and work on it separately, but the important thing is here that people can be spontaneous with information. Yeah, so phase three, like, oh, wow, yeah, remember, there's some it's really interesting links, and it's, I'll bring it up on the screen to you know, bring it up, sum it all up, you can reposition information where you want and then you can prioritise and create these kind of collage storeys. And you can annotate the screens and everybody can get sort of come out there meeting with a sort of, yeah, we want to do a project in that area that builds roughly on that colours. And that's the idea of have a space where people can really spontaneously do this stuff, the rules are changing. It's all about ups, opportunity spaces rather than platform utilisation. Now, it's it's, it's future mobility opportunities, races. Okay, afterwards, it might be about applying the right platform. But it's not, that's not the core of it anymore. It's about making sure you've got the right service idea. I mean, either, it's like you're starting the projects, one step further out than we ever used to. And yeah, this just shows you how more works then we got these ideas, ideation space, this is also one day we're going to do is have this that space in that theatre where we have these fine consultation, airy digital screens where we can bring people in put stuff at an early stage on these digital screens, perhaps with VR physical models. And we can we can ask the general public, you know, or customer groups very early on, what do you think about the idea? What do you think about this? Would you rather they are doing the normally that takes us years to get to that stage? But here we can do really super quickly? Oh, no, I don't think that's really worth going down that route. And then realign and you know, so much more spontaneous kind of reactions of testing and, and similar screens than what a big moves that was just me testing in the States but we can slide them all together for one big screen. So lots of so use of technology together things differently. We have an also demonstration area for new tech this probably less here. And then like I said, it's a space where we can bring digital information over physical media to digitise equation. Greater rooms. Yeah. So that does a rig that this is nomics. So this is the mock up in America. But you can see that the still taken on the

I had a real product. Yeah, I'm always sharing those you can draw over that still. Yeah, it captures the angle of that drawing relative to the model. And the customer can take those lines. And we we make that cast dated to that direct to that viewpoint to look right.

Robert Dooley 31:23
Okay, so you know, Android, like, gay try to get perfect cycles.

Ex Senior Designer, JLR 31:27
Here you can see on this screen here, it's a virtual ramp ankle. physical model. So again, that show you engineering data model was a better example. I'll show you the inner top in a you know, in a in a way large land solid car. So you know that that show you you know why this is important is because, you know, as we look to build cars differently, Simon sublet experience of some of the new condominium serials, like compensates and things. Yeah, so normally we know how to put it, we know how to relaunch I know we're door shoreline comes together, we know, we know how it's normally done, it's an inside and outside and a door opening above it, we you know, designers know that we know when you open the door roughly what it will look like if you put the line where it is. But now it's your look to compensate vehicles with integrated component tree, then you know, some of those, the visual way the claim will look is less apparent. So you need to have be better informed when you're doing the play. So these kind of digital tools can help inform about how you know the new sections have built up and how engineering parts coming together over what is a lump of clay, or, or in this case was a real car. So you know, it's very innovating in using technology in the process as well as to when we have a net instead of a traditional kind of the room where we look at the car. We have, we have this very clearly TY we can put models on the turntable and we can still make them very immersive into that space. So using a mixture of 2d and 3d and and that's kind of all I wanted to show you actually was really interesting. Sets about process. And also there are new products. Okay, that's really

Robert Dooley 33:22
when it was okay with you. I was a question. I'll present something to you. And then perhaps come through that. Yeah.

Ex Senior Designer, JLR 33:32
I think if you go we present on there, you can get it if you haven't. Be sure. Right.

might just need to press these.

Robert Dooley 34:52
So this is possession I gave to

you 3000 years. Family University family funded by families through fund by the government, three families but

my mom

and I haven't paid to preserve the assets this week. Why

Ex Senior Designer, JLR 35:19
is a different viewpoint?

Robert Dooley 35:21
Yeah, exactly. So this is actually a quote from someone who to me, that was like the real college I didn't study with. And this position, I bring it to the two strands. So my point is that if you look at car design, the Model A, which is the first real design for production car, and modern day for focus, in architectural terms of the formal elements that are very similar, we've got an IP go see them as kind of a reflection driver 30 minutes healthy, which is obviously always been there. And everything kind of flows from the driving experience to brag connexion and relationship made, and then that flows through the design process into the object, a lot more money and time is spent on the design of the drivers compartments in the interior, the design language flows from that, and the rest of the seats. And that's the thing, too. So I'm kind of trying to create most of new knowledge claim is a design process of places passenger experiences Central and post drive experience what's currently there. So the electrical, the jacket concept, and this, my kind of preview of it is it's a it's a hangover of drivers mentality. It's focusing on steering wheels, past present future. Whereas Why do we need a steering wheel when we've got a fully autonomous vehicle. And the other kind of default positioning on the right side is that point five is this idea of businessmen suits doing business and accounts. And actually, these emotional, you told me that far more opportunity than just doing space to do more working. And then just got into the Volvo. Reading the Volvo is really interesting. I think it's one of the most public theories that I've seen. That's interesting with all those concepts. And the way the way this was designed, the concept is interesting in the fact that they started with a bunch of scenarios, and designed from the sorry to use rather than just a standard time zone process. However, this concept still relies on the same ways of manufacturing. And so therefore, it realises that the same models in production are quite things be told. And that's something which is, so it's different. It's not that different. My Mysore, because it was, I think we can kind of see where I am now getting towards the end of this first year, I'm going out really wide to the literature review. And the next thing is kind of refine that down. And then development and every three years.

Those are driving.

So it's often a junction to autonomous vehicles to stop the academic studies and the public. But what I was saying was don't call it self driving drivers, because that that kind of misses the point of autonomy, which is about the connected with other elements, we spoke about choosing density five, so I did my research to looking very much around level five for automation, I'm not really looking at traditional. And this is it this kind of Holy Trinity, which is shared, and electric, and then auto Thomas, that was lovely. And we actually need to redefine that as for the beginning of my lecture, the and this is where this idea of I didn't quite a single book comes in, I kind of had this idea for a while, but the problem with lack of critical discourse, and, you know, proposed Rob website, when I went to my, my books on their content, design, their

results. And now the books. And the books are written. Generally they come from a engineering perspective, they either come from enthusiasts perspective, where they come from how to sketch it. And the problem with all is, is there's a lack of critical dissonance now, because I like to compare yourself to architecture more and more, it's more more of a trend. But actually then architecture, there's a very strong tradition of critical, critical discourse, and a strong tradition of architectural theory. And none of those exists within their affiliate electric rafal Auto, but I know when you say was that was my supervisor, my dissertation BRCA, but he comes from a design History Background, there are there are no design practitioners that actively reflect on car design, beyond giving a few interviews, that's very different to architecture webinar, heads of studio, Patrick Schumacher, and disagree on many issues. But he is head of studio heads are architects with constantly writing doesn't happen with

the education and culture.

So Greg Lanza described as a relatively close shop, and it is it's a small city, conservative industry. I think probably because of the risk and the company do this work with birds, it's, you know, it's just a brilliant aerospace or construction in terms of risk, it's highly complex. So actually, when you are working with in this kind of environment, within within forest within a forest production schedule, is actually it's not going to welcome criticism, because criticism is a risky activity, and therefore, anything is critical is kind of going to be removed and not not endorsed. And cardless Studio does look rather like this. You know, in countless uses, the majority of people are still male. And they aren't diverse. And they're quite small, small subset subset of people who are cards I guys writing my dissertation, and we're always on gender, it almost feels like there is one book, which I came across with Michael Jordan Medicis X, FCA. And he breaks down into these these steps, Jesus nice dialogue counter to show and it's a good book, it's interesting book. But what it fails to really do is place big design process within production schedules. And to actually acknowledge that has a constraint and there's something that you have to design with it. So I my research, I'm interviewing people on the left are the ones that interview people the right or left to interview, because there aren't these books. And I'm excited to go out and get a really good understanding of the process. And the big thing that came out of all these interviews, and keeps getting confused is this idea of platforms and the platforms.

Ex Senior Designer, JLR 41:35
And like I said, there was a sorry,

not what I said, No, you said I do think

Robert Dooley 41:42
the electronic platform

Ex Senior Designer, JLR 41:43
still. Now I said she said to the opposite. He said it's about understanding the landscape and experiences. And then it's about alignment.

Robert Dooley 41:54
So in the future is what is what do you think it will be about? Yeah, yes, the life was very much about how things have been happening. And I think that's a real restrictions. He I think we agree that that's needs to change that we need to get rid of platform uses it but sorry, if this is very much a case of understanding how things currently and this is taken from forward, and you decided to use it for platform. And if you look in here, we've got some sort of simple introduction of posts for them, which is you're looking at ways of customising that, you know, the electrical family on the right, you've got vwo throughout the market opportunity, you can customise it always customization within the confines of a production line. And so if we look, what we've done is we've actually got production lines on the right today on the left, the original full production line. And all we've done is we've automated what the workers were doing on the line with us robots to replace those people. And so if we're using fundamentally the same models of production, it's not really that much of a surprise that the final project is fundamentally pretty similar. And that would be my criticism of those concepts like the Volvo 360 which is a really nice concept in many ways. But actually, what it fails to do is it fails to offer tells to break out of a model of production and therefore can offer the flexibility is required to provide all those centres and the future

Ex Senior Designer, JLR 43:23
that certainly wasn't it was a modular modular architecture modular power train, okay, the whole body structure with with different

powered axles instead of a platform based solution, okay.

Robert Dooley 43:45
So today's agenda is to touch on briefly there is a trend and moment to compare architecture and design. And, you know, you see that in production vehicles, something kind of architectural, like you described, but the driver or any Range Rover, and then on the right also you see it in, in concepts as well. But by really, I mean, there are lots of SEV The classic example Yeah, same as Georgian architecture, this is where I disagree

Ex Senior Designer, JLR 44:11
with you, okay.

Because

any, any vehicle going back to

say something around 60 centimetres or Italian, Italian car design was influenced by boat by the boat industry and the boat industry.

terms of understanding

in terms of understanding classic views of vehicles, I flat views, which are front side, yeah, we plan shade, and they telling cut them today, Italian colour design is based

on those traditional by and what they allow you to do is evaluate architecturally and to the glue and to the Golden Triangle. Although they don't reference it, they all look good only because they actually perform correctly on the traditional methods of architectural understanding. Yeah, portions to count design relates back to the portions of architectural models, basically. Or practices to

Robert Dooley 45:32
theologies. That's why that's, that's where I would disagree that is a it engages architectural on the fall element. So in terms of static as a surface, but not as a structured

Ex Senior Designer, JLR 45:42
knowledge structure, but as a as a as a as a volume. proportional element. Yes. So definitely follow the rules of date, follow the rules of architecture, you. And it's only now that you see that really breaking down with a lot of the time these products where you see you may see something like an eight for example. For us, it looks in the BMW. Yeah, it just looks like to us actually, probably this is like a coupe. But Chinese buyer actually looks like a sports guy. But you put it on side, when that attack Italian traditional Italian model, and you probably go No, it's definitely okay to stick up or say the same. It is really interesting that the I think, you know, the rules of how things take away the lines, the colours, the surfaces, and just look at the side views of the of the poetry. They the volumes and the proportions of those vehicles. Right from the 50s and 60s, um, well, even earlier today, there have been have been have been following roles of not just architecture, but halfway things look on paper. Yeah. Okay, look correct.

Robert Dooley 47:10
So, what I would suggest I think you're right, and I agree. I think they haven't, they haven't actually, I think this is the reflection of the lack of critical discourse within big design is that they haven't engaged beyond the the visual, they haven't engaged structurally.

Ex Senior Designer, JLR 47:24
And Okay, so, so. Okay, so that's fine. Yes. Fine. You say that.

But go back slider. Both of those vehicles have got to work on an emotional level. Yeah. architect everything works on an emotional level. And those, those key vehicles can be quite emotional in different ways.

On those proportions, but I think

Robert Dooley 47:59
so. So therefore, this point, why why do we need to worry about engaging with structural architectural structural issues?

Ex Senior Designer, JLR 48:08
Why do we need to engage with it emotionally? Yeah,

sorry. Yeah. Okay. I mean, we need to,

even in new generations with saying the emotional connexion to

two products is still there. But as it

is, I would challenge that it's I'm not saying that perceptions in the same way in but I'm saying people really want to relate to things to them at an emotional level. Yeah. And that, that's, that's justification enough. Yeah.

Robert Dooley 48:41
But I would challenge that by saying that, that is perhaps perspective from from the driver mentality.

Ex Senior Designer, JLR 48:48
No, because we know now I'm not talking about owners here. I'm talking anything, anything from a Louis Vuitton handbag to people are painting on an emotional level with your host services, even if they don't own them. And they're just using the Thomas heavyweight bras. There's no reason that product needs to look like it does. But it but it's become an iconic product that people love, because it does appeal on an emotional level.

Robert Dooley 49:18
I would disagree that they above it. is when they launched they were incredibly popular. But I mean, because of the because of the and I think this all ties together because of the you know, the faulty ektron

and I'm not not

vitamin B's that actually you.

Ex Senior Designer, JLR 49:41
You, you get all that right. You put an emotional product at the services. And I think there's

no, but if you set aside on that, you just put a normal red bus next to Thomas Hedrick right in the middle of London, blank straight and ask people which one do they want to go? Yeah. No preconceptions the same service? Same? Have Miguel say go for the emotional side? Yeah.

Robert Dooley 50:06
But I think that's the point is that it's not coming from that perspective, I think what's happening is,

Ex Senior Designer, JLR 50:12
it has to come that has to be recognised as a valid way forward.

I came

out of its, this is not something linked to drive. This is something to do with people. People are a bag of nerves and driven for emotional challenges. Yeah. And at a human level, we are we are visually affected by how things look. And and whether it's a flower, whether it's whether it's whatever it is, and and people make that is one of the input signals we have to work

Robert Dooley 50:47
with. But I would say that it's it's not it's going to become less of that. I think the importance of how something looks visually, will become to build emotional experiences will become far less important to the feeling of bad experience.

Ex Senior Designer, JLR 51:02
I disagree to the service experience. Now. I think we've got it, you've got to get in both, right? I

Robert Dooley 51:07
yeah, I'm actually I'm really not trying to diminish one over the other. What I do

Ex Senior Designer, JLR 51:14
I do, I would rather say that it says have to improve? Yes. But But I would say that the emotional level doesn't need to change, you gotta stay there where it is. But what you're right with this services, and the experiential nature needs to be more people are not doing the difference between the past and the present. was up to now? Okay, that's a beautiful sign whatever happens, I'm just gonna have to have it because yes, fantastic. Yeah. Right. Yeah. That's how it's been till now, which I think has got it must, must have something

Robert Dooley 51:49
to do with driving psychology, because

Ex Senior Designer, JLR 51:50
I know, that's had to do with ownership and, and aspirations and how people perceive you. And the perception, you want to give yourself a vehicle, right? So that's, that's one thing. That's probably how it's been. And people have made huge compromises that mortgaging your house to buy a Ferrari whatever it is, yeah, yeah. Or at a small level it might be to buy to buy that device. You know, but now, people are very much. God looks great. But how? How transparent how, how well does JLR look after its employees? How much they play it on the production line, how much energy is used to produce it? how, you know, all the transparency in the brand, and what the brand stands for behind it? It's got to be there. So that those other values that are influencing it? And then how good is it as a service? How, how does how well does it get me from a pig? how did how efficient and all the other things that come into it? So I would say that it's no longer I just want that I don't care about how it drives or how good the interior is, I just want it now it's well, you know, I'll evaluate that. And I'll let me write that. And I will validate that and by the way, I have not going to live with any American, I'm going to live with using public transport four days a week, using a shed car for the weekend with my mates. And and I'm going to use for

long term is I'm going to use those into the what I'm trying to say. And I think it's the same with you they that that viewpoint of stop because as they're playing down the value of the looks, and it's more than they evaluated with a much wider perspective. I completely agree. Yeah, yeah. Don't Don't just focus on the one thing for that it's not just the structure for the year that makes the difference. It's a whole host of stuff.

Robert Dooley 53:57
Ya know, and that's kind of that's kind of what my argues is, is how when we say that, you know, because it engages the dark edge, we're talking about individual level

Ex Senior Designer, JLR 54:08
maybe with with a portion

Robert Dooley 54:09
and that sort of thing.

But I mean,

architecture, a long history, look up with it is watching minimum, which was really interesting, because that was driven by his interested in planning. And on the right, I don't lose, developed a concept track, which actually was he was he was doing rather than from the traditional side with the cards on his drone photography, and I'm doing so that's that's been happening that is so that was that was about simplicity.

Ex Senior Designer, JLR 54:39
Which one be busy as well.

Robert Dooley 54:43
Yeah.

