



A SEMIOTIC INTEGRATED PRODUCT DEVELOPMENT FRAMEWORK FOR INTEGRATING BRANDING IN AUTOMOTIVE PRODUCT DESIGN

M. Cini and P. Farrugia

Keywords: emotional design, design activities, integrated product development, market implications

1. Background

Nowadays, the technical advantage between companies in the automotive sector is constantly reducing [Verhoef et al. 2012], leading to most cars being comparatively the same. This trend is due to the increase in quality level of car manufacturers, technology diffusion and platform sharing, leading to most cars being comparatively the same within their market segment. Thus, to be successful a company has to be more than just good at producing quality cars; it has to produce good looking cars, with a meaning. Product aesthetics, integrated with branding, is a major tool that can be used to gain competitive advantage, [Kotler and Rath 1984], [Oakley 1985], [Bloch 1995]. For example, *Audi* says that the product design determines up to 60% of a consumer's decision to buy a particular car [Kreuzbauer and Malter 2005]. Furthermore, a product design can be used to represent the brand, commonly referred to as design language in the automotive industry. Thus, branding is essential for the success of the product. Branding is no longer viewed as a separate activity to product design, but the product in itself represents the brand. Arguably, the product is the most important brand representative as during the interaction with the product, the user creates perceptions of the brand [Hestad 2013]. Similarly, the importance of adopting an integrated product development (IPD) approach [Andreasen and Hein 2000] is fundamental since a company must concurrently consider marketing, product design and production. Despite ample evidence on the importance of branding, in several of the product development models reviewed there is no specific reference to branding and how to specifically link it to product design [Cini 2014].

Branding appeals towards the emotional side of the brain; humans are inherently intuitive beings and the desire to buy something can override the rational part of the brain. Branding and product design have been typically seen as separate entities, with branding and marketing viewed as an add-on to the product [Hestad 2013]. In recent times there has been a change in mentality, with designers incorporating brand awareness in the development process, not just in the development of the product itself but also of the surrounding activities between brand and customer. There are several messages that can be told about a product, and one of the common ways to group all messages is through semiotics. Semiotics is the study of signs, where a sign is something that can be interpreted to stand for something [Chandler 2002]. The three pillars of semiotics can be directly linked to the three parts of the brain; the instinctive layer called the visceral level; the behavioural level which contains the processes that control everyday behaviour and the contemplative part of the brain; the reflective level. Such levels can be perceived respectively as product characteristics - appearance and other sensory characteristics, effectiveness of use and pleasure derived from using it and representation of self, personal satisfaction.

Within this context, the hypothesis in this paper is that designers in the automotive industry would benefit from a semiotic IPD-based framework which adequately integrates branding in design. Based upon this introduction, the rest of this paper is organised as follows. Section 2 provides real case studies where branding was (un)successful in the automotive industry. Section 3 reviews related work covering existing approaches on the use of semiotics in the context of design and customer response. Section 4 focuses on the framework developed and provides real examples where the stages in the framework's principles were applied. A qualitative evaluation was carried out with a range of typical end users of the framework, including renowned automotive designers. Section 5 discloses the results obtained. A discussion follows in Section 6, highlighting the strengths and weaknesses of the approach. Section 7 draws key conclusions, with focus made on the contribution of this paper.

2. Branding in the automotive industry

A car is one of the few remaining luxuries that allow people to define themselves socially as they desire, and it is why the car's image, as seen by society, is vital to carmakers. There is also the financial value of branding; the *Toyota* brand is valued at \$29M and *BMW* at \$26M [Millward Brown 2015], despite Toyota selling eight times as much cars. Luxury must be continually differentiated, recreating a distance between itself and its peers [Kapferer and Bastien 2009]. Yet, it is very common that carmakers make an error of judgement with regard to the latter when it comes to branding.

There are several examples where carmakers tried to achieve luxury brand status without a holistic approach, and all invariably failed. One such example is the *Ford Motor* group acquisition of several prestigious brands like *Aston Martin* and *Jaguar* in 1990s. The group aimed to increase profitability of these brands by applying mass production methods used by Ford Motors. Despite the massive investment the plan was a failure, ultimately because the "*Ford-ization*" of such brands was diluting their premium brand image. One such example was using a *Ford Mondeo* engine on smaller *Jaguars*. Without an integrated approach, where the brand values are infused within the company technical expertise in order to deliver on all levels, the resulting product will be one that does not fully deliver on the product story, and will invariably not meet sales expectations.