Yeah. I mean,

Ex Senior Designer, JLR 54:46
but that's all right. Yes. Fine, I think. Yeah. It's also about I would say, I would say that was ultra conservative.

Because it didn't, you know, sleep out still at the windows in the same places is a car actually, yet? Yes. Yeah.

Robert Dooley 55:01
Yeah. But anyway, don't worry about I think his approach was about how it fits into his, his his the Australian climate, right. So it was more but outside. And let me see some engagement from big design in architecture. But I would say this is this is engagement on again, the formal aesthetic level. This was a project he was doing. And this is about this subject. He was doing a project project, Jackie, what studio did with another company after

years ago.

But within architecture, that's been the first digital that started in the 1990s, late 80s, and 90s. And it's really defined by this idea of parametric ism, which you may or may not have paid off. Yeah, that's

Ex Senior Designer, JLR 55:52
just the visa programme allows them to do stuff that couldn't do before.

Robert Dooley 55:57
There is no idea as to whether or not they could do whether you could do it not mathematically allows you to do within a within a realistic time of production. Yes. Yes. And there are lots of things politically, socially, economically, a girl grow this business value example of that kind of architecture here. And but what happens is we see and we see the digitization of architectural design tools, but we don't see the distillation of production. So the Eden Project and calm was a great example. I was there again, a couple months buttons right here. Yeah, I mean, whatever the structure is not really work. But the point is, you have these sort of grown looking like forms, but actually, when you look in there, with the scaffolding, it's producing exactly the same way. So what we have is we have a digitalization design process, but not a digitization of manufacturing. And if we look at personalities, and we start to see some these of these, these sort of trends of parametric tourism creeping in, so you know, this kind of thing on the on the grill, the front, on the Volkswagen thing here, you know, with the ice and the iPads, and that's the thing.

Ex Senior Designer, JLR 57:12
That's no different from the 1920s.

Robert Dooley 57:18
Yeah, but I think what we're starting to see, we're starting to see if you compare that visually, we're starting to see in terms of the designers that are being used to seeing an alias, and the introduction of Dynamo. And that's the thing which is being used to produce this some things which could be British before, but generally one, though, produced very badly, whereas this is being put on a Volkswagen concept.

Ex Senior Designer, JLR 57:40
So we don't know what you're trying to say here.

Robert Dooley 57:43
So my point is that we've digitised the design tools, and we haven't digitised the manufacturing. So I'm stuck with Spencer, what I'm looking at is some things which being turned the second digital turn. This is coming out of the Bartlett's and in this taking business 10 by Maria cafe. But the most recent publications is discreet which is acquired by GO spread some huge work to the button. And what the discrete seeks to do is to rather than just having, you know, digital designs, and then fabricating things and traditional methods, this is actually digitising the way we make

things. And the most basic example of that is, you know, using a que, so a Lego brick is discrete, discrete, it means an individual unit. And the idea of being that you combine within the design process, using computational power, mass computational, and then using robots as production in production, you have these individual units, which you can then build up so you can imagine Lego you can stick together and you can put it into a group of things. That's very different than the first digital term, which was all about trying to use digital tools to make these continuous sweaty forms. This is about using discrete block elements. And this is done some some work done deals different housing projects, which can then be assembled by robots. And so then therefore, they can be assembled or put together. So it's about you treating physical materials as digital objects. So square, or cube, it's just like a pixel. And then you build those together. And there was a meeting in the arms are not just using squares and stuff about the design to experiment with different forms, and it can be used, it could be interlocking. Now what that offers a whole load of really interesting opportunities, because that means you're not relying on tooling to make objects it means that you have flexibility. So car interior can be configured one way, and then for you know, either later on the big whose life or for the next passenger can be reconfigured into a different way. So that's what I'm really interested in looking at. Yeah, I'm what I'm what I'm doing is this is there's a huge amount of work to do here. And I'm very hands on a lot of CNC machining. And that's something but I've also a lot to learn about robots, as I'm just beginning of this at the moment. Yeah, I mean,

Ex Senior Designer, JLR 1:00:02
it's just, it's in the back of my mind. And it's worth noting, right, just all I would always say here is that a vehicle has been, as you said, highly optimised for the last hundred years. And every time we've gone through that iteration, it's got more and more efficient. So for example, we went away from having a chassis and a body.

Because

the amount of stiffness required the CNC combine the chassis with the body, then no longer the unit, you could reduce the weight by a third probably because the map material needed was could be reduced, and the whole body side became the structural element of the video go rather than having town. And then this structure club with an outer structure, you know, for the more the more obstacle wouldn't frame and then added medium but another medium skin, I mean, say basically incorporated the professional neither in the Morgan were structural, structural, it was underneath 3333 structures to produce the Yep, something they keep the rain up, basically. So you know, more more, you have more you have now is one, because you have the body side, that is the structure of the car, and the and, and, and there's no in a panel in it. So what I'm trying to get out here is that we do look a lot about putting modularity back into vehicles in CG for modularity. But this is in the maybe in a nice way of doing it that's happening. Is it easy for me, galactically input extra complexity and white, when it's not actually required for for those functions, which is why it's always a difficult, you'll find out that's why why a lot of resistance is that idea. totally understand, I think this and that's that that's the only thing to note. So when we when we talk through these are already in this image, you can sort of see there's a lot of structure there to support the flaws are now to see in a traditional you know,

hunk construction system that you would have on a built on a three storey building, and normally with the glass around outside, it would be all of the middle through, you know, and humbly extent. So, you know, that one saw saying, it's, it's, it is. And when we talk about elements that build themselves, if they build themselves as they go along, they have a strong, I can see so far we've seen that they have to build themselves each time with enough strength to carry the next thing, whereas some actually they just over completely over over engineered and, and they're not efficient structures then and so you bought the important the the greenhouse one, the

Eden Project here, in project

in there came from, it's the same as a wallet in Bama from the war when Wellington bomber from the war. It was actually it's a geodesic structure. And actually some very incredibly clever structure because it carries all its low 3d skin with no price needed. And and they need allows you to do quite, quite clever shape developments as well. So I think I'm sort of saying is here that there's this incredible efficiency to that, that that structure

Robert Dooley 1:04:02
and building. But once that's only that is once it's been built, and when it has been built

Ex Senior Designer, JLR 1:04:08
yet. But it's very, very well not necessarily that one, but it's very highly optimised around its need. And what we do see from mobility going forward is if mobility becomes more on demand, and people take more products and meet individual journey requirements to meet those individually, individually expenses, they move a big way from the being compromised vehicle we have today, which is when I want to buy a vehicle today, I want to think about my holiday and taking the kids to South of France, and therefore I need to have an estate with business, this much space in it. And you compromise your whole year. And all your whole three years of lease year for that requirement. Because you know that that's the one time you will really need it. So you suffered the rest of three years. You take that away. And you you you say right now I'm going to borrow vehicles or use different mobility things for different requirements, you start to see that they could become highly optimised. I just want one I could sleeping for that for that journey itself France. And by the way, when I get there, I'm just going to take the shortest thing that allows me to drive around nice or, or to all the all the grand Konishi wherever you want to drive it. So what I'm sort of saying is that the rationale, the rationale that I told about the new generation, that they will have that I think they're evaluating things like that, so we might not be looking to adapt vehicles, we might be looking at that the vehicles have become just again, much more different and much more highly optimised than basically the one four wheel. Five metre number of metal. Yep, no, I think I probably agree. Yeah, I think I think it's just way we can PJMV sila. Yeah. Yeah.

Robert Dooley 1:06:03
So I think it's RU. Yeah, so I don't know, I'm finished. And just a few points. That I think the thing with this is, it's, it's arranged in a trilogy, I think what it does offer, I

think it breaks away from the fullest production, it's post all lyst, it doesn't rely on a production line. And I think that's really important, especially as you see, you're not gonna be selling as many vehicles without selling as many vehicles in the future. It's not the services that are being provided with this business. And again, this is fairly speculative stuff. In terms of the structure, I think one thing it's really important as well to mention about this, about this process is it doesn't just use a designer of ease a huge amount of computational power as well to experiment with solutions using initial blocks. Yeah, I have some criticisms of it. And I think that actually just to say, Okay, good at the moment. So as well, sorry, scalars. Well, the moment is being used to do housing or Valium, or that there are some people who are using it for furniture that actually a cost, it's dying. And I think in between those two scales, that's funny that chairs because that

Ex Senior Designer, JLR 1:07:18
ended up with a

Pantone change, isn't it? Yeah, yeah. And it's someone's given in the parameters of that space. And then it's filled those things up to me that I've only read

Robert Dooley 1:07:32
a little bit about this concept. And I think perhaps that was the point was to use a familiar format, it was more about demonstrating how this with this this individual, this discrete unit could be could be configured to make something.

Ex Senior Designer, JLR 1:07:45
Yeah, more and more interesting to see what it makes to support you without.

Without that parameter being included. Yeah, yeah. Yeah, for sure. I think, then we would see something really interesting.

Robert Dooley 1:07:59
Yeah. But my problem is twofold. I think, because of the scales they're working on. And I think this comes back to this is the thing we were discussing earlier. Well, I think they don't provide is the level of finesse and detailing that is required by the equal designer in order to create that emotional connexion between brand and person? Does that make sense? I think, at the moment, this is very much defined, and looks as architects work within large architectural movements. So disagree being a movement, modernism being a movement, whereas big designers work on a smaller scale, they work within the they work within a brand, and work within a brand language in a visual language. And I think what needs to be done here is this, this methodology needs to be adapted, or changed to make it more suitable for visual designers. So that, you know, you could have discrete elements, but that discrete element has relevance. And then as the wider whole can can actually offer that brand experience. Because I mean, you know, that my suitable for whoever's making that chair, but it's not going to be suitable

Ex Senior Designer, JLR 1:09:03
for Channel, do you know, the,

you probably seen some days, carbon fibre, billions be made.

architectural design,

where they literally have the load parts of the carbon fibre to support the objects support the pavilion, and the reason I mentioned that is, you know, when you when, you know, we have a lot of we work with the structural analysis teams. And on so critical low pass around structures, and where the opportunities are to do things with that as well, yeah, especially when you want to accomplish it, okay. And

if you

if you start to really understand some of that data, you literally putting structure, just where you need the structure, yeah. And you actually get these very highly optimised. And then you, you work the other way around, you work to say, I'm going to protect this bit of space, from that form, from that computational development, you protect our base space, and it works out the structures around that space to make it strong enough, now you've taken that better way. So you take it back a bit where the guy sitting, for example. So the end The end for you can do it, vice versa. So, I mean, what's interesting for me, there is the way bending, and that can work with different materials and different characteristics. So use that to sort of you can use that sort of, that's how we did that feature. typeform, we worked backwards on it. And that landed up with this kind of structure that is the shape of the structural skin between the wheels, basically. Yeah, so when you lay a few aerodynamic returns, so with that, and that's what you end up with in terms of XXD reform, yes, get it out the right drag coefficient.

Robert Dooley 1:11:06
So, so that's interesting. So you're what you're doing to bring this competition tools into the design process?

Ex Senior Designer, JLR 1:11:10
Yeah, yeah. So I mean, I, you know, today, you know,

there will be studios out there that very much are still just starting organisations. But I bet the most of them if you went in now, copy doing similar things to us, where they experienced his first understanding how manufacturing techniques, everything can influence and do things differently. We're not, I wouldn't say where they're holding back in in one area. But what I would say is that we're all developing now a much broader variety of individuals into the teams to reflect that, to might have a good exterior stylist, good interior, design, seat designer, YP designer, but most of the work we would do is more the the research element, the what type of experiences we're trying to create, then trying to work in a more interactive design approach, which is why I said it relatively might, we might even play out scenarios where we have a space in VR, and we literally, fail scenario of a child of mother getting in the car with

I'm going to say, for the sake of this father getting in the car,

which is often me, getting in the car, you know, trying to pick up the kid going and getting the shopping and putting in the car. And what I'm saying is that anyway, whatever the scenario playing out is we do it virtually. And we do shed scenarios, all sorts of things. And we we literally can start to understand, you know, in 3d, where do we put surfaces and not objects to actually want me to put that down the back there, I need this here on the Welcome to turn round see the child, we start playing on similar we do all a lot of that virtually now. And that allows us to sort of, even before we make any final designs to understand where everything needs to go. Yeah. And you know, that's probably more similar to how you find aircraft. Look, you know, aircraft interior teams working.

Robert Dooley 1:13:21
What's interesting say is that you're bringing in, perhaps you're bringing in yourself methodologies from transportation design near Robert as well. Yeah. Yeah.

Ex Senior Designer, JLR 1:13:37
Okay, that's the end of that, I'm going to give you one more thing as well, because it's something we sort of think about quite a lot as well, is

if you think about the Greek the 00 carbon side of this, and you know where automotive industry is and where it's cool to get to and mobility as a whole. Relax the electrification part of the equation, presumably, you can have the clean energy to do it. electrification of vehicles and using frugal resources for batteries and stuff like that, presuming you can do that properly. Electrical vehicles have a quite an analogy to the horse in the car. Because in the days of the horse, Nicola, when the first sort of focused on coaching square moving people around, they had horses every 25 miles. Yeah. And the carriage took you on the journey to the south of France. And every, every every and he stopped at the change the horses, he moved out 19, you see where I'm coming from about the range and charge and not say you want to do it like that. But the reason I mentioned it is, these forces could add 25 miles.

And that was already a lot because of the weight

of the character is low. So they were the efficiency of the design and that carriage in terms of the minimal suspension it had in terms of the wooden construction, because it's very like stiff material. It was highly optimised the spokes of the wheel. Yes, highly optimised design for its time. Yeah, probably, if not, as highly optimises a modern car. So now we look to electrify the car. And also they didn't have a drive in them. Because the horses were outside and the drivers on top.

Then we developed the horseless carriage,

didn't we. So we put that driver into the front of that carriage. Yeah, right. And then we realise that the engine needs to go into front properly or underneath. So then a massive tunnel developed down the middle of the car to take the drive

trains, the wheels.

So the logic of the whole cockpit environment has come from this legacy of the hole in the car, causing the cart through to the engine get an integrated, the driver getting integrated. And now what you've got to see is we're going back to that stage of not having necessarily a driver incorporated into the vehicle. So the and therefore, I'm not necessarily having an engine in the front. Because it can go in other places activity in it. So all of the legacy of the systems of the vehicle are actually sort of changing. And that's where that opens up. opportunity to really rethink the car. Yeah, I agree. Yeah. Yeah. And I think, you know, that goes for the manufacturing go to the mall and the space layout, the the look at the vehicle, everything, it's all up for grabs in, you know, in jail, I've been quite critical of jail as well, that, you know, and it's maybe something good, what you're saying as well, is that I think cards, I'm, we tend to say, Well, you know, we can't quite get the proportions as we used to have them somewhat, I'm really pushing for it. Yeah, we still work with the Golden Triangle, we still work with how things look and feel. But we don't try and replace what we currently have with electric car, let electrification do something different for you, and then you'll get the most out of it. So what we have to do is really encourage that mentality that, you know, you think through the opportunities, rather than the restrictions being in the same? Can people think the restrictions can its restrictions compared to what they used to? Yeah, but actually, there are, you know, opens up opportunities equally

Robert Dooley 1:17:45
wife and the iPad is the

Ex Senior Designer, JLR 1:17:46
best electric vehicle. And that moment, you haven't even that's quite conservative. So we, you know, the opportunities there are huge, and I'm sure in the manufacturing as well, as long as we understand the efficiencies of Kendrick already has, yeah, then you know, he, he can he can work in that area as well.

Robert Dooley 1:18:07
Yeah, that's really interesting.

Ex Senior Designer, JLR 1:18:10
I shall get you something on that.

Robert Dooley 1:18:12
So just two seconds. So this is my plan for the next two years of my life. Yeah. So what I'm doing now I'm working with the guys, and I'm developing for the next year, that year to got a nice little robot, and robot, robot for assembly. And what I'm doing is I'm going to take the discrete methodology, principles process, and iterate and try and develop something is more significant than what I'm planning to use my third year, before I start writing up, is to go and work with some design teams and do some sort of sessions whether that's like a week to weekend thing, and actually got some some ideas what I've got to do use this new process to design a seat to design an IP to design a system for customization, whatever it might be, not just not just

physical objects. And the idea is is to go and do that with different Kaka Yes, yeah, sure. And then try and bring that together in some kind of exhibition. So I've got contacts with a couple of places. I'm thinking somewhere, probably Design Museum be in a tribe on an exhibition of the cool guys. If you guys be interested in me always be

on here. I'll get in touch. I'll keep you updated. So yeah, I'd like you to Yeah. And then I will

be about that moments like what I've got this this fat mythology to that and

Ex Senior Designer, JLR 1:19:36
yeah, you know, come back to us each day. That'd be interesting. Yeah. Especially in this definition. So

Robert Dooley 1:19:41
brilliant. I'll keep you posted. Something's going. Cool. That's great. Thanks so much for your time. I really appreciate Oh, really interesting. It was so nice to have someone who could challenge identities and often the light coloured light times what I'm saying

Ex Senior Designer, JLR 1:19:57
is why were you saying it's just you know, it's a lot of factors. Yeah. Yeah.

Appendix ii – Interview transcription and summaries

ii.c. 2019-09-24 HEAD OF I DIVISION, BMW- summary

The conversation was between Robert Dooley and Head of I Division, BMW Head of I Division, BMW, who is the head of BMW's i division. Head of I Division, BMW discussed the design process at BMW, starting with the early concept phase where market needs are analyzed. He then described the current studio process where one main design is developed instead of competing designs. Head of I Division, BMW also talked about how electrification impacts packaging but not the overall design process. He sees opportunities to speed up development using ideas from software like minimum viable products. Head of I Division, BMW discussed the vision iNext concept and its layered user interface.

ii.c. Transcript

Head of I Division, BMW 0:01
May I ask you,

just Yes. For your notes in every case before

or before you quote,

certain things that

maybe not like open to the public, please let me know before you publish.

Robert Dooley 0:31
Thank you. I really appreciate it. I really do. And yeah, just just before we begin, thank you so much for taking the time this call, I appreciate you very busy. So thank you very much for doing that.

Head of I Division, BMW 0:52
As excited as you are

your questions or

to have them to

Robert Dooley 1:03
brilliant, thank you. Okay, so just to kick off then, I've got a couple of questions we'll work through but just to begin with just in a few minutes, could you just give me a summary of your background you know, so, your current role at BMW and kind of how you got there.

Head of I Division, BMW 1:22
I have a background in industrial design and transportation design working in the design industry for

two decades.

path before BMW with

several companies before I joined the MW group design as a senior designer for was working on cars, automotive interiors, to selling your watches bicycle and everything before then I joined HW he was responsible for several interior developments on Rolls Royce, especially

race.

Unknown Speaker 2:22
I worked on the LCI

Head of I Division, BMW 2:26
Phantom

Unknown Speaker 2:29
I did.

Head of I Division, BMW 2:32
In 2013, I was given the role as design, project manager and all creative design lead

in advance design,

what we call the early phase design phase for coming on our seven and eight series, exterior and interior design development, which was great. I was heading into design for the project. And I continue that in 2014 to 17 as famous as creative read and design project manager for x five x six x years into design. And then I took over into the 17 SWI.

Unknown Speaker 3:43
Okay, thanks very much.

Head of I Division, BMW 3:55
as well in design, I have had the chance to work on several brands.

Robert Dooley 4:13
Okay, thank you very much. That's great. Okay. Sorry, if I'm a slight delay, and Okay, so I'm just very quickly summarise. What my research is looking at is looking at the future of automotive design process. And I'm particularly interested to sort of work out what are going to be the impacts of things like autonomy, electrification, and you know, sharing upon design process, but to sort of begin with what I'm really one of the reasons I'd like to chat to you today is because there's a very difficult writing on visual design. And so in order to try and capture a kind of a clear understanding of how current how things are currently designed, and conduct these interviews, to try and sort of capture a clear picture of how things are done. So to on

that sort of basis. To begin with, I still got two areas I'd really like to ask you about. One is about your sort of day to day, what is it like? You working on an interior design project within your studio is one? And then the second point is of, could you then explain to me where that process sits within a wider sort of product development process within within the company?

Sorry, okay. Um, so my first question is all about the sort of the day to day, what are the activities you undertake day to day in in a studio when you're designing a project? And then the second question is, where does that sit within sort of a wider product development process?

Head of I Division, BMW 6:00
Okay, um, yeah, I try to keep it a bit of an indication of how design development is done.

Robert Dooley 6:08
That's great. Yeah,

Head of I Division, BMW 6:09
maybe maybe allow me to give

two statements before I also thought I think it's an interesting question. So how does the actual paradigm shift affect our design processes? at all, and how does this reflect in my daily life? First of all, I would like to say something that the design process is never something that is set in stone.

For decades,

let's say,

I'm a big fan of

following the process, because it gives every part in the process the possibility to achieve an overachiever. And with respect to all these people, everybody should know his role in the process. I'm a fan of that. So I'm not a fan of flexible processes. But from time to time processes has to be redefined.

And to be honest,

W, the process of setting up the process is always a dynamic thing. So we always try to make a design process and development process in general, more efficient. So if you ask me, what does all my daily life look like? Or the Let's speak more about designers? designers, given the task from the company, maybe that is not very, very beginning. When the company has the seating, oh, yes, there's a need. There's a search for a position in the portfolio or for a new character in the portfolio or the desperate need for some people put their heads together outside of the design offices, and they get a rough estimation for what could be like, especially in terms of position of power of components. So say the package estimation of the colour and

rough estimation of the plants, where this may be produced, we also the company is getting, trying to give us a rough indication about what

Unknown Speaker 8:36
regarding

Head of I Division, BMW 8:42
different sorts of customers. So from a bigger, wider perspective, we are trying to funnelling that car design is stepping in, this is what we would describe from BMW as the offence to the phase or early, early phase in the design development of a car. This is where we get a good understanding of what our sales people can sell. We try to get a good understanding of what is the market needs? And what is the customer expectations regarding dimensions regarding quality regarding the amount of let's say, luxury dynamics for the specific car? And also what are they willing to pay for?

With all with all the components?

Robert Dooley 9:48
Sure. Okay. That makes sense. So could you then destroy.

Head of I Division, BMW 9:56
From that stage, we conclude early design stage phase, let's see six to nine months later. And this project is handed over to the production design studio, where I am. So my team is

then getting

a good bit of what that

could look like. And we do, we try to make this even more seamless, transition absolutely seamless, so that our actual design phase is directed.

To a certain extent, we used to have

many design proposals competing for a

very long time in the process.

And lately, we agreed that it's very helpful that we get an early design understanding, we have a design competition on a sketch and maybe design phase. And then we go into one model. And this one, this one model, we drive to a very high degree of functional technical and aesthetic liability,

and edit.

And one step later this project, where we have with the company a very good understanding of how that car looks and feels, we have the second design phase and a second design competition model. And then we have a final decision from two

to one. Okay, this, this final model that has been chosen is brought in another loop to maximum serial production, feasibility. And then at a certain point handed over to other parts in the company, by design. Hello,

history brought through into the final

phase, the role of design is changing, we are not the creators who want something from our colleagues from other parts of the company, we're changing into the quality judges, and we make sure that we all get

our need for quality, and design.

Robert Dooley 12:38
Okay, that makes sense.

Head of I Division, BMW 12:56
This was the renewed design process. Before that we had a process

for many years,

where we had

several designers competing,

let's say three to five

of them were chosen for a one to one model,

which were given a three to six month period of design development, with a new board decision where we went from three to two models with another six months development. After that, we went from two to one model, this was the old process.

Unknown Speaker 13:35
And

Head of I Division, BMW 13:36
we have the feeling that the needs to, to the point early is very strong. And also we have the feeling that we can shorten time to market processes, with the new process that I just described to you that we jump into from a white sketch face into one model that we bring to

Robert Dooley 14:10
Okay, um, how long have you been using that process for now?

Head of I Division, BMW 14:19
Approximately two years ago, pretty

concentrated constantly looking at our processes. Before

you get

together

expectations, so to say, everybody knows, this is my, my, this is where I can influence contributes to the final product. And this is where I hand it over. This is where somebody else is leading the decision. So I'm a fan of processes, the process itself and the concept and elements. So if we would speak together.

Robert Dooley 15:33
Okay, that makes sense. Okay. of said to me there has brought up lots of other questions. So if you don't mind, I'll just sort of quickly move through some of those. So, first and foremost, obviously, your head of the AI division, which are you know, all electric or electric hybrid cars and I wanted has that has that shift to an electric platform had any changes on the design process that is a different process or a modified process to what you might follow for a conventional powered vehicle.

Head of I Division, BMW 16:20
Because our job as designers is to to bring to give

the most precious or the most to give it the best design and aesthetics that you can achieve. So, if this runs on, on petrol, if this runs on electricity, on pure love, it would not change our job. on the technical side, of course, we are designing different things.

Packages changing

and layouts

are changing, this is influencing the accuracy of the car to certain extent, maybe we diameters

on the interior,

you have to you're packing things in your dashboard. So you get

like influence on your packages. Design.

designing an electric car

has no difference.

Robert Dooley 17:31
Okay. And process difference. Sorry.

Head of I Division, BMW 17:42

electrification, that is changing our business at the moment. As you can see, automotive industry is in a paradigm shift. That gives like new impulses to our business. It's big data, autonomous Dr.

Hyannis for digital services.

This is changing the role of individual mobility in the society. And this is changing perception and the demands for individual ability or disability services or this paradigm shift that is really affecting our design process. Okay, let me give you one word. And I'm really fond of

maybe wording that we learned

out of software, an IP industry.

The minimum viable products?

Unknown Speaker 18:42
Yes.

Head of I Division, BMW 18:43
We know from other brands, our time to market is quite long. So the point where we have a pen and paper sketch, this thing is all down the road, and somebody put some cash on the table to buy it or to leave. This is a question of months or years, not hours. And I take a lot of inspiration from his software development in the new startup industry.

that limits the

functionalities of early mockups, just to what

they try to

limit the production to the real us and try to make that work.

You're working at the right stuff. And they take everything else by side. And

customer specialist.

They make sure that they do like

very

Robert Dooley 20:03
Yeah. DS really interesting point. Actually, I hadn't heard it described in that way. I wonder is that for BMW is a luxury or premium luxury brand? I mean, a minute a minimum viable product doesn't doesn't sound particularly luxury, does it? Is there a juxtaposition there between you.

Head of I Division, BMW 20:38
If If a level of

maturity is one of the key aspects for the product, it has to be addressed.

If it's if it's sort of saying oh opinion,

we're doing a new BMW, that is, of course, a premium product. But it has been kind of three times five key messages,

then we know that

technology is growing and evolving. And we just have to make sure that we develop a product on the best level of luxury and premium that is that we can afford on the new technologies that we save daily business and hygiene factor, we make sure that this happens. But in terms of getting having more speed and getting having a better

approach, we have to

focus on the real.

Everything of functionality in then I will have no doubt that.

Robert Dooley 22:16
Yes. Okay, so so I'm also just going back, you mentioned something really interesting about, you know, seeing big data or economy and digital services as beings are big disruptive to the industry. And typically on that last one, digital services, I mean, do you see the growth of digital services affecting the design process,

Head of I Division, BMW 22:57
order to each other. This is all we have a bit more seamless process, because it's about the seamless experiences inside of the cars. So we do interior geometry, interior, and interior

user interface and user experience

growing into one. And today, I think it's one of the most important things is with like,

constantly

Unknown Speaker 23:29
developing

Head of I Division, BMW 23:30

technical offers, and information technology and customer demands. It is about the composition of things. So you have to make sure that these disciplines not just coexist, but they really grow together,

I want to give you one example

of maybe one of the one of the shortcuts that I was involved in. And next. And the reason this came out of my team. And the reason I next is a car that does the next step in terms of displays, because it's how many shows me but on the dashboard, you have the FEMA production. And you have what we call this high tech surface integration kind of organic user interface, where you have a car, and you can touch the car with your fingertips. And you can paint with your fingers a symbol that is followed by trade off nice. And with that symbol, you indicate your functions in your car. So this is one step that is really interesting to something that I would call an organic user interface. Especially when your cell of your car gets more and more intelligent, it is really important that these new products do not make life for the customers more complicated, that they do not be a time. The products are not asking for any take care of me, adjust me, here's a different information layer that you need to obey. I think the future is about simplicity. And it should be bright and optimistic. To some of these philosophical things up, I think

one core key element is

that these disciplines are growing, growing together and work

on like shoulder to shoulder

to create a composition of experiences where geometry blends.

Robert Dooley 25:50
Okay, thank you. So, just very, very quickly, just because you mentioned you've worked in different companies, but also in different cultures, you know, over with Master is there any sort of difference there you notice working cross cultures in the way that you design all the systems you design within.

Head of I Division, BMW 26:21
But of course, I think it would be not totally fair

to to compare, like, external brands with the company that I'm working on now.

16 or 17 years. So,

of course, a lot of things have changed,

maybe but maybe I can I can

MW cars,

cars and Rolls Royce motocross the differences in, in the in the content, for sure, there is differences. Also in the philosophy, we have differences, but only to an extent in the process.

If you will,

what I can just say, if a company of let's say 100,000 people is looking at one car, you have to make sure to have everybody on board to, to talk to the right people to get all the input in it is different than if you work in a company with just 1000 people or just 500. And in our our processes in general in design over the BMW group are the same, or at least they are highly similar.

What we sometimes allow,

and only with a close look onto project goals, time budgets and achievable results is that

Unknown Speaker 27:58
we we we

Head of I Division, BMW 28:03
to make sure that we get the best product

development you

you do have a different speed on in Atlanta,

Unknown Speaker 28:29
there was a hand finished

Head of I Division, BMW 28:31
masterpiece,

where as a one series is a car

that is the premium content segment. But there is rolling out of the plan every day.

Whereas a Rolls Royce Yes.

Another degree of involvement, human involvement. And so this awesome, makes

Robert Dooley 29:06
development process

Unknown Speaker 29:07
in design.

Robert Dooley 29:11

Okay. Okay. Sometimes if

Head of I Division, BMW 29:20
we have the feeling that this car has, that the platform is quite strong, or not so flexible. We can discuss about shortening design loops, to the amount that is useful, but

don't find me.

Robert Dooley 29:48
Okay, I mean, that's really interesting. And also, it's a really good place for us to come to the end. Because if you don't mind, finding out that you design division. And next I'd really like to ask you just separate to my research I was at. I was at Frankfurt two weeks ago, and saw the vision. And next I've just been I've been reading up on the the user interface, which is really interesting that the these three or four playing layers you're using to describe the interface. I found that really interesting. Sorry, I just I was at Frankfurt two weeks ago. And I've been reading up on the vision and next concept. And I found it really interesting, the way that you've designed the user interface there to sort of work on four layers. I found that really interesting. And that seems to be quite unique.

Head of I Division, BMW 30:58
Where you can, can enjoy your eyes, you can ride yourself or enjoy a good time with your family. It offers everything that you would expect from a car that is the digital bridge to your life.

Unknown Speaker 31:11
It gives you flexibility.

Head of I Division, BMW 31:16
And the contract points of that. So on the other hand, is statements of vision. And next is

driver

focus car. Yeah.

So how do we do that? We do it.

Unknown Speaker 31:34
Dynamic,

Head of I Division, BMW 31:35
lightweight. But of course,

this to at the full level.

What, what do you need when you ride your car, or you can go to a track you want. You want your car to support yourself. But you also want to be in control, you want everything at your fingertips. And everything from an economic and financial standpoint tailored towards the USB drive on. So this is basically the interior layout, you have like seating landscape of memory foam that is exactly attracting to you very,

sort of say demanding gear. And

you have these, as you mentioned different levels of displays,

Unknown Speaker 32:16
or different levels of

Head of I Division, BMW 32:18
inter interaction interactions.

They are minimalistic in a way,

but made so that you can really

that you have everything in front of you. You have

these little display on the steering wheel that gives you the ability to adjust.

To adjust the presence of God the general setup the

setup of your car at a very early stage. And then you have the information wondering from legislate to the crystal glass installation on your dashboard into the head of history.

And according to the different scenarios

on nothin. And especially the driving speed and

the demanding nature of

this all the information is more

minimalistic,

wandering more onto the screen.

Robert Dooley 33:18
Yes, yeah. Yeah, I think he's really interesting. And a really great concept. So it's great.

Head of I Division, BMW 33:37

And, of course, more and more things to look at them to control, which you may want to do. But we have a growing number of clients to say, Come on, you can do that. Just give me that one button.

Unknown Speaker 33:48
And I know it drives

Head of I Division, BMW 33:50
dynamic. And that's it for me. So this is on the one side,

the people who just believe in us that we do club setups, and they don't want to be confused with too many things. And on the other hand, on the other hand, even the client who was well aware of every technical adjustments, he wants to have only the informations available, that are really needed, and the rest of the information should go into the background.

Robert Dooley 34:30
Okay, thank you very much. Thank you so much for your time, I really do appreciate it. And for your insights that been really, really helpful. And what I will do is Alexa, posted earlier, obviously, any citations are run past you first, but also I'll just sort of keep you updated with my research as I go on and share any sort of papers and that sort of thing for you to have a look at. If you're interested

Head of I Division, BMW 35:01
you make me give me an indication of

publishing this or

two books or something, because then I have communication partners and then I have to get them on board and say Hey, Mr. Dooley is

Robert Dooley 35:29
whenever I whenever I use your information, I will I will let you know. And then then you can get your favourite stuff. Of course.