A success story where a carmaker made a conscious effort to integrate branding within product development is *Lexus*. *Lexus*, *Toyota*'s luxury brand, is ranked highest on overall dependability and attracts consumers looking for reliability and luxury in America [Millward Brown 2015]. *Toyota* may deliver on the reliability aspect, but customers do not associate *Toyota* with luxury. Thus, instead of trying to penetrate new market segments, *Toyota* created a new brand, *Lexus*. The integration is subtle and holistic, allowing the brand to be distinct from *Toyota* while using the same components of a *Toyota*. It is also worth noting that branding has now become a regional process, and it is why carmakers have design offices all around the world to keep in touch with their local markets. It is also why carmakers offer different products for different regions as brands are perceived differently throughout. Continuing on the previous example, whilst in *America* *Lexus* is viewed as luxurious, in *Japan* *Lexus* is perceived as an extension of *Toyota*, and therefore without the essential intangible attribute of luxury.

What is applicable to the automotive industry is applicable to products in general. Kapferer states that there is no prestige without respect [Kapferer and Bastien 2009]. A brand has to reinforce their credibility with every product it makes. The expectations vary from brand to brand. Customers looking to buy a sports car are more interested in its acceleration rather than the leg room, whereas leg room and comfort is one of the main factors in family cars.

3. Related work on semiotics in the context of design and customer response

Bloch [1995] proposed a model in which a product form is represented as a solution to multiple factors that influence product success, such as the target market and performance specifications. Although Bloch's model does not suggest the product to be viewed as a sign, his framework is based on the element that the product form elicits a variety of psychological responses from customers. He divides these responses in two; cognitive and affective responses. Cognitive responses refer to the judgements and thoughts evoked by the product based on the information perceived. The form of a product affects consumers' beliefs about the product and brand. Designers often use certain elements to encourage this creation of beliefs [Berkowitz 1987]. For example, leather upholstery in cars is being increasingly used

to portray an image of luxury, softness, comfort and detailed designs showing artisanship. Bloch indicates as well that the form of a product influences how it is categorised with respect to other products in the same class and other classes. Although aesthetic responses are down to the design and other sensory properties, it is not uncommon that both the aesthetic value and the behavioural value occur together. Here Bloch starts to take into consideration as well semiotics with the different levels of responses. In the main primary path, it is shown that the psychological responses lead to behavioural responses. In this case behavioural response refers to the decision stage; either the consumer is attracted or not, in fact Bloch states that the behavioural response can be considered along the approach-avoidance continuum. This model considers the fact that consumer reactions do not occur in isolation but instead are influenced by several variables, including tastes. According to Bloch, another aspect that that designers and marketing people need to consider is that different market segments have different requirements. Market segmentation analysis before the product development process begins can prove to be very useful in identifying subcultural and social group influences on design preferences [Bloch 1995]. Apart from the individual tastes and preferences, the situation and context moderate both the psychological and behavioural responses to a product form. Bloch's model lacks interaction with other business aspects and looks at the product primarily from the perspective of product form.

Moultrie et al. [2004] developed a framework which models the consumer response to the visual form of a product. They built their framework based on the communication model interpretation for design by Mono [1997], but expanded their research on the cognitive response of the customers. Special emphasis is given to semiotics. The framework not only considers the relationship between the product and customer but the whole chain, from the design team to the consumer. The model proposed by Moultrie et al. considers as well the affective response of a product, which is the emotion elicited. While only the visual perception is being considered, the emotions evoked are also considered in the framework. However, again there is brief mention of the other IPD pillars in the framework. Branding is not given the necessary importance as well, despite mentioning several factors on which branding is built.

Another work that builds a framework based on a semiotic model is that proposed by Lange [2006]. Lange's framework aims to integrate both the engineering perspective of design together with the marketing position. The success of a product in its intended market is dependent on the image of the brand, which in other words a product is considered appealing through the interpretation of the product's properties. Using a semiotics approach, Lange relates the brand in relation to the properties of the product. The triadic nature of the model reflects the three aspects of semiotics. The visceral level, which can be broken down to ideas, realisation and uses, the behavioural level that encompasses all the stakeholders involved and finally the reflective level that takes into account the image of the product and ultimately the brand. Lange's framework explains the relationship between semiotics and product design very well, but is very isolated with no mention to business practices and external influences.