Head of I Division, BMW 35:47
If you have

any questions, feel free to contact me.

Robert Dooley 35:55
Really appreciate that and thank you so much. Thank you. Okay. Have a great day. Have a great day. Take care. Bye bye

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-09-25 SENIOR DESIGNER, BIOMEGA - summary

Senior Designer, BioMega discussed his background in industrial design and how he came to work for ByMega. He explained that ByMega takes a different approach to vehicle design than traditional automotive companies by involving designers and engineers together from the start to define the vehicle architecture.

For the ByMega car, they took a clean sheet approach and did not reference existing car designs. They focused on the user experience and stripped out unnecessary elements to create a minimalist interior. The design process involved defining the packaging and layout before considering styling.

Senior Designer, BioMega emphasized that ByMega's category L7 vehicle gave them more freedom than a traditional "real car" would, but they are also developing a category M1 compliant version. He believes new vehicle types will emerge between traditional cars and bicycles now that electric components are cheaper and simpler.

ii.c. Transcript

Senior Designer, BioMega 0:00
The PhD, what's the storey of the PhD? how long this? Are you researching? How does it work?

Robert Dooley 0:08
So I just started my second year, just finished with that first year. So I'm one year, and I've got three years, possibly four years to do it, but I'm trying to get it done in three years. So what I'm doing is,

Senior Designer, BioMega 0:23
yeah, I've

Robert Dooley 0:24
sort of the PhD started on a hypothesis, a hunch, if you like, which was that current car design process, it probably isn't suitable for designing for electric connected vehicles. And want to try and find a new methodology was better. The first year has been actually a very long literature review. But actually, in car design, there's very little writing or reflection on car design process. So it's not like I'm doing an architecture PhD, where I can reference 100 books, there's nothing I can reference on. So hence why I'm doing primary interviews with people like self in order to try and get that understanding of how things are, you know, across different brands across different segments of the industry.

Senior Designer, BioMega 1:08
It will be a methodology, like a guideline of how to design for, for vehicles in the future.

Robert Dooley 1:16

Yes, yes. So perhaps at the end, I don't want to prejudice what you might say now, but at the end, I'll sort of fill you in where I am. But yeah, I'm basically looking at adopting some stuff from architecture and applying that. Yeah.

Senior Designer, BioMega 1:29
Cool. Cool. Okay. It's like a copy when you're done.

Robert Dooley 1:33
Yes. Certainly. Yes. Yeah. I mean, I'd be really keen to share it and also keep you updated as I progress as well. Definitely. Okay. So first of all, Could you just tell me just just so I understand when you're telling me things later on sort of where you're coming from? What's your background? how you ended up with by Amiga working with it and stuff? And that's something?

Senior Designer, BioMega 1:50
Yeah. So yeah. And by the way, if we could do this, until 1030, is that enough?

Robert Dooley 1:59
That's great. That's perfect.

Senior Designer, BioMega 2:01
Because, you know, I can talk forever, but we got here. So I gotta jump off. But I want to leave you with all the points you need. So let's go real quick with my storey. I am originally from Argentina, industrial designer. From from vacation, I also studied in Milan, in Polytechnic in Italy. Traditional industrial design, that means not vehicle design, but product design. And if I have to define myself, I would be closer to the school of Bauhaus. And so you know, the rationale. Let's really think about what kind of products we build, you know, how is it built? How is it disposed off, you know, long lasting products that are no nonsense. That's basically me in a nutshell. And I've been basically, I've been living here in Denmark, for the past four years I've been I contacted the people behind by mega so we're actually a design agency, where the in house design agency for Bocanegra were not employed by made by mega by me as a client. So we're basically a boutique industrial design agency, which last year, you would find it as skip said, ideation this year is rebranded within the many one brand. Yeah, we're going to send you a link in a bit

Robert Dooley 3:32
to be great, just and

Senior Designer, BioMega 3:34
we're actually not only many one, but we're many with our agents are our branch of the agencies many one mobility. So that is still in the making, dissolve, you know, working as,

as we speak.

But we are basically many one mobility. And what that means is that we are industrial design, at core focused on transportation. So I've been working Personally,

I've been working on other projects, I've been doing some some furniture, some packaging, been working, basically, since I was 18. In design, so. But I did in Argentina, when I was studying, I did a thesis on an electric motorcycle, and we kind of launched that, that project as a startup, and I've been developing the bike the electric motorcycle for about two years. And that didn't really take off in the sense of, you know, manufacturing and investment etc. And that's where I contacted the people here in Denmark behind by omega, because, you know, I wanted to do electric vehicles, which were, you know, that were aligned with the way I was thinking. So of course, electric bicycles. Also, non electric bicycles were interesting. But having an approach, you know, new technologies and new manufacturing methods and new ways of thinking things, right.

I'm going to show you a specific

by mega bicycle, just to have you understand, thank you.

Basically, I'm going to send you a link.

Okay, it's super high quality. But this, this image I just sent you, it's basically it's a bicycle that by mega designed, and it has, instead of the down to traditional down tube in the bottom of the frame that has a cable, steel cable that operates by tension kind of fixes the framing position, but also you can be touched by pulling that, that handle and you can unlock the cable and use it as a as a lock to tie your bike to a post. Nice. So that was built behind before I came in. But that was you know, I saw that kind of stuff. You know, from the distance, kind of just researching and I was like, yeah, this this kind of guys, guys who think like this, you know, that's, that's where I want to work. So of course, you know, I picked myself to the company. And of course, I've been doing electric motorcycles, so I know where I knew about structure and you know, powertrain etc. But always within an industrial design background, so not really hardcore engineering, but but what the way I define industrial design or the way that should, if you really describe industrial design in a correct way, it should be product development, or design development, that means not only doing styling, and nice little shapes, but understanding the whole spectrum. So a bit product architecture, so you have, of course you have the user, but you also have manufacturing, and you have all the stakeholders in mind. And and of course the shape factor is important, but it all has to be aligned with how our product is built and how its disposed off and how its operated. And, you know, cultural significance is, etc. So in that in that line of thinking was really aligned with the with the studio here and and, you know, the founder of the studio, he's creative director, and he's also a really, you know, creative guy as well. So, I kind of fit in through that kind of way of thinking. Yeah, long storey short now I'm studio manager of the stuff the of the studio, of this branch of industrial design with within many one. And I have was, you know, leading the project of the electric vehicle, the by mega car, which you have seen in your you're inquiring about? And basically, what would we do here, what what I've been tasked to do since I came here is industrial design, design development. So we kind of take a project, such as a new bike frame, in, you know, we take in the design brief, let's just say you want a new cargo bike, or you know, you want a new folding bike, or whatever it is you want. And we really think, Okay,

what this, you know, let's take a step back and say, Okay, what, what does that mean? Right? You know, kind of kind of kind of fold in bike be made a, I'm just, you know, thinking out loud, but can it be made out of, you know, self inflating material that then you can deflate and fold? Or can it be, you know, made of strings that you can, you know, reattach and fold. You know, why, why do we need to jump in and say, Okay, let's search for existing falling bikes, and then just build a new shape based on that. We really think on what exactly does it mean to fall? You know, do Do you want to come back to do we want to do it. Just practical one, one movement kind of thing. So that's always the way we operate. And, you know, in any project, even if it's a it's a lamp, you know, or a chair, which by the way, as of this year, we're merging are where I'm focusing only on transportation. We've been doing some lamps and such in the studio previously, but our edge and our kind of point of impact is transportation. That means anything that moves basically,

Robert Dooley 9:35
correct. Okay, cool. Right. Thanks. For summary, that's great. So just I'm aware of time. So what I really came to understand is that, yeah, by me visually, is different to most vehicles. Yeah. reproduction vehicles out there. And I'm just wondering, could you sort of summarise to me what the design process was behind it? And would you say that that's different to traditional automotive process? And if so, is that a deliberate choice? Or?

Senior Designer, BioMega 10:05
Yes, so? Yeah, so let's, let's take a step back and define automotive design, I think, if you look at traditional automotive design, it's closely related to styling. So styling means you have some designers in a room, and they are tasked to, with with the task of doing the surfaces on the interior and the exterior, basically cast, and just basically fighting the engineers. So you have engineers, yep, 200 engineers in one room, and you have six designers in the other room, and, and the designers are just, let's just call it, they just do the skin of the car. That's the traditional car design, I would say from the 50s. Until now, we were very aware of that. And we really didn't want to fall into that trap. So since day one, we said, okay, let's, let's comprehend the vehicle architecture from the beginning. So, how is it going to be built us going to be used, what are the packaging options, we have, we move things around, and we actually had engineers in house. So, we took what I would say the design development approach, which is what I would consider the industrial design approach, and applied it to, to car to car design. That is That was you know, day one from the project. Basically, if I have to explain a little bit more of the project, and now this this can get into you know, specifics that I cannot say too much. But basically the the main owners of by mega wanted to do a car and but they are also very open minded. Since they do the bikes are quite different. So they didn't want to a normal car. And they had some really specific inputs, like, for example, the wheel sticking out, that kind of defines the technology of the card that you see today. In the in the website, that kind of came from them already. So what I mean is that even the client was already open minded and kind of wanting to challenge the topology. So from from the started was, it wasn't a different process, for sure, are different in the same process for sure.

So on the one hand, we didn't have

designers versus engineers, which is the typical, or I think in some agencies, that's how it works. And on the other hand, we we had the, you know, we had the idea of doing completely clean sheet. So we are not coming from the car industry. And we're not let's just say we're not car nerds per se, so we're not like super fans of one specific car brand. And then we kind of, you know, get influenced by that we were saying okay, no, we're not going to this shouldn't be looking like anything in particular, because we're not interested in, in, in relating to anything in particular, it has to relate a little bit to our bicycles, and the and the design language like the, you know, the curvy surfaces, surfaces and the soft kind of shapes relate to the bicycles, but shape and topology wise the volume of the car, us. We didn't really start with any specific cars to reference. This not like we said, okay, we're going to do a cabriolet that looks like this car and that car, and then we're going to just do a different shape on top of it. You kind of said,

Robert Dooley 13:52
yeah. So you, you had this Stein point of defining the vehicle architecture, vehicle packaging, working engineers, but then after that, how did the what was the storey behind the interior design? How did that how did that develop? What process did that go through?

Senior Designer, BioMega 14:09
So when we when we kind of said, okay, what's the starting point? starting point, it has to be the user, right? I mean, that's, it always has to be the user. And that has to be the not only the guy who's sitting and driving, but all the passengers. And also, by the way, the pedestrians, which is something, you know, you don't hear often from a car designers thinking about how the look or the shape, or the function of a car

can and may affect

the pedestrian, in a way negatively. So we were saying, okay, we're not interested in doing something aggressive, we're not interested in doing something that looks sexy, but it's super difficult to operate and, you know, cramped up and uncomfortable, we're really starting with the with the user. So of course, we said user first, that means you want to have space inside. But also how are you going to drive this car. So this is a car for the city, big city. So we decided to do a very small package. So it's a very tight package, if you look at the overall width and length, etc, it's it's quite small. So we said, okay, we're going to have a very tight package. So you can handle the car easily in big cities, and you know, we can park it, etc. But then we're not going to sacrifice interior space for that. As as you can see in some other cars that are, you know, micro cars are super uncomfortable. So that's, that's kind of the starting point of the layout. The other aspect was that electric vehicle allows you for, you know, a clean sheet, almost. I mean, I would say totally different way of thinking vehicle interior, because you don't need to up the, you don't need to have all the components that you would have in a combustion engine, of course. And also you want to lower the weight. So I think I mean, the, you want to lower the weight in itself, and you want to lower the centre of gravity. So the compacting everything in the

skateboard platform in the ground is something you're seeing in electric cars. And that makes a lot of sense. So that was also a starting point, we said, okay, we're going to have the skateboard into back into bottom, we're going to have motors outside of the current. So actually in wheel motors in the in the wheels, therefore we can give the space back to the users right to the to the people who are inhabiting the space. That's, that's, that's one thing. The other thing is that we said, okay, we have a small space in itself. So we have prime, you know, we have, we don't have too much real estate to work with, then we're going to take out all the unnecessary things. And I mean, seriously, if you sit in a car, today, you just, you know, finish this interview, go to a car and you start looking around the interior, there's 1000 buttons and little things that you will never use, or you you'd never wonder why they are there. And that is just because generation of designer to generation of designer to just literally continuing and saying, okay, there's this button here, let's just do it in a nicer shape. Okay, or this, this button here, let's just do it in our, you know, brand style. We didn't have any of that we were not having a spreadsheet of buttons that we had to do. So we kind of said, Okay, what do we actually need, right? So you need to you need to operate the vehicle, you need to move it around. But you don't need too much more you don't need. You know, there's a lot of comfort and luxury. You know, I would say luxury items. There's, for example, a famous conversation I had with one of the Automotive Engineers, that we're asking us, okay, where are we going to put the coat hanger? Or how how do you think the coat hanger will will look or what material? And I looked at the guidance like what are you talking about coat hanger, we're not, you know, we're not 1950

you know, men in suit driving around.

This is absurd, right. And but this is very normal. This is I mean, coat hanger is one thing, but you know, cupholders, there's a million things that you can do, you can live without, especially if you're driving around in a city for a short amount of time and you want to you know, streamline your, your your trip. And you know, you don't want to you don't want to have a cluttered life full of things. So basically, we did, we stripped everything down to the essentials, we had a flat floor.

And

if you look at the dashboard and the kind of front area, we kind of figured that if we don't have that motor in the front, then we can clean everything up to the extent that we can actually put a window in the front. And having the window in the front can actually help to see a little dog or you know, a bicycle or some pedestrian that crosses around. So we wanted to kind of make this a very open space by using a lot of glass and openings. And by reducing the amount of unnecessary things, so basically compacting everything together and having kind of structural elements visible. So basically, the dashboard is beam that has the structure within that that beam. So instead of just doing a dashboard, because you have to do a dashboard in a car. And you can basically we said, okay, we can have the beam structural beam that can hold all the components to drive, you know, to help the steering wheel and the screen, also the airbag, etc. But we're going to kind of keep it at the minimum. And that basically, that's a philosophy that you can see applied in the entire car.

Sure. Uh, one more point I want to mention is the seats. So and again, I just want to mention that this car that you see today is basically it's an L seven each category cars that means kind of like a retinal Tweety, right. That means that you can do without a lot of the regulations that are required in the car industry, because it is it is a category of vehicle that is less demanding in, in, in, in requirements, but it also has a limit on the speed and the the amount of kilometres per hour that it can you can reach we have throughout 2019, we have been developing a category and one version of this vehicle. So that's a, let's just call it a real car.

That is

that is to be registered in the European, you know, euro and cap of crest tests, etc. And it had and it has all the safety and economic and you know, legal requirements of a real car, of course, we cannot really show the images of that vehicle, but I can tell you that we're doing our best to maintain this concept. And it's actually being maintained, we're kind of pushing the limits of what the car industry can do. But that I mentioned this, because the kindest recent extremely complex industry and

it is kind of like,

I mean, it's a very big, it has been doing things for a long time. And I have a lot of respect for for you know, a car manufacturer that has a car and road. And you can write it for you know, hundred thousand kilometres and it needs to, it needs to work in is to work on rain and snow. And just to work up to 10 years. You no nothing can fail, right? It's, it's up there with the space industry and the and the aeroplane industry they are they have to be bulletproof. Right? But because of that, that gives you a lot of constraints from the design perspective, it's like, No, no, we know this works, don't move this, like don't change this, you know, don't do a new door, you know, don't even think don't do a new seat, that's crazy, it's going to be too much development, you're gonna have to register the seat in the crest us etc. Don't even touch the seat. So in a real you know, Hamada gated category and one vehicle, you have all these constraints that you cannot do, Missy cannot do much.

And that'll, and that

affects the design process of car designers. In the L 70. category, or a category that's lower than that, you know, electric vehicle, smaller to vehicle contemporary, there's a lot of room a lot of freedom. So I don't know if you research this or if you're going to include it in your thesis, but I think there will be a lot of you know, new vehicle type ology is coming between what is a real car and let's just say a bicycle. So I think I think we're entering the glory age of weird little vehicles that are somewhere in between a real car right now. And, and a biker are basically a pedestrian and in a big, real car. The reason is, this is because the electric components have become so, so inexpensive and simple to operate. And small actually, that, you know, it's very easy to do little vehicles. Of course, they will require some market adoption. And, and they, they cannot be super, you know, I don't think they can be super weird. Let's just call them weird. The beginning because people are going to just kind of make fun of them. Right. I remember when that TweetDeck

mountain, it was laughingstock for, for Americans, right? Yeah. But, you know, I was thinking that's brilliant product. Right. Of course, they overdid it, and it's super uncomfortable. And that's, that's something you cannot do as a designer, right? You cannot offer a product that is not comfortable. But they it's a really interesting project. I think the tweets anyway, I remember that, because I literally had conversations with Americans that were laughing at it. And it's like, okay, I mean, you live in a big city, you know, why? Why not, you know, let's just rethink the way we move around. And the, there was another point I was going to mention,

lost my track.