This literature collectively indicates that that there is a research gap in the development of a semiotic-based IPD framework which adequately integrates branding, specifically for automotive design.

4. Framework for the integration of branding in automotive product design

The aim of the framework is therefore to serve as a discussion tool during the initial design meeting by highlighting the most important factors that need to be decided at that stage. It is important that the framework is useable, specific, yet generic enough to be used in multiple companies. The framework is characterised by the main product design factors which cover branding and integrated product development aspects (see Figure 1). Such factors have to be considered in the automotive environment which is characterised by external influences and constraints. Another part of the framework concerns a list of checkpoints aimed to act as a reference in order to evaluate the car design from a branding point of view. In addition this reference list is aimed at prompting automotive product designers to assess the emotional connectivity of the car with customers, as a consequence of their decisions taken. As explained in [Cini 2014], the framework is based on theoretical foundations coupled with qualitative feedback received from a number of stakeholders, who evaluated the initial framework configuration. Following are details of the framework.

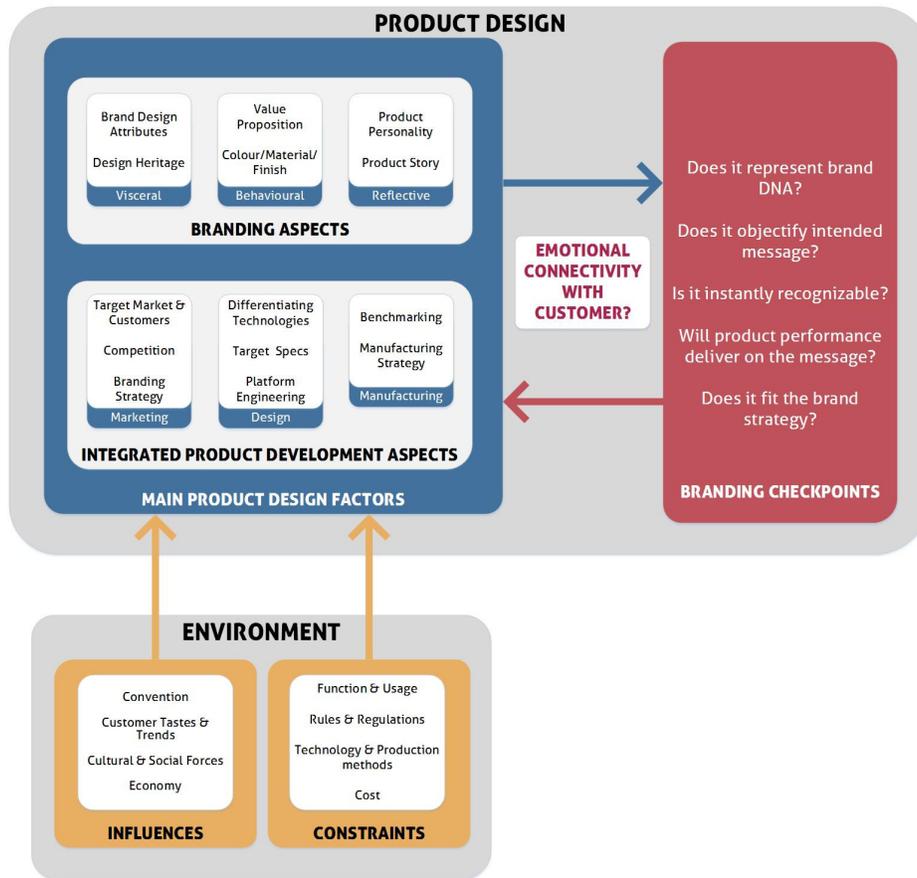


Figure 1. Conceptual framework for the integration of branding in automotive product design

4.1 Branding aspects

Aesthetics and branding have become the most influential aspects in decision making by customers [Kreuzbauer and Malter 2005]. This is especially more important in developed product categories, where the technical differences are minimal and the focus shifts towards the communicative qualities that represent the symbolic domain of the product [Karjalainen 2003]. Semiotics takes into account all the psychological reactions that a consumer experiences through. The proposed framework presents the different branding aspects, classified according to the three levels of semiotics:

4.1.1 Visceral level

1. **Brand Design Attributes:** Brands usually possess certain key identity attributes through which the brand is recognised and defined. Explicit references are those design features that are immediately perceived and recognised by customer, like the *BMW* grille.
2. **Design Heritage:** design features become distinguishable characteristics by being repeatedly used in one form or another over several models, only then these become part of the brand's identity. By visually referring to this heritage, designers seek to make the product recognisable as being worthy of, or enhancing the brand. Design Heritage is built in two ways; designers either build on the same approach by changing the design language slightly throughout the ages or build a model years later that refers to the classic design language of a historic car, as it was seen with the re-emergence of the new *MINI*, *Fiat 500* and *VW Beetle*.

4.1.2 Behavioural level

1. **Value Proposition:** The value propositions will be the main selling points of the car. Value propositions can be based on economic value, functional value, emotional value, symbolic value

or a combination of some or all. The value of the proposition is only good if the product is able to support the claims. An interesting case is the value proposition of the *Tata Nano*. The value proposition was twofold; the first was that the target price was Rs 100,000 (approximately €2,000), which would make it the world's cheapest car and second proposition was for a safe, affordable and attractive car for Indian families that often commuted on a scooter.

2. Colour/Material/Finish (C/M/F): have the ability to invoke emotions and communicate with viewers, and play a big part in the design process when developing products. Colour influences the brand, with certain brands being identified by a certain colour. Also, the fabric and finish of the interior define the character of the car.

4.1.3 Reflective level

1. Product Personality: Refers to a set of characteristics that are used to describe the product. A product may have different personalities depending on the situations, showing the user different sides of it depending on the mood. For example a *VW Beetle* has a cheerful and friendly personality whilst a *VW Tuareg* is dominant and tough. A product personality can therefore be used to define the brand emotionally.
2. Product Story: The importance of the product story cannot be understated, because it can often be the decisive factor in the buying decision. In the automotive market where there are a myriad of options, having a product story with which the customers can identify, is essential.

4.2 Integrated Product Development aspects

In order to succeed in the automotive sector, it is vital that all three pillars of IPD, i.e. marketing, design and manufacturing are taken into account as from the outset every project. These factors have been selected and developed based on literature of different IPD models as well as design practice in the automotive industry.

4.2.1 Marketing level

1. Target market and customers: Market segmentation also allows for an analysis of consumer needs within that segment as well as comparing the strength of the company's existing or prospective product with respect to others in the same sector. By mapping competitors' products along with its own products in segments, a company can assess which products will provide the best opportunities either to address weaknesses in its own product line or to exploit unattended customer needs.
2. Competition: Rival companies are at the same time doing their own market analysis and this will inevitably lead to developments by competitors to move into more profitable market segments. This increased competition will inevitably lead to a loss of market share and profit share within that segment if it is not addressed, so competitors need to be continuously analysed.
3. Branding strategy: It is important to have a full understanding of the organisation's strategy as it will also define the approach towards the product design in its market positioning and pricing strategy, which ultimately defines the budget for the program in several terms, such as of technology and design. There are companies that focus on technology leadership by developing new technologies and bringing them first on the market. These tend to be the premium segment brands such as *Mercedes* and *BMW*.

4.2.2 Design level

1. Differentiating technologies: It is important to keep in mind that the car is still fundamentally a functional object, and thus its functional aspect needs to remain in focus. Together with the marketing and sales team, engineers try to forecast which future technologies will be desired by the customers, or which they think will revolutionise the industry. In a highly saturated market, having a distinctive technological feature or advantage is imperative in breaking away from the market.
2. Target Specifications: Customer needs are usually expressed in the "language of the customer". These are generally vague and subjective and, whilst useful, they provide little guidance for

how to design or engineer the product, thus they need to be established as a measurable target of how the product should perform. The targets set here can be various depending on the market segment since different market segments have different requirements and customer expectations. The main specifications that are defined in general at the initial concept stage include cost, speed, acceleration, weight, fuel economy and sales volume. Other specifications are dependent by sector. For example in the luxury section where people are usually chauffeured in their cars, target specifications can also be rear headroom, leg room and shoulder room.

3. Platform Engineering: Given as well the increasingly stringent regulations with respect to environment and safety and the increasing market segments, automakers look at sharing components between several models. Platform planning is a cross-functional activity involving all stakeholders of the company and where the integration of all departments is essential. A platform is a shared set of common components between multiple cars. Platform sharing is a popular product development method where different products and the brand attached to them share the same components, technologies and service procedures [Olson 2008].

4.2.3 Manufacturing level

1. Benchmarking: This serves several purposes. First it allows the design team to analyse market trends and customer tastes, since most customer driven demands come from having seen them in other cars. Secondly, it serves as an analysis of how the proposed car would compete against these benchmarked cars, based on the initial specifications. From a manufacturing point of view, benchmarking indicates the level of performance, quality and finish that the new car will, as a minimum, have to be equal to.
2. Manufacturing strategy: This is becoming ever more important in the automotive industry, with companies nowadays looking to make the most of their manufacturing and labour resources by becoming ever more efficient.

4.3 Automotive Environment

In this section the key sources of influences and constraints in the automotive environment are highlighted, using Bloch's [1995] and Moultrie et al.'s [2004] work as a reference.

4.3.1 Influences

1. Convention: Despite the desire of designers to break the routine and design something completely revolutionary, they have to deal with convention. Humans are a creature of habit, which is why it is very rare that new designs are not similar to something that customers are already familiar with. The same happened to car design. The first cars are almost identical to coach carriages without the horses. Since then, car designs followed the same evolution pattern with the engine in front of the passenger. This example shows how difficult it is for designers to move away and do something new which will be either loved or hated by the public.
2. Customer tastes and trends: Are invariably one of the main outside influences on design, be it a conscious decision or not. Trends are the ultimate cultural and social influence on product design, where the influence is not just on a single product, but instead it becomes a style or a trend. In the automotive sector, the explosion of surface detailing and sharp feature lines seems to have waned, giving way to the return of clear and elegant lines with classic proportions.
3. Cultural and Social Forces: Preferences for products and product form and also shaped by cultural and social forces [McCracken 1986]. Part of the designers' job is to interpret these forces and channel them in their designs. An example of this is customers are lately becoming ever more environmentally conscious and new designs are reflecting this. Materials used are not only environmentally friendly, but advertising brochures explicitly point this out.
4. Economy: The state of the economy affects car makers and their approach to new cars. The economy affects in a multitude of ways. It affects the target markets and the approach to product design. In hard times, customers start moving towards the cheapest or most valuable options of the market and brands need to ensure that they not only are present in these market segments, but also competitive both in price and in product. Also, the economy affects what characteristics

customers find more important. In times where fuel prices were low, the importance of miles per gallon was low and looks and size took precedence.

4.3.2 Constraints

1. **Function and usage:** The function, or main scope of the car, defines how a car will look. This ties in with the product story and the target market and customer, because a family car that has to fit five passengers comfortably will look invariably different from a sports car whose aim is an enjoyable ride, sometimes at the expense of comfort. However, apart from the main function of the car, the aim is to target the basic functions of a car that may sometimes be neglected and taken for granted. These practicalities of what the product does need to be understood from a user perspective, and including aspects that go unnoticed like ingress and egress.
2. **Rules and regulations:** During the design of the car, apart from the challenge of having to package all the components and their functional requirements and making sure that the brand is well represented, car designers have to comply with a range of legal and regulatory guidelines that will invariably influence how a car looks like. Looking at exterior lighting requirements for example, the headlights shall consist of a high and low beam, to illuminate the environment in front of vehicle. To complicate matters further, different regions have different requirements. For instance, one of the main differences between the American standard and the European standard is the glare to other drivers on the low beam setting.
3. **Technology and production methods:** The current trend in production methods is becoming inclined towards the increased use of carbon fibre, not just for body panels but as well as the chassis. Carbon fibre has a high strength to weight ratio compared to steel and aluminium, however it is expensive and time consuming to produce in high volumes. Although this technology has been limited to racing car, its use is becoming ever more frequent in the automotive industry.
4. **Cost:** It is not just the technicalities that influence the product form but as well the cost of producing the product depending on these technologies and production methods. The marketing experts set the price range depending on various factors such as market positioning and competitors. The company will have a target return of investment on the project and these pretty much dictate everything from the new technologies used to the type of materials.