Robert Dooley 24:48
You mentioned just came back a little bit about your design process and thinking about what a user needs. And I'm just wondering, were there any kind of methods or processes you follow that, you know, I'm thinking I don't like I do use them to do mythologies. And that's something did you use any kind of process to engage with users? Or was it very much like a case of you guys having more of a vision and then interacting that?

Senior Designer, BioMega 25:08
Yeah, to be to be completely honest, we're a little bit more of the letter that is a little bit the apple, the original Apple approach, the you know, the Steve Jobs approach where, where you don't really ask too many people what they want, because they will just literally want a faster horse, right.

But, you know, that sounds a bit

cocky, and you know, egocentric, but in a way it works, because we're doing things that are right, think we're doing things that are in the limit of acceptance, so you have to do something that isn't the limit. And, of course, people are not going to some people are not going to like it, and some people are going to hate it at the beginning and then after a month are going to love it. It's just because we're operating in the limit of weirdness so to speak. Because I mean, that's what innovation is, right, you have to balance the amount of how new something is right to operate, and to look. And, you know, you have something in your mind of what a chair should look like, or what a car should look like. And then when something different comes along, there's a lot of rejection. So within the design process, we don't operate too much with focus groups, because that will kind of funnel us into traditional design. And, and, and, you know, kind of funnel us into what they are used to seeing, which is exactly what we're not interested in doing. Right. Yeah. With With that said, we have done ergonomic tests and, and, you know, usability tests, especially for the UI and you know, ergonomics of how you touch the screen and how can you look at the screen and, you know, does it work? Do you feel comfortable sitting like this and touching the screen looking at the road? So usability test for function?

Yes.

Focus groups for Do you like this or not? Not too much.

Unknown Speaker 27:06
Okay, brilliant.

Robert Dooley 27:08
Okay, I'm very wary of time. But that's great. So yeah, that that's been really helpful. Thank you very much. It's really good to hear about your process and stuff.

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-11-08 DESIGN DIRECTOR, CHANG'AN - summary

The conversation was between Robert Dooley, a PhD student researching automotive design processes, and Design Director, Chang'an, an automotive designer. Design Director, Chang'an provided helpful context on the current automotive design process and his views on how electrification, autonomy, and sharing may or may not impact it. Some key points included:

- Electrification alone likely won't significantly change design processes, as EVs still have similar physical constraints as ICE vehicles. Autonomy at current levels also doesn't require major changes.

- Factors like increasing connectivity, digitalization, and a focus on user experience may influence processes more than the technologies themselves.

- Rapid development in China is a bigger disruptor as companies must move faster. However, disruption is often overstated in media.

- Sharing models may increase vehicle usage but not necessarily change design, which will still consider factors like safety, quality, and brand image. Overall impacts on the industry are uncertain.

- Design Director, Chang'an emphasized understanding broader trends and avoiding assumptions that technologies alone will revolutionize design processes in the near future.

ii.c. Transcript

Robert Dooley 0:01
Yeah, I'm a graduate of the Royal College in London and I'm adding a PhD. And I'm based at a university down in Cornwall, called bound University, which is not an old old art school. So changing now and it's focusing more on digital creativity. I'm also part of Yale University of the Arts, London, and I still have some links in with the RCA. And my, my PhD is looking at the future of big design process. I'm interested in how the way we design because we will change with the advent of autonomy, but also electrification sharing and connectivity. And and how that might cause us to need to have a different kind of design process. But what I'm really interested talk to yourself about is it's very hard as you as you might be aware, there's not much writing on big design. There's not many books written about Pete you know, it's not like architecture, there's quite like a movement of people writing about architecture. All the time. And so actually, if someone says to you, okay, well, what is current interior design process for automotive? Well, how are things currently done? You can't you can give them an answer, but you can't say I'm going to read this book on it. So what I'm doing is conducting interviews people like yourself to try and get an understanding of what is current automotive design process. And I'm really interested to find out from you, what your background and then also what what are the day to day activities you're doing when you're designing an interior? What things

are you doing? What's that process you go through? And then also, where does that sit within a kind of wider product development process, if that makes sense?

Design Director, Chang'an 1:35
Well, right now you're trying to make a statement to only on interior design, right?

Robert Dooley 1:41
That's particularly why I'm interested in yet.

Design Director, Chang'an 1:43
My first question will be, why the first assumption will be that aluminium is driving and electrification will change the design process. What was the first intention for you to actually believe that there might be something changing?

Robert Dooley 1:59
I am not Saying definitely will first. But yeah, I mean, I think it's I think it's when you hear people, often you hear heads of studio at talks and that kind of thing, and there's this sort of this old design process sign will need to change. And often it's, you know, it'll be more about the classic things are, you know, it will be more like maybe transport design, or it will be transportation design rather than just car design. Or it will be it's more about the digital service or the digital experience in the vehicle. And so, those obviously, require slightly different processes to designing for a standard Vic. The design process for transportation is more closely linked product design, whereas, you know, digital is very, very different. It's based upon, you know, rapid innovation, rapid iteration of, of concept, which is, my thinking is quite different from the traditional automotive model, whereby you have a production cycle. That's I

Design Director, Chang'an 3:01
was sad to say, first of all, I think we should not I mean, there's a lot of talk and friends, especially since I say the last four years, a lot of people talk about, like, disruption or the minute a lot of talk about startup companies, a lot of things happening, right.

And I think today is a bit time to actually go back a little bit to what happened to understand what happened and how the media is and the fires of trend brought things that might not happen. I give an example when I was studying up your the RCA in the mid 90s. We were talking the same sort of things. You know, my two projects, one of them was an autonomous electric vehicle. As an example, with no wheels. I don't think it's something very surprising. So we have electrification on one side, and autonomous drive on the other side, and they have to be completely dissociating electric cars. You know, you can buy one, the last 20 years ago, but one is nothing really special about it, you know, it's just you change, a sort of IC engine was a transmission with a battery pack and another electric engine changing the architecture Yeah, you know a little bit you know, it makes the car may be higher if you put the battery down the floor. And maybe if you put the electric engine at the back axle, it can get more space at the front. But laws of physics are not exactly changing, you know, you don't want to die. So you have a crush zone in the front, even if it's with engine or taking another structure in order to compensate the crush

energy. So there are different things and I think that we tend to mix celebrate everything like the destruction of the ultimate technology, and they're very, very different. The EV world is disrupting the end the the car industry, because most of the OEM money making machine was based on its core business. Which is the engine transmission chassis and other satellites of around this product around this this engineer products are more supplier based and for example other radio air conditioning other things are done by suppliers is a bit more complex, but the core values of OEM was definitely this this a mass production engine transmission world. So the disruption is coming by how to make money out of changing a money making machine in a new world which is basically with batteries and with electric engines. So, that's why must have OEM that take it seriously. They're developing their own battery factories in order to bring back these knowledge to them and not give it to any specific supplier like Panasonic or Tesla or whoever not patented. This is using Panasonic as well, or BYD or the Chinese manufacturers. So that's one side So on the process of designing a car because it's an EV car, it's not changing much, you know, you've probably have the Cal points, the pounder is down the windshield, that might be lower, you can probably reduce a little bit the space of the front and to have it lower in order to have because you have more space and the crash zones are a bit more flexible so you can go down that because most of the architectures today we're facing we put batteries on the floor for weight distribution reason. So you go high with a roof so it would be a very strange car if you get old down here and get like a box. So this is for the for the EV world so to speak, right so you can imagine going to a mono volume car because there's no more reason to have an engine that of France and you can do it in different way. Yeah, okay. But, you know, if you look at the runaways pass, or a lot of MTV the 70s 80s 90s MTV MTV was it Trent of a motor box and he had a petrol engine inside. So it's like, Is it real disruption for design process? I don't really think so. an interior design is like the EV world is not changing a lot, the H point which is the core point of the body where it's making it safe that starts the architecture of the car from h1, which the heat point from the driver is just going a bit higher. If you put batteries underneath. That's it, you know, but apart from that you could have been an SUV or MBA. So that's one part on talking about the autonomous driving. There are different steps and changing the process. It might be one thing the the big illusion is to believe that we're designing cars with no steering wheels, because you don't need to drive. It's an illusion because it's a target and concept cars are showing a targets in the future that nobody knows when it's going to be feasible as a matter of business. So what's happening is that years ago, I mean, you call drive I was working folks, waggon, five, six years ago, you could buy a golf, a normal golf seven, and the car was driving alone. He was just shifting to the lane assist. He had camera following a car braking, and you can just get your hands off and the car was driving on a model way. What that's what we call us, I think I to today, level two autonomous driving. And that's true, because they're changing all the time, depending on the trend. And it was quite normal. Legally, it was not possible. That's the car give you the choice not to tell you to hold the steering wheel for legal reasons. So after 20 seconds, the car, we're telling you please hold the steering wheel. But that's got nothing with technology. So what happens with the levels of autonomous driving is a long process that will take probably 10 to 20 years. Nobody really knows about it. So on the design process, we're designing absolutely Normal cars that will say all they say it's not changing the

design process, they are autonomous level 2.5 to level three, and you still have the steering wheel, they still have it. So what is more disruption when I say more something truly changing the process design process is the user experience. And the UX is more thinking not the product itself, but the relationship between the person and the holistic approach or the project or the product. And this is probably changing a lot more. Because if you start thinking, Okay, the product has to have high quality, it has to have an amazing perceived quality. The leather has to be nice. The air gonna mean in case of crush has to be you know, whatever it is, you know, like, but if you use the user experience as a start, then it's it's not a passive thing must have cars been designed passively. That means in case something happens. If you take a UX approach user experience, you can't do it, but you have to because you cannot ignore safety. So you still have to design a car in a certain way that the user feel whatever experience you want to give them. And if you want to make the cars look safe, because the user experience you want to choose easy safety, that you might design in a complete different way than you will have done it before. Because it's just an experience. That means your experience you can it's every company's got the different targets on the experience. One could be, you know, if you look at for example, let's say the three major quite famous BMW experience was always driving dynamic, Volkswagen Group experience was incredible perceived quality perfection, Toyota is reliability. So there are different type of experience that you choose our core values of your company, and that's changing the design process how you do it. For example, every Volkswagen of the 12 brands, they all have incredible tight fitting stamping proceed quality material and everything and the way you design the cars the way you put the shut lines the put the surfaces where you put the older shut lines and the say tunnel centre of town to the IP, they're designing a way that the perceived quality is sin. If you look at the Toyota they don't care and they care Okay, he's gonna be a plastic he's gonna be

a won't be breakable. By doesn't matter if he looks like so the the perceived quality is not important. They say nice, better day doesn't break that is going to be your experience. BMW for a long time they went for more driving dynamic, because it was a driver machine and everything was about going into the experience. Now because we're going into the digital world, the experience is obviously concentrate a lot on the HDMI human machine interface or you I user interface where you have all of us a lot of this a more and more interface to the outside world internet video a movie cameras, friends FaceTime WeChat whatever system you have that is more and more integrated into the cart and at this point on the design process every company will have a different take on that one the take of some startup company like Biden is to put like a big screen like this possibly because to make a statement and of watching a video or movie or or whatever you know some other cool be like Tesla reducing to almost anything just a little tablets. Some other cool be like us we do like for now double display plus an electronic gear shift go everything autonomous. But or were of course I cannot tell you about what's the future. This is the current product portfolio we having right now. Yeah, every every company will have a different one. So the design process is going to be different depending on what you want to do the electric vehicles is not changing the design process. autonomous driving for now, it's not changing in the lots. The only thing that's changing is, for example, if you will tell the car to drive alone, is how do you actually make the person know that the car is

driving and you have to take back control? This is this sort of communication. They say, imagine, you know, Neil, Neil, Neil, right. You know, the normal thing, for example, is a face that is telling you whatever you want, but that's got nothing to do with the fact that is electric or autonomous. You can have done it in a 40 have a face telling you, hey, what's the weather today? You know what I mean? So I think we should definitely like very careful to not mixing everything, like because it's easy. It's going to change something in the design process or Because it's an autonomous cars changing design process, it's will be possibly the day where we can completely change manufacturing and probably, I believe what will change a lot is if the optimization of every single object on the planet is hundred percent safe, then you know they won't be any crushed anymore. And that would change everything, because all the crush zones is going to be empty. As today we have about 1 billion vehicles on the planet and I'm not even talking about motorbikes and cows or horses, or bicycles, you know, motorbikes. But in order to achieve a true autonomous world, the one we all dream of where everything is in the big picture of internet, Internet of Things, everything connected, no way you can crush a car anymore, or 0.01%, which is probably the safe zone is pretty Are you gonna be not in the century, because you will not be at least not on a global scale. So they might be places like even London, I believe, for example, London might be one of the places where you just closed completely the city to normal vehicles like you do today for diesel, the have euro three or four. And you say, okay, the city will be completely autonomous, drivable, and then you can do that. But because the business plan will not be amazing if they just 10 cities doing that around the world, that there is not like a real industrial effect that we change the design process because your question is read about the design process. So let's be very honest, all this disruption thing we talked about is highly exaggerated. But based on these two things, EV an autonomous vehicle. The big disruption on the design process is more the speed of China.

I can tell you one thing. That's maybe from, from America, probably people don't see that and from Europe, maybe not. When I was working the Volkswagen Group them is 12 brands and or 13 brands, as quite a lot of brands. I knew that 40% 44, zero of sales were in China, but 60% of the earnings were in China. So that was like five years ago. You know, you have to look at China as this is where everything's happening. And this is China is driving the world right now. And what's happening in the design process is the speed they are using that is unknown. The You know, there's a constant evolution of the whole country that goes so fast that this is truly changing the design process. Out of this a normal design process that was 36 to 42 months. They have to reduce it very quickly in order to fulfil the customer expectation and this is retrenching it the way we do it because you don't have time for anything, you have to be very flexible and agile. So that's why we introduced more agile processes into design process that has to be much more reactive to unpredictable statements like a new startup. I mean, I know have you heard like four years ago in 2014, there was no startup on the planet on a car and then everybody started to talk about it from dies and Apple, Neil fired a future uses exit, right? There's so many. So this is really where the disruption is. But having say that, after four years, most of them are not surviving. The best one are still completely struggling to make a business case. So what I always say is that the car industry is the hardest business

you can find it's very difficult to make money and especially in large scale because suppliers supplier change government, that is very difficult to control dealership quality guarantee insurances, you know, this is a big question that is really changing everything. So the design process, if you're specifically talking about it, I can we can talk about it as a separate thing about digitalization by going faster, but how to use new tools, VR virtual reality, they will be a complete different topic to stand thinking like is if easy and autonomous driving East changing company into the price of the interior. It is changing the show cars for example, concept car because we all do show cars like you seems like okay, when you drive, you can turn a seat and you can read a book and the steering will disappear. But it is something that that is not going to be a manufacturer scale for a long time for the simple fact that you're going to have another 1 billion cars next to you. And even if you have one spatial road of spatial city that is only for autonomous Driving. They might even some city just making us some countries making one line only for Thomas drive. But it's very far to believing that we got this mega cities out of all these autonomous thing driving completely alone. I mean, it will take time and China goes fast and China and we work for the Chinese government. So we're we're bringing all where and when we will be going and they're pushing definitely to go into this direction. But obviously this is something is a very, very long way to go.

Robert Dooley 19:30
Yeah. Okay. So that's great. Thank you. That was a fantastic summary of as really interesting. Thank you. There's a lot think that's really interesting. At the end, I'll I'll talk you through some of my thoughts, which I think you might find interesting. So I'm interested there that that's the point you left out then you're talking about China. So this you know, for you, you know and also for for car designers now moving and working in for China or for China. Companies that speed? How is that changing speed change what you're doing on a day to day basis?

Design Director, Chang'an 20:08
Well, I think there's this first there are two things there is the culture, which is one thing. And secondly is the actual speed of people changing their evolution. If you talk about culture, China is a country that is reborn and like going very fast I want to catch and to be the world leader, you know, as soon as was in every innovation, technology, electric vehicle, obviously, and everything. So they're definitely catching up very quickly on the culture, the communication way and because they don't have the culture of they say hundred years of building cars and designing cars. So everything is sort of like a startup in whichever companies seem a bit messy seem a bit like always new, always changing because they don't have a real understanding or experience of what was before. And that's the good thing about it. That's how the can actually go very fast without thinking, Oh, yeah, but we had this factory for 57 years. We have to keep it and we have to keep the employees there. But they means more, but All right, we're just going to be more innovative. You know, there's a lot of things that change very quickly. So, the Chinese company, they're there. I think in their process, they did 10 years or 15 years of sort of getting inspired by the other end right. And now very quickly, this sort of overtaking them and making a completely different nice like time but China is fighting back I would say so they're really going for to not look at the past but doing their own thing. And that's why for

example, the EV world is being actually control we were talking about it you know, there's maybe I should send it to you there's there's an article from the Los Angeles time is very unusual in unusual that from California is coming to talk about actually what not many people know who actually really drove the easy world and most people think is Tesla is nothing more wrong than this Tesla is not the driver is the guy that was called one guy who is a was the Ministry of innovation and technology of the Chinese government. The only person on the government only that is not from a communist party doesn't make him better or worse it just like a factory which is even more admirable, you know, because it's, you know, to succeed and convince the whole Chinese government to go easy to go everything sustainable and EV and that's where it goes. And also everybody's falling. So if you want to look at this, just look at these guy one gang. is he's is he's definitely a figure of the planet is the one that drives everyone crazy to go. Sorry. I think it's WS Angie and then GAG I think one gun lets me check I can even probably find the article but you'll find Yeah. But it is just to know that I think a lot of especially coming from an English speaking country, we might believe always like we talked a lot about Elon Musk and Tesla and everything that is not the lead the company did an amazing job. This is not but that's not what's driving everyone to go EV it's basically something else where the second one gun

the habits, not it's not there.

No, that's football Chinese public and is this one.

Born in 1942, leader of the Communist Party of China which is not true on politician.

What One Not to be confused I mean there's so much the same you have to find it

Robert Dooley 24:04
yeah

Design Director, Chang'an 24:06
philosophy GA CPC to get

the same start with a second one

musk LA time I think really funny article he's a pretty good friend Bloomberg the world leader electric car isn't elements all right

you can you can take that type I can show you there yeah I'm just finding it I just looked at on Google are sorry just how to change the camera but

anyway they look at this article really quite interesting. Do you see it? Yeah the sensor this time the world's leading electric car visionary isn't Elon Musk okay, but he's just I found this article about thing isn't is the only American article I've seen that was actually quite writer but what it is, but that might help you to understand a little bit. Who is this guy? Right? Yes. Not that's not really what's important but what's important because you talk about design process, you have to understand why are

we changing it? Or are we changing it? And what's the reason for it? And I think I don't want you to be naive of writing a thesis or PhD the to say, you know what, electric vehicles because there's no engine we're completely free. And then because we are autonomous driving so designers can completely be free because we no steering wheel, you know, you have to be focused on be very, very clear to why should that happen. This is like the long term vision to Sarah the whole world or the whole country or the whole say. I was

called that

They say you should create an environment where, where you will have people using only autonomous vehicles that might be possible. But that will not be the big solution. Because as long as you have these other 1 billion cars on the planets, and if you do a turnover, of course in Europe might be much quicker in 10 years, you can completely change the say the whole

car

surrounding but in many countries like Africa, India, probably Australia, Southeast Asia, South America, you know, you have to see not from a European standpoint, because we're peanuts, we're only half a billion people. And we're going to keep like this for the next one next century anyway, and Africa will have one more billion people, Southeast Asia will have one more billion people by the end of the century. And that's where obviously everything's happening. So you have to see from standpoint Looking at changing the design process, for what reason? And the reason is basically we're growing with so many new customers. And there are so many people around the world that wants to to reach a better level of life quality. I advise you a book to read, and maybe you have, but I think there's one book that is really interesting for if you I mean, it might be a cross function, even to the design process even it's got nothing to do with that. But it's called faithfulness, from Hans Rosling. That if you want to read one book about understanding the world, I mean, so a couple of years old, I mean, this is definitely a good book to read, faithfulness. Thanks. And you understand because a design process is based basically on customers and because we're going to UX, user experience that's basically customers, so customers and the growing and changing constantly nine other kids in our company, obviously we highly. Our market is mainly in China, even though we have like all the different emerging markets like Russia, South America, edgy, Iran, Iraq, Australia, New Zealand, these kind of markets, but they are pretty small for now, you know, it's more Chinese. But for all the other manufacturers, European Americans, they're obviously doing the same. I mean, GM is surviving thanks to China. And obviously, East Asia, Southeast Asia, and Africa are going to be the next one. So this is really what will change the design process, because you're going to have to adapt to different situations to different customers. And these are going to change a lot. I don't know if that's helping you wanting to know about Indian stuff like that, but I want to be fair to you is, don't be fooled by this, find that that EV you know, like a golf seven was easy already years ago, you know, stick to the same car, this thoughts, you know, it's not like because you have a blue plastic decoration and he's changing the fact that A car autonomous even if you look at a Tesla that has a

certain level of autonomy like he still looks like a just a boring normal car like cool I've been a Mazda from the 90s you know what I mean? It's just the car is not changing completely design process and as a designer from the RCA to believe that we load down the coupon to the hood hundred meal is not going to make a big difference for your phases in our is like a you know, car design is completely free because we have no more engine is that Yeah, but we still crushing seems to have a crash zone and always think that's low for a natural. Yeah, but you know, in the future is going to be different because car will not crash anymore. Yeah, maybe 5200 years from now, maybe but we're far from it, at least from the global scale.

Robert Dooley 29:45
Yeah. So so just two last questions. I think just to follow up really, you have this nice description of you know, the how the design process of the company is dictated by its brand values. So you gave the example of VWB About everything being perfectly, you know,

Design Director, Chang'an 30:03
they have a new one. And that was I was talking about like a few years ago. Yes, yes.

Robert Dooley 30:08
So what do you think that is to the Chinese brand, the emerging Chinese brands?

Design Director, Chang'an 30:13
That's a good, good question there. I think, of course, there's so many brands in China. There are different ones in in the case of,

of Chang'an or say of a brand like Chang and

I think most people will be surprised that the perfection that you search there you know, I think the German industry has been designing reference cars, you know, from the whole planet in a certain way. Due to some dream to drive very fast on a free model way the autobahn, right. This is what drove the car industry to go there. That means you're able to drive 250 kilometres an hour. too good to work and I live. I live many years in Germany. So I know this is just a normal stuff. And he got to reference as quality and everything because to drive a car over 204 500 kilometres or whatever, you got to have pretty good quality machine there. And this is like amazing engineering they have to have behind it aerodynamic and everything. So the whole world had to follow these sort of these sort of amazing quality search China, they're thinking but you know, they're more realistic, they're more realistic to say why a car never drive more than hundred, almost, that's what the Americans should have done instead of actually just trying to follow the German in a bad way to actually make a car that is really made for the country. And they never made it. I mean, they had a different sort of big VAT, small bug, big block culture, but they never really found something that was truly American. Four people driving maximum 90 kilometres an hour in very boring straight lines is it just try to copy but in a bad way because he was not quite not super good, no super bad. So China is going completely different way they know you know we're we have traffic and we have a

pollution problem. So they're really going into something all right let's clear the sky first let's try to make sustainability a target. And that starts with electric vehicles because going to clean in a first aspect of the development. They say the direct pollution, the emission of the cars. And then of course at the same time the developing sustainable energy the same time because you have the infrastructure obviously, that needs to be there. For example, in China, there's not a single building that has been built the last two years that is not hundred percent compatible with charging your car because the problem we have in Europe most people is that even if you buy EV you cannot charge it. You don't have a house you don't have parking space to build you have a garish In America, you can do it easily. So in China, they really going like all together. And that's the advantage of China, a strong government. They actually say this is the road. And I suggest you Google right now, China made in China 2025, which is the next one. You have the made in China 20. And you're going to have them made in China 2025 This is the document that is actually leading the world is a document that tells what is the next big picture for China. And because China is the largest power and getting the largest power, then everybody's following know, this is the document you should read that will help you to understand where what type of innovation is going to be. So there there are a few documents every five years the government make these big picture and the first one was the 15 they get a 2025 where to start talking about sustainability, about EV about innovation, about the technology but robotic about health. You know, it's all this amazing stuff that is driving everything. company to go there. And that's why every EV including including California, they actually started to get money and financial support, because they knew they were backed up by the Chinese government. Yeah, okay. Yeah, didn't even everything. So this is just very quickly at a storey. But I think you need to understand these in order to make you a thesis, a better one and understand why we're happening, why it's happening like this, why there's so many startups why everybody's going to be what is doing easy for I mean, you know, it's it is complicated, but in the end, you have to look at it absolutely in China, because this is where the where the core of the EV world and autonomous world is, is going to go you know, you're you got like the amazing Technology Centre, you know, including Tencent as a group you know, how you look at the Bat bat, which is Baidu

said which one is a

Bat where the bat

Robert Dooley 35:01
Alibaba and

Design Director, Chang'an 35:03
sorry, Alibaba Tencent, that's going to give you an idea on the technology aspect. What are the big players in this world and our company, we are in partnership with 10 cents. So every car is going to be 10 cents. I can't tell you everything but we're there's a lot of technology, things that are coming out of all these partnerships. And I think that will help you. And in the design process that basically mean that we're much more into the technology side, you know, you know how to link the car and I

think what's important to me is the high connectivity, the Internet of Things, the that really drives a sort of different process and the UX training from process autonomous is not going to change everything at this for the next 10 years because the fact that ok, car can drive alone is more a couple of sensors outside and You're just hands off on the steering wheel. But as long as you're going to have to drive the car from time to time, you're still going to have a steering

Robert Dooley 36:05
wheel. Yeah,

Design Director, Chang'an 36:07
less very specific vehicles. But I don't, I don't think can say is going to change the design process because it's not because a few companies are doing the very limited edition for something that is going to be a taxi for Dubai, for example, or Robert taxi for airport or something like that. It is not about the big picture. So if you want to look at the design process and the big picture, you cannot just take some very small elements, you have to see that we're almost selling every year 100 million cars. Now it drop is probably 70 millions last year. So there's a big drop in the car industry. And you might go back to 50 millions or I don't know whatever. But what's important is that this is very big numbers compared to maybe 100,000 or even 50,000 of just auto squad. So that's not changing the design process to come back always to your question about design.

Robert Dooley 37:00
Sure, okay, so lastly, I do understand your point. So the last one that is what does the impact of sharing have? And do you think the impact of if we're not owning our cars anymore? So designing different models of ownership king that will change design process?

Design Director, Chang'an 37:19
Yes, I would say I would say the design process probably not even I mean, we're all thinking okay for sure that we make a microbus or boss, you know, for my more people to share and you can change the quality of interior. I would not say that, but I wouldn't want to add another points. The German market for example, I mean, for me, it's a lot of people like the disruption you know, if you look at media as the old talk about the test like healer, the disruption of industry, you know, the media's are really sharing a lot of hate, because that's, that's part of selling, you know, they're people love to hear these things. So I think reality. It's been such a long time that actually people don't actually own the car. They do leasing they do credit and they do company cars in Germany, the penetration market of company cars, it's absolutely gigantic BMW LD and receivers they all I don't know what's the sheer but there are some cars they close 200% of all the company cars. I think there was like even a huge die. Sit down I was in Germany hundred percent company cars. So look at the picture of what is it to own a car versus to use a car and I think we can admit it's a bit more confusing. What is it ownership and I think most people even older people like me, I haven't owned the car for years. I just get company cars and change all the time I just use it. So let's be honest, what is ownership and the the sense of ownership that this is mine is my garage and I clean it. A lot of my colleagues use it

for more old timers like an old nice cars, but the ownership of no new car thing is that for a long time anyway in many new situations, so let's talk about real car sharing, which is using an app, or the instant for a few minutes or two hours maximum. And in order to actually go to go back to the question, I'm using it a lot. And so father, just normal cars, right? And the question is, like, why would we need now or next 510 20 3050 years, a different type of vehicle because you don't own it in your garage? And I think it's going to be the question, you know, why should the design be different? Some people think is like, well, because we don't care anymore. You just need a service. And, you know, today, you look at what happened in a phone industry. And you can say that every phone is the same or not, or is it the interface is different is the exterior aesthetic. And the case of a phone you don't really have interior design, so be more difficult to actually look at the interior design versus not Does it does it really change the fact that when you have an app, you will use the app that you like the most. So they'll be maybe more Orval?

Let's say, the feeling of you which app Do you want to use? You know, I worked in a Volkswagen Group Potsdam, which was one of the future centre. And I worked. I was one of the first one to actually work on this new EV car sharing world and we met many practitioners. And what I found out with my colleagues was that the Volkswagen Group had so much potential, because if you have to choose one app, you know, why will you use the Toyota app to see all the Uber app versus say the Volkswagen app as an example where you can drive a Lamborghini for the weekend for one hour, a Porsche for a weekend and now the if you want to a Volkswagen up a car, Ducati MN truck You know, in the end, the offer is going to be probably the best for what people want because one day you're going to have kids the other day you got no kids, maybe you want to go out and go to a party. Maybe you want to have a motorbike for the weekend. Maybe you want to go to track day. You know, this is probably what we all want. You know, I always was frustrated that I had one company car that could not even change every every day or two days and all of the day Why don't have a cabrio. So sharing is probably get why do you share in having only one to say BMW one to Siri mean who wants a nap like this? You probably want to add the gives you what you want. Because an app the perfect app is the one that if you feel like happy and sunny and you want to cabrio Why can't you get it? So I think this is basically what we all want basically once your phone and say hey, you know what, I feel a bit depressed. Can I have a car in order to go somewhere cool, and you just surprise me as an example, you know, or Yeah, you know, I'll go to IKEA can Do you have a transporter is there but to believe that is only one vehicle for everything because this car sharing, I don't believe because human beings never been like that one day you have a black t shirt the other one you have a shirt you have, you know we can we like to change we don't want to be exactly the same every day doing. So, on the design process. There is only one thing that will be very specific. It hasn't happened yet. Or it happened for one company called Raytheon where Amazon hoarder order hundred thousand of these vehicle. What we believe my happen is that like for example, when I worked on the Opel Insignia or Greek regale, he had different names through continents. We worked very closely to insurance company to have the best rating because if companies take order 5000 cars, they want the one that really is going to cost less insurance and everything so it's pretty important and you like that you design like this. So what's going to happen

in this a goober so powerful so much money that they go to whoever Porsche Fiat whoever and say, all right, you gonna do me one or 2000 cars? That's completely possible the question there is that in the long term if this technical or innovative or internet companies are so region support for that actually will use OEM to actually build their own cars and they will tell people what they want as a product. And this is a possibility or is it replacing a typical OEM because people will not actually want to have a choice of vehicle. We're very far from it. In many cases, yes, we will use apps you know, to actually use these products and I think we're doing it I'm doing myself in every city but it's still you get minis you get BMW so you get any kind of car. So why not? You want to choose a car you like the most Why? Be a primer is a human being that say at some point I don't care at all. That's what people go to Apple or to a Huawei or to show me or whatever phone or you know or why you go to Louie Vito versus going to h&m or Gucci? I think those the brand always have to be something important to people. I think it depends. And I think there are some people that will be more price sensitive and say, Okay, I want to the cheapest one the cheapest app because I just want to transport but some people will probably want to be more saying why is the same money? Maybe it's better I take the BMW as the fact is to say money is the price Why will I drive a car or a box, a square box if I can have a something that I believe is cooler. And I think I know most young people they're sort of tend to say in your generations or maybe you're close to it. Don't do a driving licence done on call I'm here this and

I think this is the Z generation might be a little bit different. I'm sure at the end, you know is just it depends how you sell a product. If it's just an old fashioned quality car, you might not do it. But if it's like a trend, or object or universe around the app or system that might work that's why every company is calling them mobility provider and not car manufacturers anymore because it sounds cooler and we we are more open to do different accent, innovation and car sharing, stuff like that. But until now we're even Uber. I mean, there's not many companies such as Amazon that order these driven cars. That put a lot of money. But apart from that, for now, the disruption is not really happening. Now people of course, they have the choice to buy less cars and to share the cars. And to go back to what's going to happen with the design process. If we design a car that is going to be Old outdated after two three years because someone's been using it one hour per day out of 24. So which is almost nothing What happened to a card is used to say even half of the day if it's 12 hours you know doesn't ego much quicker older? Yeah, has to be replaced more or busy matter doesn't matter maybe it should even be equated complete opposite maybe we have to be much much more cars, because today the cars are not moving at all, was the cars are just parked almost 90% of the time worldwide except taxes. So some people say Haha, yeah, the car industry will be completely dead because because because the car will be just driving alone and cities say Well okay, if a car does 20,000 kilometres a year in a normal person, and instead does 1,000,002 year, that's gonna be a big change. Yeah, but not in a way We believe is going to be normal car industry in Monday completely opposite he might be much more demand if everybody uses it all the time. And he's going to be destroyed much more if it's your own private car, you will definitely take care about it clean it, maybe you know your your wife or whatever. But if it's like you can see all the car sharing and scooter sharing and bicycle sharing after a year the old shit and I have to replace them. So I

don't think it's going to disrupt the the industry and therefore maybe not the design process, except that we might be even have to be much quicker and replaced and even much quicker. And if that's the answer for sustainability, now we'll see. Yeah,

Robert Dooley 47:43
yeah, yeah, yeah. Okay. Good point. Okay. Yeah, that's really been really interesting. Thank you very much for your time. I really appreciate it. I've got a shoe off in a few minutes. I've got a meeting to go. Yeah, yeah. But I mean, just so you are aware perhaps so My door prizes knows I'm doing interviews that this and I'm sort of reflecting on how things are. And then I'm going to start working out how things might change in the future. I'm working quite closely with some recently, the Bartlett School of Architecture at UCL, who have been developing something called discrete architecture. And discrete architecture basically says, architecture process is quite digital. We use digital tools and architecture, but the way we construct things is still very manual. You know, the construction industry is very manual. They're looking at bringing in, automated assembly into, into architecture, Israel, and I. So I'm looking at borrowing some of their methods and bring in but perhaps later, later date when I've got more on that I will, I'll update you might be of interest to look at when I've gotten away

Design Director, Chang'an 48:51
very quickly. Let's see changing the design process out of this or using 3d printers. I used it years ago in Volkswagen. We had 3d made workshop a 3d printing, plastic metals, all sorts of materials. And, you know, the design process always been changing from hammering aluminium, to actually doing like side the full size tape drawings to actually starting to use pastels and magic magic markers to actually going into the Photoshop world to 3d more in a 3d and the rest is going to be VR completely sketching in 3d and directly being more freedom and using 3d printing methods. But I don't think this is linked at any kind of an easy our characters sharing autonomous vehicle is just a normal tool improvement that has been the same for hundred years. And of course, it's going to be something different that we're seeing more VR, and 3d tools, and it's going to be 3d printing tools and different types of things. And of course, it's going to be another 10 years or 20 years always different. But to answer the question is nothing to do with the finance EV or autonomous car sharing different different things. Yeah,

Robert Dooley 50:02
just tools. Yeah, yeah. Okay. So thanks so much for your time. I really do.