4.4 Branding checkpoints

These product branding checkpoints were founded on evaluation criteria proposed by Hestad [2013]. Based on feedback received from the evaluation of the framework, two other branding checkpoints were added to Hestad's list, namely "Is it instantly recognisable?" and "Does it fit the brand strategy?" Both of these additional checkpoints provide a more robust approach to branding, ensuring that the product firstly is instantly recognisable. Secondly, it is important that the product represents the brand strategy, both now as well as the future image the company wants to portray. Together, these checkpoints cover all aspects of branding, both the product and the meta-product. Following are further details on the rest of the branding checkpoints:

1. **"Does product represent brand DNA?":** The aim here is to ensure that the product that is being developed is ultimately an associate of the brand; there has to be a perceived fit between the brand and product in the eyes of the customer.
2. **"Does product objectify intended message?":** The product story and emotions need to be reflected in the design. Taking *Land Rover* as an example, a *Land Rover* is idealised as being a tough off-road vehicle that can be used for adventures. This brand message has to be taken on board and make sure that the looks reflect the intended message.
3. **"Will product performance deliver on the message?":** This checkpoint relates the marketing and engineering design. It is essential that the performance specifications reflect the intended product story of the car. If a car promises the most comfortable ride, this has to be the main concern of the engineering team. For example, the *Fiat Panda* is aimed to be a people's car where functionality supersedes looks. This does not mean that they have to be necessarily lacking, but that the main concern with the design are functional aspects, and the design has to

work around them. Given this premise, the *Fiat Panda* delivered on the product story, offering fourteen different storage spaces and up to eight-hundred-seventy litres of luggage space. Teaming this with a roomy interior, designers had a challenge to package this all, but they did so very well.

5. Evaluation

5.1 Evaluation approach

The evaluation objectives were primarily to:

1. Evaluate the relevance of semiotics to represent branding in product development;
2. Assess the extent to which the factors really represent design, branding and engineering;
3. Evaluate the importance of considering constraints and influences;
4. Assess the completeness of branding checkpoints;
5. Evaluate the framework's practical usefulness in the automotive industry and;
6. Identify the framework's strengths and weaknesses and hence areas of improvement.

To achieve these objectives, a qualitative exercise was carried out. Participants were first given an explanation of the framework and its theoretical foundations. They were then asked to participate in semi-structured interviews. A 5-point Lickert scale was employed to test the participants' attitude to questions posed, where 1 is the lowest rating, whereas a rating of 5 is the highest. Two main types of interviewees were sought; in industry and in academia. The academic participants were chosen from two different backgrounds; academics teaching IPD modules as well as automotive design academics from a sample of different colleges and universities. The industrial participants include high profile designers, programme directors and engineers with experience at renowned car makers including *Porsche Automobil*, *McLaren Automotive*, *GM* and automotive design firms, e.g. *Qoros Auto*. The aim of such a diverse background is to cover the topic from broad perspectives, allowing the framework to be analysed by a wide range of stakeholders. Table 1 gives a snapshot of the participants' background.

Table 1. Background of participants

Industry Background	Number of Interviewees	Average Experience (years)
Academic - IPD	5	15
Academic –Design	5	8
Industry - Management	5	12
Industry - Design	5	19

5.2 Key evaluation results

Results show that participants, irrespective of their background, agreed that semiotics is relevant to represent branding in product development (average rating $M = 4.60$, $\sigma = 0.60$). As a participant stated, he has three main criteria to judge cars; “*Emotion, how much does it turn you on? Intellect, does it fit with the brand and how new is it? And execution, how well is the handiwork done?*” The three aspects mentioned by the participant relate to the three facets of semiotics. This further confirms that semiotics is the right choice to represent branding in product design, especially in the automotive industry.

Participants also expressed a positive attitude on the extent to which the selected factors in the framework really represent design, branding and engineering at the early design stages ($M = 4.45$, $\sigma = 0.60$). The qualitative data indicated that the introduction of other factors would have made the framework more cumbersome, and that the chosen factors are an umbrella for several sub-factors, that could then be developed on in more detail further down the line in the product life cycle.