Design Director, Chang'an 50:06
Robert, nice to talk to you. And if you have more questions you can write me down. Yeah. Brilliant. Yeah. Have

Robert Dooley 50:11
a good weekend. Jeff. Thanks, you, too. Take care. Bye

Transcribed by https://otter.ai

Appendix ii – Interview transcription and summaries

ii.c. 2019-12-10 SENIOR DESIGNER HYUNDAI AMERICA - summary

Senior Designer Hyundai America discussed his background in automotive design, starting in Canada and eventually working for Mercedes and Hyundai. He explained Hyundai's design process, which involves multiple phases of modeling from initial concepts to final approval. He discussed how interior design has tighter constraints than exterior due to fitting humans.

Senior Designer Hyundai America described how trends like larger screens impact design. He also talked about different cultural approaches at companies like Mercedes versus Hyundai's focus on customer satisfaction. He saw potential for more interior flexibility with autonomy but said full implementation faces legal hurdles. Finally, he noted the importance of emotion in purchased vehicles versus the shared economy where functionality matters most.

ii.c. Transcript

Robert Dooley 0:00
Perhaps best if I briefly explain what I'm doing. And then to begin with it be great to hear a bit about yourself and your background. I'm a graduate of the Royal College of Art in London, right at the because I'm programme now doing a PhD at Falmouth University, which is based out in the southwest, the UK. And my PhD is looking at the future of automotive design. And looking at particularly how automotive design process may need to change or adapt with sort of meet the challenges of autonomy, electrification sharing connected, what I'm really interested in finding out those at the end of my first year now, but I will be a traditional literature, the go read books and find out what's already been done. But that's very hard to get within because it has not helped me much written about, about that car about car design. So what I'm doing is I'm taking this little small programme, where I'm interviewing people like yourself, and who have been in design and design management, and to try and get captured clear understanding of the interior design process festival where I'm focusing more in grey area, and looking at where that process fits within this product development platform. So process if you like. So that's kind of what I'm doing and why I was keen to chat to you. But it'd be great to hear a bit for I've got a few questions just to walk through. But perhaps before we begin, that'd be great to hear about yourself and your background and that sort of thing and how you came to the working for Highland day.

Senior Designer Hyundai America 1:30
Sure. Well, so I'm, I'm originally from from Canada, I grew up in Toronto and always wanted to design cars, which is not something you can do so easily in, in Canada, because there's there's no car industry, there's just some factories. So I my my parents are actually had emigrated from from Scotland, so I've got a British citizenship as well as Canadian. And I had a, we had, you know, a family friend who was like sales manager for for what was British Leyland at the time in Scotland. And so he put me in touch with the design department and at them and in, in Coventry

and I met I went to wrote first wrote and he told me about all the different schools and then one time when we were when holiday when I met him, so I knew about the different schools in the States and Britain and stuff. And so because it was going to be easier to go to, to Britain then to come to the states i i did a foundation in in in Carlisle and then I and then I went to Coventry and did a couple years there. And while I was there, I didn't you know, I don't know, I didn't really like them. And they didn't like me very much. So I one year when I was back home, Christmas time I went to the Detroit Motor Show and looked at the the work that it does. CCS had a display there. And so I looked at the work and it was it was really good, better than most of the stuff that was coming out of Coventry at the time. And I was also very interested in the in, in in the computer side of it alias in particular, which is based out of Toronto. And there was one seat in Coventry that that one person got to use because he was a researcher. And then I while I was touring CCS, they had a lab full of SGI computers that you could alias on. So I decided that was the place for me. So So I applied to their guardian, and then Didn't you know, after the summer didn't go back to Coventry. And so then I finished my degree up in, in CCS in Detroit. And got hired straight out of school to work for Mercedes in California. So which was the last place in the world I thought I'd end up but here I am. 22 years later still so. Okay. So I worked. I worked for Mercedes for about seven, seven and a half years, I spent a couple years in Germany, I did a couple of interiors while I was there. Then I when I came back from Germany, I decided it was a change of time for change. And so I you know, I, I knew actually knew the guy who was running the studio here. So I applied. got, you know, got hired here. And so I've been here for 15 years now. started out as a senior designer, then then manager interior now I'm the Senior Manager. So that's my history in a nutshell.

Robert Dooley 4:52
Sure. Okay. Thanks so much. That's great. I'm so okay, the festival sort of to begin with, because you perhaps you're managing interior designers, but you have to summarise This is the process, you go through perhaps a recent example, you can have an interior you've worked on and sort of the process you went through. So where where was the start point? What was the start point, that process? And what was the end point?

Senior Designer Hyundai America 5:17
Okay, well, we, we have basically four phases of our design. So the first, well, there's actually there's a fixture there's like a, there's actually a fifth phase, because they do a proportion phase before we actually start designing. But when we don't typically get involved in that in California, they usually do that in Korea. So ours, there's a four phases is a vision model, there's a first model, there's a second model, and then there's an approval model. And then there's, there's a fixed model after but that's sort of tied in with the approval and the the early the first model is really the gate where this selection makes vision model, everybody does a concept. And we, you know, we look at, we will compete against the other studios, and look at those in VR. And then we come back and we do another phase based on the theme that we've developed. And then that will be presented as a physical model in competition with the other studios, and then pick the one that's going to go forward. And then there's a the next phase is a refinement, you know, further refinements of that model, each one's about

three months long. So our involvement, if we win is typically about a year on a project. But if we don't win, it could be you know, six months or less, depending on the programme.

Robert Dooley 6:45
Okay, and you mentioned you said begin with the studio over in Korea has like, maybe have a longer phase and five phase?

Senior Designer Hyundai America 6:53
Well, yeah, they have, what they'll do is before the designing starts, they'll have a product face. So they're, they're looking at what especially on next year, they're looking at what the overall proportion, the vehicle is, you know, modifying the package, because the package is still a little bit soft at that point, it's not fully frozen in, you know, the the basic dimensions of it, I would length, you know, silhouette, all that stuff, counterpoint, those are all still movable during the proportion phase. And then after that, that's, that's pretty well tied in, we still have a fairly loose package that we work with. So there's still ability for designed to influence in proportion. A good example of that is the new Sonata we just we just showed in New York that's about to come up. Come in, it's already on sale in Korea, but it's just coming out here soon. So that one the proportions and the and that was heavily driven by the design department. Right.

Sir, good.

Robert Dooley 8:03
So is that is that driving of the package traditionally driven by engineering constraints, or what drives those those sort of packaging constraints?

Senior Designer Hyundai America 8:12
Well, typically, engineering owns that in most companies. And in the past engineering, I had to stronger hand on it, but we've been given more ability to to modify it. So obviously, it's within, within reason, you can't do things that are impossible and you still have to be able to build it and you know, meet the cost targets and everything, but we have a fairly, you know, we have enough sort of flexibility in our in our system that we're able to sort of help control you know, even like down to tire size, you know, design has some saying that you know, wheelbase, okay.

Robert Dooley 8:50
So, is your interior as flexible or is that is that more tightly defined as a package.

Senior Designer Hyundai America 8:56
interiors are more tightly defined, because you have to human beings in the show, so and you have to fit. Like, you know, the on an exterior, the components involved are, you know, headlamps and tail lamps, right. Whereas an interior, you have a myriad of you have seats, you've got steering wheel, you've got airbags, you've got radios, you've got a cluster, you've got vent systems, you've got all the ducting for the event, you've got, you know, there's, there's all of this stuff. So it's much, much tighter than

what you can do. And that has nothing to do with what the engineers want or don't want. That has more to do with, you know, the shape and size people are.

Robert Dooley 9:43
Yeah, sure. Okay. Let me I'm just going back to you mentioned that you've been able, there's some flexibility of all that means designers can have more say over the packaging than just engineering and what what do you think has Why? What's the reasons that what's been what led to that?

Senior Designer Hyundai America 10:00
Because, because our vice chairman has decided he wants to push the engineering to do what the design, you know, what design thinks the car should be? So we've been given that

that ability by our upper management,

Robert Dooley 10:18
okay, so.

so touchy, then just explained to me, you said that this process of designing, I'm assuming talking about production interior here, not not an advanced interior? is within a within a year? I just wanted, could you explain to me where that fits within of a product lifecycle? So what I'm what I'm thinking here is, is how does the work from advanced design? How does that feed into the work in production? And then how does things like faceless and that sort of thing tie into that? Sorry, Miss, what, how does that tie into it? Sorry, so how does? How do you sort of design I'm in advance design is different to the way you design in a production environment? And how does the information from Advanced Design feed into into production design? Where does that year long process sit within within a wider product life?

Senior Designer Hyundai America 11:15
Well, that that year long process is the is the production design process. So that's when from when we start, you know, if I if I if my design wins all the way through from first sketch to the you know, the fixed design model is about a year. And so that's from doing things that are probably a little bit crazy, and totally off package to you know, sort of refining and dialling it into something that I can that we can build. So we do mostly production work here. You know, we're doing starting to do you know, we do some advanced stuff, we do some show cars, and stuff like that. But you know, the process for for a concept car isn't terribly different than a production car, there's, there's usually a little bit less competition involved, it's more that each studio, you know, is assigned one to work on. So the competition is internal, rather than between studios. Because for for production projects where we have a studio here we have a studio in Germany, we have a studio in Japan with three studios in China and the main one in Korea, and will be competing against the other studios for projects. So you know, at the first phase, you'll maybe have three of the studios competing and then you know, maybe sometimes for for the vision that gets down to usually three models of by the end of vision, and then the first phase will be usually three models, and then they'll pick one of the three that's going to go forward to

production. So that's what dictates how long we work on it, whether we're successful in competing or not.

Robert Dooley 12:54
Sure, okay. Somebody says, I'm okay. Sorry, I'm just noticing things down. I want to come. Yes. If you decided a facelift, and if you you know, on the exterior after a year or two, or maybe three, I don't know how long the exterior design will Germany basis rather than the whole new design of car you get the facelift, do you do similar sort of programme to the interior and then a longer or shorter or?

Senior Designer Hyundai America 13:23
Well, what tends to happen is

like the the exterior facelift is fairly staple in the industry, you know, like the car cycle is four years, about two and a half years, you bring a facelift out just in or if it's five years at three, you just to keep the exterior fresh. And that usually involves just soft part. So bumpers, you know, usually not changing sheet metal, unless there's a problem with a car and then you know, then

Robert Dooley 13:59
she sheet metal can get involved.

Senior Designer Hyundai America 14:02
On an interior, typically a facelift involves electronics, so you use the opportunity to to refresh the electronics in the car, usually not changing very much of the instrument panel because that gets quite expensive. Again, unless there's a problem with a design, right. So if you can look at like our the the Tucson CV that we have the mid sized one. And that one had a fairly you know, typical exterior facelift where all the sheet metal was was carry over the change the the lamp enters, but the shapes and the lamps stained the faces front and rear both changed. But the interior had been criticised for being a little bit bland. So we carried over the doors, we carried over the whole lower instrument panel where the like the glove box and stuff is and the centre console got updated a little bit just for technology, but the whole upper instrument panel was changed out. So that was a pretty big change for an interior facelift. Normally, you don't change the surfaces that much unless, as I said, the design is not been received well, and you want to try and you know, improves the cars ratings that way.

Robert Dooley 15:21
And just so crashed, and why do you not want to change those a surfaces

Senior Designer Hyundai America 15:26
expensive, and it's a bit diminishing return? Right? So the problem with problem with facelifts is the basic proportions of the thing are going to look the same, right? So you spend a lot of money to change something for not a lot, you know, for not a lot of benefit often. So you if you're going to make it if you're going to make a change, you have to make a substantial enough change that people notice it, otherwise, it's not worth changing.

Robert Dooley 15:53
And so you said the people said that the for example, in the example you gave the interior with the bland and how did you find out that? What a few reviews or feedback? Or what was that process of what information to the design team?

Senior Designer Hyundai America 16:08
Well, I mean, we looked at it, and you know, I actually worked on it. And you know, the it got pretty blended out. And we thought I thought it was blend. And then you you know, you look at the reviews in the press and the press thought it was bland. So okay, no, it's sometimes it'll be you know, you know, our product, our marketing are doing always doing research, you know, the marketing group, product planning are always doing research and stuff. So there, you know, comparing that towards against the competition, so you can see where our strengths and weaknesses are. You get reviews in the press. So there's a bunch of feedback, but you know, some of it is we look at it, it's like, yeah, that woman wasn't our best one, maybe. But the other ones were really happy with so.

Robert Dooley 16:51
And so I wonder if you could maybe tell me a little bit about how trend impact planning design process and maybe specifically help with, you know, recently led trends that impacted the interior by having me?

Senior Designer Hyundai America 17:04
Well, I think the the trend you're seeing right now amongst every car company is big, bigger screens, right? So the screens are getting cheaper, and everybody likes them. And so you're getting more and bigger screens. And so that's a trend. That's hard to buckle, right? Because it's a you get a feedback loop, oh, more screens are better, bigger screens are better, so that every, each one's going bigger and bigger and bigger, and more and more and more. So we'll see how far that can play out.

Robert Dooley 17:36
Okay, yeah. And you mentioned that you've worked for a couple of different brands and in different countries, or was it all in America?

Senior Designer Hyundai America 17:46
Um, it was mostly in America, but I did work in Germany for but it

Robert Dooley 17:50
didn't have anything different that in terms of cultural emphasis, oh, me, let me design process, would it pretty standard, wherever you were?

Senior Designer Hyundai America 18:03
Well, in on a superficial level, the car design is car design, right? You draw you, you get an engineering package, you draw something, then you make a model, and then you present it. So as far as what skills you need, it's the same everywhere, I'm sure the the the, the, the, the way you culturally interact with people is different from country to country, and different country, you know, different places have different

ways of interacting. But that's nothing to do with car design. That's just the way do with you know, for example, if you look at the way you interact with, with a German compared to American compared to a Korean is all very different, right? So Germans are very face value. You say what you say what you mean mean what you say? And it's all very out in the open. And so you have you looked at the German looks at something they think it's awful to say to your face that things hideous, what what are you doing, right? And then the American will get all offended and think, oh, he hates me. But then you do something else? They come back? Oh, that's great. I love it. Oh, he loves me, right? Where's the Germans just they're really just looking at the design and they like or don't like what you've done, right? So Americans, someone in the middle, contextually weather, how much context you take from the from the conversation, Koreans are the extremely opposite from German. So there's nothing is, you know, nothing is open. It's all done behind the scenes. And so you, you, you sort of present things quietly, and you have side meetings, and then you you know, so that the decision can be made in a consensus way. So that's different from company to company and culture to culture. But that, again, that has little to do with, with with car design specifically, that's just, you know, different different cultural interest.