Results also show that on average, most participants agree with the inclusion of constraints and influences in the framework ($M = 3.95$, $\sigma = 1.10$). As one participant highlighted, “*Constraints are very important in order to develop a successful product. Ignoring influences and constraints till later on in the product development cycle can result in cost implications and a product which doesn't satisfy all constraints*”. It is well worth highlighting the slight discrepancy between results from participants with IPD/management background and those with an industrial design background. The former ranked

constraints and influences' importance generally higher ($M = 4.20$, $\sigma = 0.79$) than those with a design background ($M = 3.70$, $\sigma = 1.34$). The reason why three industrial designers were not favourable on the inclusion of constraints and influences is that whilst the constraints are unavoidable nowadays, car companies should ignore the external influences as it would mean that these brands would be following not leading, always behind the curve.

With regard to evaluation objective (4), the qualitative data yielded the two branding checkpoints mentioned earlier in Sub-section 4.4, and which were eventually included in the framework.

The framework received positive feedback from participants and all rated highly its usefulness in practice ($M = 4.00$, $\sigma = 0.79$). One participant remarked that *"this rationalised approach needs to be used as a basis for group discussions between company designers, strategists, engineers, sales and marketing people and the board, so that future directions are supported by all team members."* Another participant from industry also found the framework very practical, *"In general a very good, very condensed form that helps to concentrate on the main topics in the early stage of a new car."*

6. Discussion

The framework manages to translate the needs of both branding and the other traditional IPD pillars effectively into the main factors of product design. There had to be a judicious compromise between a large amount of factors, but then would have rendered the framework cumbersome, and a limited amount which would have made the framework too generic and lacking the substance to be effective. Indeed, this aspect of the framework, the balancing of factors and presentation was praised by participants. Another strong point lies in the fact that the participants in the industry found the framework to be a useful tool. This is reflected in the qualitative data gathered in the survey, which indicate that the framework provides a more structured approach compared to their current practice. The branding checkpoints are another strong point of the framework. On the other hand, the main weaknesses which emerged from the evaluation concerns the fact that the framework does not offer feedback and is not in 'process form' to aid the design process. This weakness was highlighted especially by academics, which are used to frameworks being process based or activity related. These types of frameworks usually follow a chronological order of tasks and activities, whereby depending on the result achieved, the next step is determined. This rigid approach however was found that it was not the way to go to create a useful tool for the automotive industry given the non-linear approach to design in the industry and the difference in design processes of different companies [Baxter 1995], [Lewin and Borroff 2010], [Mohr et al. 2014].

As room for improvement, it is suggested that a screening process based on the 'Real-Win-Worth-it' (RWW) method [Day 2007] is added to the framework, to serve as a guidance tool during decision making. This screening process is a simple but powerful tool that presents a series of questions that cover all aspects, ranging from the product, market and the company's capabilities and competition. In fact, the RWW method was suggested by three participants, and when brought to the attention of other participants they were equally enthusiastic to the idea of this variant of the framework as it makes the framework a better tool and can be adapted to several stages.

The survey findings provide a degree of evidence that the framework succeeds in creating a reference tool for automotive designers to integrate branding within IPD principles. The promising results obtained are based on a relatively small sample size. On the other hand, the strong point of the evaluation lies in the pool of participants with diverse background, thereby avoiding having biased results, based on one company or just one section of the industry. The hypothesis formulated in Section 1 is validated, based on the high degree of acceptance of the factors chosen in the framework ($M = 4.45$), the integration of constraints and influences ($M = 3.95$), the positive response to the usability of framework in industry ($M = 4.00$), coupled with the encouraging comments and feedback received by all participants.

7. Conclusions

It is concluded that this paper contributes a framework which integrates branding in automotive product design. The distinguishing features which collectively make the framework novel consist of semiotics, IPD principles and branding checkpoints. Besides the theoretical foundations, the framework is based on qualitative data gathered from a pool of experts including renowned automotive designers. Future

work is required to enhance the practical usefulness of the framework by including screening processes inspired by the RWW method. In addition, it is planned that the developed framework will be implemented in a proof-of-concept computer-based supporting tool.

Acknowledgement

The authors are grateful for the input provided by the participants, who despite their busy schedule still found the time to volunteer for the evaluation. Thanks go for the University of Malta which funded attendance to the DESIGN2016 conference.

References

- Andreasen, M. M., Hein, L., "Integrated Product Development", Technical University of Denmark, 2000.
- Baxter, M., "Product design: a practical guide to systematic methods of new product development", Chapman & Hall London, UK, 1995.
- Berkowitz, M., "Product Shape as a Design Innovation Strategy", *Journal of Product Innovation Management*, Vol.4, No.4, 1987, pp. 274-283.
- Bloch, P., "Seeking the Ideal Form: Product Design and Consumer Response", *The Journal of Marketing*, Vol.59, No.3, 1995, pp. 16-29.
- Chandler, D., "Semiotics: The Basics", Routledge New York, 2002.
- Cini, M., "Semiotic Based IPD Approach For Supporting Branding In The Automotive Industry", IPD dissertation, Concurrent Engineering Research Unit, Faculty of Engineering, University of Malta, 2014.
- Day, G. S., "Is It Real? Can We Win? Is It Worth Doing?: Managing Risk and Reward in an Innovation Portfolio", *Harvard Business Review*, 2007, p. 110.
- Hestad, M., "Branding and Product Design", Gower Publishing Ltd. Surrey, England, 2013.
- Kapferer, J. M., Bastien, V., "The Luxury Strategy – Breaking The Rules Of Marketing To Build Luxury Brands", Kogan Page/Replica Press PVT Ltd. London, England, 2009.
- Karjalainen, T. M., "Strategic Design Language - Transforming Brand Identity Into Product Design Elements", *Proceedings of the 10th International Product Development Management Conference*, Brussels, 2003.
- Kotler, P., Rath, G. A., "Design: A Powerful But Neglected Tool", *J. Bus. Strategy.*, Vol.5, No.2, 1984, pp. 16-21.
- Kreuzbauer, R., Malter, A. J., "Embodied Cognition and New Product Design: Changing Product Form to Influence Brand Categorization", *Journal of Product Innovation Management*, Vol.22, No.2, 2005, pp. 165-176.
- Lange, M., "Construction of a Design for Brand Perspective", *1st Nordic Conference on Product Lifecycle Management*, Gothenburg, 2006, pp. 175-186.
- Lewin, T., Borroff, R., "How To Design Cars Like a Pro", Motorbooks Minneapolis, USA, 2010.
- McCracken, G., "Culture and Consumption: A Theoretical Account of the Structure and Movement of Cultural Meaning of Customer Goods", *Journal of Consumer Research*, Vol.13, 1986, pp. 19-30.
- Millward Brown, "2015 BrandZ Top 100 Global Brands", 10th Anniversary Edition, Available at: <http://www.millwardbrown.com/BrandZ/2015/Global/2015_BrandZ_Top100_Report.pdf>, 2015, [Accessed 08.03.2016].
- Mohr, D., Muller, N., Krieg, A., Gao, P., Kaas, H. W., Krieger, A., Hensley, R., "The road to 2020 and beyond. What's driving the global automotive industry", McKinsey & Company, Available at: <<http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-road-to-2020-and-beyond-whats-driving-the-global-automotive-industry>>, 2014, [Accessed 08.03.2016].
- Mono, R., "Design for Product Understanding", 1st ed., Ericsson, G. (Ed.), Liber AB Stockholm, Sweden, 1997.
- Moultrie, J., Clarkson, P. J., Crilly, N., "Seeing things: consumer response to the visual domain in product design", *Design Studies*, Vol.25, No.6, 2004, pp. 547-577.
- Oakley, M., "The Influence of Design on Industrial and Economic Achievement", *Management Decision*, Vol.23, No.4, 1985, pp. 3-13.
- Olson, E. L., "The implications of platform sharing on brand value", *Journal of Product & Brand Management*, Vol.17, No.4, 2008, pp. 244-253.
- Verhoef, P. C., Pauwels, K. H., Tuk, M. H., "Assessing Consequences of Component Sharing across Brands in the Vertical Product Line in the Automotive Market", *J. Prod. Innovat. Manag.*, Vol.29, No.4, 2012, pp. 559-57.

Dr.-Ing, Philip Farrugia, Senior Lecturer
University of Malta, Industrial & Manufacturing Engineering
Room 007, Faculty of Engineering, University of Malta, MSD2080 Msida, Malta
Email: philip.farrugia@um.edu.mt