Robert Dooley 20:01
Yeah, and

No, that's okay. I'm sorry.

Senior Designer Hyundai America 20:06
Sorry. Okay. Well, so I was gonna say, you know, the way Mercedes develops a car is different than the way Hyundai develops a car. So, you know, the, the, the, the philosophy of the company is different. So it's, it's much more you know, leading edge cutting edge technology that we're developing in house for ourselves, and then bringing it and and, you know, the basic philosophy of, of Mercedes is, we build the best car, if you don't like it, buy something else, we don't care. Whereas the philosophy of Hyundai, is we're building a car, we want people to love us, and we want we want to make cars that you love, and we may not make the, we may not make the something first, but we democratise it, we bring things that you want, and for you quickly edit price you can afford. So we you know, we will not do things that we don't think people will like, Where's Mercedes doesn't care if they think is the best thing. And they will just do it. And if you don't want it don't buy a Mercedes. Sure. So that's a that's a company difference, philosophically, that leads to different designs. And so you can look at a Mercedes and you can look at a Hyundai and you can understand why they're different because of the different philosophy.

Robert Dooley 21:27
Sure, that makes sense.

Okay, yes, that's interesting. He said, actually, slightly. That's what my main questions go on. actually be interesting to have a chat to them about two things I sort of Frankfurt which was festival, the high end day 45 concept. And right, which I thought was actually really good. Did you work on that with us, your storey and

Senior Designer Hyundai America 21:51
we we were peripherally involved in that one.

The the there were some ideas and the interior that came from one of our proposals, but we weren't directly involved in that one.

Robert Dooley 22:05
I find it really interesting the way that the the clearest example, and I mean, the clearest and most logical example for a crossover interior, that is an interior that can function both for driven but also for that and autonomous thing. Right? that really stood out to me that actually the thing I was most impressed by was the headspace concept you guys had there? Which I understand came from with the Korean studio, maybe. I thought that was a really interesting vision again, of this other sort of a full, full autonomous all at the level for the right vibe autonomy environment. Right. And I wonder, then, then your design process there was they seem to really focus on flexibility, flexibility to use

if the internal space,

Senior Designer Hyundai America 22:54
sorry, you cut out there for a second?

Robert Dooley 22:56
Sorry, the with the hate space, this also driving behind the design team to the flexibility and flexibility is that anything is quite new? Or have you always been thinking about that?

Senior Designer Hyundai America 23:10
Well, you know, I think the you know, an interior, especially a CV sort of thing is about flexibility. And it's it's about, again, what you know, what our philosophy is, is to give people what they want. So I can back that up to another sort of specific example in a production car, whereas we're in. In America, typically, when you unlock a car with a remote, you push the button once to open the driver's door and twice to open all the doors. Because Americans are afraid someone's going to break into their car while they're getting in the car. In Europe, you typically push the button once and it unlocks all the doors. So if you buy a Mercedes here, you push the button once it unlocks all the doors, basta, that's it, right? If you buy a Hyundai, there's a setting on the end in the cluster, I can change it to one one click or to click. So what does the people want? We, you know, will let you choose what you want. So the flexibility to let people choose is is something that we build into our stuff, because we want people to like us,

Robert Dooley 24:24
through example, is there any examples of that way? With the physical part of the interior? You think about that?

Senior Designer Hyundai America 24:37

Coming in the spot here?

Robert Dooley 24:39
Yeah.

Senior Designer Hyundai America 24:43
Well, you know, I think we were one of we got we have ones where the, you know, the the middle seats, slide and tip so that you can prioritise luggage versus, you know, versus space. You know, because if it's just children in the backseat, you can push the seat forward a bit. So you get a bit more luggage room versus you know, prioritising space if you have adults in the back and don't need luggage room. But you know, right now the I think the the interiors going forward, everybody's thinking with, with, with, you know, electrification and automation, that there will be more flexibility pot possible, because if the driver doesn't need to be focused completely on driving, they can then interact more as what's going on around them. But right. Now, as from a legal perspective, that's not something you can actually do, right, because cars still need to have a steering wheel, the driver still needs to be able to grab control at any point, even in the fully, fully autonomous cars on the road. So we're some way legally from being able to, to do fully execute the lounge concepts. But I think everybody's sort of playing with assuming the rules are going to change. And so trying to figure out where that goes, and also help by by trying by pushing and playing with the envelope, you can also help the legislators understand what is possible, what is impossible, which way they should move. So that's Chinese, some of the reason for doing that stuff, too.

Robert Dooley 26:21
Okay. Um, so one last thing that is interesting, you're saying, because there's a big worries in the amongst our people, not just the car designers, car people, but you know, so much of so many car brands rely on driving experience, there's all create that emotional connection with the customer. But actually, what you're saying is the key, it's kind of that already at the position whereby it's not, they're not Mercedes or something, they're not relying on this, you know, driving pleasure or whatever the slogan might be good company, to build that relationship. So you're kind of building a relationship based on different criteria, right? You said about pleasing people.

Senior Designer Hyundai America 26:56
So yeah, go ahead. Finish your question, sir.

Robert Dooley 27:00
It was more of a statement, just

kind of not happy to have that same worry about all people are going to not love us anymore as a driving brand. You know?

Senior Designer Hyundai America 27:08
Well, you know, I think, generally, or historically, people have bought Hyundai's haven't bought them because of the driving experience. I think we could all admit that. There's some of our cars are better to drive than others, like some of the end

ones are drive pretty nicely, the Genesis, the Genesis cars, which you don't really get in Europe yet, but they drive pretty well. But that wasn't really sort of our sort of core philosophy. But the interesting part about it is I think that, you know, once the autonomous box comes, that you know, a company like Mercedes or Bentley or Lamborghini even or Ferrari even, doesn't have a problem. They put it you know, Ferrari could paint the box of red and put a big, you know, prancing horse and yellow on the side, and people will buy it. Because of the brand Porsche people buy it because the brand Porsche everybody thinks of as a sports car brand, they sell more SUVs than anything, right? So it their brand is is is flexible enough and strong enough that they can get away with it. No one is going to care. Whether there are a tonne of his box has a Hyundai badge on it, or Ford badger tweeted about. Yeah. Okay, so where's they'll pay more to drive around in a box with Bentley on the side? Because it's it says something to them. And it's a you know, it's like, you know, Gucci bag at that point, right?

Robert Dooley 28:39
Yeah. Okay.

Senior Designer Hyundai America 28:40
And so and you know, and the Ferrari boxes, like someone wearing a pair of Nike trainers with a suit, right? They're not, they didn't buy them for the purpose. They like the brand Nike, and so they'll they'll wear them, you know, they'll pay and buy and wear the shoe. Not worrying about what YU we know what she was initially designed for the brand at that point. So that's the challenge for us. And that's why, you know, we're staking our claim to to, you know, we're, we want you to love us, we want to do you know, what do you want? And that's who we want to be for you.

Robert Dooley 29:18
Yeah, okay, licence. Okay. I'm brilliant. Thank you very, very much for your time, I really appreciate it. One last thing I saw just go over. So basically, what I'm doing now is I'm taking this risk that I'm so the idea of my PhD is trying to come up with a new methodology, if you like a new design process, which might be might be better suited to meeting the sort of the challenges of flexibility. And what I'm doing, I'm working fairly closely with the Bartlett School, which is a University College London architecture school. And as a research group that have developed a really interesting technique of digital architecture, so this is whereby your assembly, flexible structures, which can be assembled and reassemble depending on the use case,

Senior Designer Hyundai America 30:06
the car, the car industry already does that. Do you think?

Yeah, okay, because well, cars or cars are all built of components sets. So I mean, if you look at like, if take full swag and group frigging example, right? Yep, every single car they make, they've got about two platforms, right? They've got the gas platform, and they've got an electric platform, and then the, you know, the Audi's uses sort of, and, you know, he's a more aluminium intensive, but the basic building blocks are the same for Polo as an eight, or failing. So everything's scalable, you know, they've got, you know, they've got different suspension components designed, and they can

apply whichever suspension component they need to the given thing the chassis has, this has these parts that can, you know, you can play with the width play with the length, but you can move all of the components around. So that's all a bunch of building blocks. And it gets even easier with electrification. Because then you really, like if you, you know, like a Tesla, right? It's, it's, it's built on, on escape, escape port, basically. And then you apply the, the, you know, how much battery you want, that gives you the overall proportion of the car. That's why model assets so big, because they wanted to have, you know, a large physical volume of battery, and then you've got the suspension parts, and, and you put all those, you put all those together, and, and then you drop the body on top. So I think that sort of the, you know, I think that sort of stuff is is already existing in the car industry. And that's why once the, so that's why it's been difficult for the cars, the the the sort of legacy car companies to quickly react to the Tesla's of the world. Because what Tesla did was they took, they had no building, they had no components, they made their own building blocks, and, and started building cars. And, you know, it was easy earth for them to do the Model S. Because it's an expensive luxury cars is mostly hand built, and they could just put stuff together, they had a bit more trouble doing the model three, because you had to build that like a normal production car. But now that they've settled that, it'll be easier for them to do for their cars going forward. And once you've got the car companies re re align their development to electrification, then it'll be very easy. You know, the luxury isn't much simpler. electric cars are much simpler than gas cars, right? But yeah, well, when you have factories that are designed to make gas cars, then you have trouble making electric cars, right? And also, when you're not 100% sure, whether you want to make electric cars or still make gas cars, and it's difficult, because you're trying to do both doing the two together is much more difficult. Right? But doing just electric cars easy.

Robert Dooley 33:07
Yeah. Yeah. So yeah, I completely agree. What, what I'm looking at is I'm trying to sort of take that concept and advance it further and apply to the region interior. And so that would be looking at fairly sort of future scenario, the use of this method, and what I'm looking at doing is basically adopting, if you imagine the simplest way to describe it is a Lego brick interior. So rather than having moulded panels stay in place, the idea of the that you choose the the design, the attraction movement is critical, discrete, because the discrete elements are individual elements. And so the IOB have individual elements which are interlocking, and which can then be robotically reassembled. And so there's this little design, it's like an idea could be in a shared electric vehicle, you know, I use it and it configured one way. And then on the way to pick you up the interior reconfigures itself for you to then use it. Right. Is that right? streaming company?

Unknown Speaker 34:10
Yeah, which,

Senior Designer Hyundai America 34:10
which is, which is interesting. The, the, the one thing Yeah, you want to keep in mind is, so you know, there's two use cases of cars going forward. One is where people buy them, and one was where people don't buy them. Right. And if people are

buying them, the, the, the emotional aspect of the design is still really important. And so you're designing, you need to design it, so that people want to want to buy it, and they want to get rid of what they have and buy, the new one that it makes is all shiny and exciting. And it makes them feel good about their purchase. If you are designing for a shared economy where you don't own it, then it really doesn't matter. Because if I get in a taxi, I don't care what the taxi looks like, if I get an Uber, I'm not really worried, whether it's a Corolla, or an E Class, as long as it's clean. And, you know, again, someone will pay a little bit more for an Uber black, or, you know, or limo, then they will for taxi. But, you know, that's more down to materials, rather than, you know, space and material, right? So you're paying for bit more space, you're paying for nicer come to your seat. But there's not a lot of emotion attached to it. So it's very different. It's, you know, and that one's comes that, you know, that's a macro economic question of, you know, which I don't have the answer to is, is it is it chaired? Or is it purchase? And I also think that depends on where you are geographically. in a, in a, in a place, like, Britain, which is quite small, the shared is easier to do than in places like America, which is quite big. You know, you've got, you've certainly got pretty remote parts of Scotland, even though Can you imagine if you lived up in the up in the north of Scotland trying to get an Uber?

Robert Dooley 36:19
Yeah, yeah.

Senior Designer Hyundai America 36:21
Right, you know, or the middle of the highlands. And, you know, I, you know, and you sit there, and you've got a, you're on a farm. So, you know, there there are, there are certainly people in urban situations probably won't need to buy cars as much, especially in places that have decent public transport infrastructure, which again, America doesn't. But it there certainly places that you don't get too far from the city. And you're going to need to have a vehicle that's there all the time when you need it. So that Then what is it? What does it look like? It gets its I think everybody's excited about the, you know, the shared ride in the cities, but I think there's other places where the cars will still need to be somewhat like cars are today.

Robert Dooley 37:08
Sure, okay. Brilliant. Thank you so much. But I appreciate this now. 40 minutes. So there's some really, really good content today. Thank you. And at the end does, yes. Really, really interesting. Would you I mean, I will be I'm planning on writing papers over the next couple of months. You have to be Would you like me to sort of keep you up to date with stuff and that sort of thing?

Sure. Yeah. That's

pretty great. I will do that. If you got an email address, or anything I can.

Senior Designer Hyundai America 37:34
Email Yeah, it's I'll give you my my work. One is AMOIRAM.

Unknown Speaker 37:44

No, OIOIYUJMOIR

Senior Designer Hyundai America 37:46
at HATCIHAIHATUSCIO.

Robert Dooley 37:51
Yeah, yep. dot com.

Pretty, thanks, Senior Designer Hyundai America.

And then I'll do a few months or something, some draught

a few times. I really appreciate and

Senior Designer Hyundai America 38:13
have a good day.

Transcribed by https://otter.ai

Appendix iii – Robert Dooley CV June 2025

Robert Dooley

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W: robertdooley.co.uk
Linkedin: /dooleyr

Speaking engagements, publications and exhibitions

Carsophy
by Car Design Research Ltd
2019 - Present

'C-factor' - How Chinese car brands can lead in Europe
Smart Mobility Design and AI conference, Shanghai, Sept. 2023

Losing My Edge: Car Design and Automation
Form Trends, April 2021

Repurposing the pen: why automotive design needs an intellectual tradition
Form Trends, March 2021

Craft and Automation
In Unboxing the Black Box: Reflections on Making with AI and Automation
Sept. 2020

Cars: Accelerating the Modern World - or Stuck in the Past?
Form Trends, Dec. 2019

Graduate Show 2018
Royal College of Art, June 2018

Kia Hyundai Design Lab Future Luxury
Royal College of Art, Oct. 2017

Driverless Futures: Utopia or Dystopia
London Transport Museum, March 2017

Bloom
Eden Project, July 2015

Because I Cannot See
Brighton Photo Fringe, Oct. 2014

Education

PhD *"Designing for Flexible Vehicle Interiors through Discrete Architectural Methods: Reframing the Role of the Designer in an Automated and Computational Age"*
University of Arts London / Falmouth University

MA Vehicle Design (Distinction)
Final Major Project *'London's Bike 2040'*
Dissertation *'Where are all the women? An analysis of gender disparity and lack of female participation in automotive design'*
Royal College of Art, London

BA Sustainable Product Design (First Class)
Falmouth University, UK

Experience

Senior Design Strategist, Car Design Research September 2019 - Present

- Helping clients define distinctive and commercially effective design strategies.
- Working with Design Directors and senior leadership at brands including; Volvo, Polestar, Bentley, Toyota, Ford, Kia, Honda, Nio, Avatr, Huawei, SAIC and Nissan.
- Leading design strategy and research projects for global OEMs and mobility startups across global markets (Europe, China, America), and spanning exterior, interior, UX/UI, CMF and brand design.
- Hired, managed, and collaborated with colleagues across multiple geographies.
- Managed global design audits using expert interviews and bespoke films to reframe design identity and inform new brand strategies.
- Led UX strategy projects, including HMI benchmarking and concept development for Japanese and Chinese OEMs targeting European premium segments.
- Authoring trend reports for clients such as Toyota, Volvo, Hyundai, and Ford, drawing on first-hand research from auto and tech shows.
- Oversaw CDR's rebrand and marketing strategy; consolidated web platforms and grew readership by 15% through trend-driven publishing and international outreach.
- Can provide year by year list of projects and achievements on request.

Research Teaching Associate, Falmouth University Sept. 2018 - Present

- Delivering seminars, workshops and tutorials within the School of Architecture, Design and Interiors, influenced by my research and consultancy work.

Research Fellow, SWCTN April 2019 - March 2020

- I explored the impact of automation technologies on craft production models. Research shared through journal publication and conference submission.

Technical Designer, Aldworth James & Bond March 2016 - August 2018

- Working with architectural teams to generate concepts and develop them for manufacture. Liaising with internal design teams, external clients and shop floor production teams. Full time, then during summers whilst studying for my MA.

Digestif

- CNC machining enthusiast.
- Freelance ID work includes design of autonomous agricultural machine (2024/5).
- Member of Islington Cycling Club race team; crits, road race, time trialling. Currently re-branding the club and re-designing the kit range also - ICC is the largest amateur cycling club by membership in the UK.