DESIGN EDUCATION AND RESEARCH INTERTWINED

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ABSTRACT

The number of means of the automotive stylist to express a unique brand identity through automotive form, one of the objectives of styling, have diminished. Platforms and technologies, formerly brand owned and specific to its identity and styling, have to be shared among the many, as do market segments and geographical domains. This increases the responsibility of, and the pressure on, styling. In order to substantially contribute to strategy, styling must reposition itself in the value chain.

A 'Strategic Automotive' course has been designed as part of Delft's Advanced Automotive Specialization, to educate the application of management models that aid and facilitate styling, embedded in a research program on automotive form. These management models aim to offer a common frame of reference between styling and other disciplines.

Generally, in existing research on automotive form, cars are assessed as a whole, with little to no identified relationship between automotive form and the previously identified, related, engineering and technology means. The Automotive Form Hierarchy model is aimed to provide that structure and the aforementioned common frame of reference.

This paper describes how management models have been applied in a master course which, in return, serves as a research environment for that development. The challenge lies in integrating a wide range of topics and student profiles, spreading across disciplines as well as cultures.

In conclusion, preliminary findings indicate value of the model, and offers direction for further research. Both the model and the course have been redesigned as a result.

Keywords: Design education, strategic management, tacit knowledge, automotive styling

1 INTRODUCTION

Strategic styling is a relatively young topic. In automotive even more so than in other design disciplines because the profession's somewhat mythical image has been a threshold in adapting to new project, product, and business paradigms [1]. Within a rapidly changing context, the automotive styling process has barely changed in the first century of the automobile. That is, the argument on form takes place around a number of consecutive manifestations of the design (sketches, scale models, full scale models…) and is largely based on tacit knowledge. There is no common frame of reference in place that links styling to other disciplines [2]. This is no longer appropriate for the new paradigm because its link to strategic context is inadequate [3].

Much like the concurrent engineering principles in product development, it is being suggested that simultaneous development of new methods, and the course in which they are educated, is beneficial [4]. While considering the classroom as a development and experimentation arena, methods and models may be put in practice faster. Research becomes part of the academic experience.

In this context the term 'automotive design' is the integral form giving of products, encompassing package design and negotiating with engineering constraints such as platform related dimensions, aerodynamics etc. Historically 'styling' is more appropriate (which may also refer to the styling studio) because it differentiates from other design activities. Although 'styling' is used less often by the automotive industry because of its incorrect superficial connotation [5], in this paper the term is used for clarity.

2   CONTEXT

2.1 Business context

The strive for a new paradigm lies in a number of simultaneous developments in the automotive industry that have a substantial impact on the automotive stylist's means to express a unique brand proposition through automotive form, the main styling concern of this paper [6]. Those brand identities are generally embedded in 'brand owned' properties, e.g. safety, performance or reliability. These properties in their turn, are often based on formerly 'brand owned' technologies [7].

Technological differences between cars (e.g. safety, reliability, performance) and their immediate competitors, and their related identity differences, are fading. Partly due to technological progress in itself, partly due to the actual sharing of technologies and systems between OEMs. Sharing technologies and systems leads to sharing implicit form characteristics such as proportions, overhang and stance. Those characteristics are than largely eliminated from the stylist's vocabulary and means to create distinctive designs [8].

In addition car companies are invading each other's historical domains (e.g. family cars, sports cars, mini's) as well as each other's geographical domains. This overflow of competitor's cars among which the stylist has to create a prominent, distinguishing car [9] that also expresses its unique brand identity, increases the pressure on styling. It coincides with the decrease in true form drivers that would inspire that. To address this responsibility, styling must reposition itself in the value chain so that it may contribute substantially to strategy formulation, implementation and realization [10], [11].

2.2 Educational context

For their master's degree at the Faculty of Industrial Design Engineering (IDE) of Delft University of Technology, students choose between three master programs. Strategic Product Design involves strategy, product planning and marketing. Design for Interaction focuses on the way in which people understand and interact with products in their its social context, while Integrated Product Design is closest to the 'traditional' view, developing a concept into a final product.

Within these profiling programs optional specializations allow the student to develop market specific knowledge, experience and a network. In response to the developments, as described in the business context, the specialization Advanced Automotive Design was launched in 2006, aiming to reframe automotive styling for the new automotive paradigm [7]. Advanced Automotive Design offers an appropriate strategic approach, within each of the IDE programs.

3   RESEARCH

3.1 Styling

Traditionally styling decisions in automotive are largely intuitive which is generally referred to as tacit knowledge. A design proposal must nevertheless be founded on business arguments and address the brand portfolio as part of the context. An historical barrier, in the process of repositioning styling in the value chain, lies in cultural differences between styling an other, business or engineering focused disciplines [12]. For that it is necessary to intensify interaction and understanding between styling and those other disciplines, so that product strategy, behavioral strategy and business strategy help the translation of product vision into new, appropriate and coherent automotive concepts.

To facilitate a more scientific approach towards the field of automotive styling, management methods and models are being developed. The explicit goal is to foster and facilitate tacit knowledge, rather than compromising it, because its value in styling is undisputed in the industry. Next to a Branding Analysis Model, developed earlier [3], the Automotive Form Hierarchy model, Figure 1, has been designed. The aim is to able those involved to assess automotive form in a structured manner, allowing for discussion on form beyond subjective arguments. A management model, aiming to bridge a gap between disciplines, must contain familiar elements for each of those disciplines, a common vocabulary [13], [2]. The left side of the hierarchy represents a number of distinguishable drivers of automotive form, as determined in the development and styling processes. Those levels express technology choices that implicitly determine form constraints on that level. They are linked to the company levels that are most influential in those technology choices; corporate, Strategic Business Unit (the brand) or operational (styling).
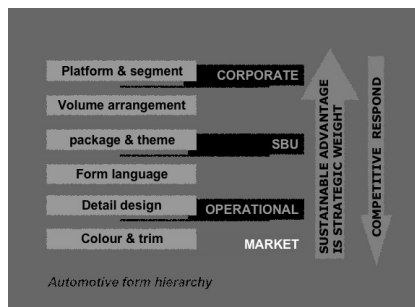
Figure 1. Automotive Form Hierarchy, 1st design (obsolete)

3.2 Business

Changes in the structure of the automotive industry, as described in the context, combined with contemporary financial objectives (globalization), have changed decision processes with respect to the level at which decisions are being taken.

Global development decisions are a corporate task. The investment for a new platform development may be $250M and must be divided over the number of cars build on a single platform. Therefore platforms are being shared between models and across the brand portfolio, which leads to similarities in form. Brand portfolio management is a corporate task [14]. In this arena the hierarchy facilitates various disciplines and levels of the company to visualize the styling implications of technological decisions, as argued in the previous paragraph.

Volume arrangement e.g. is partly determined by the platform. The decision to introduce a new car in a specific volume arrangement is generally a product planning decision at SBU level. Constraints may be indicated by the corporation with respect to the earlier remark on ROI of new platform development. The volume arrangement layer in the hierarchy is in between the two levels of the corporate structure, because it is also interacting with the package design and driven by the targeted market segment.

The form drivers of the hierarchy, top-down, decrease in complexity and are easier to copy. This is being labeled as the ease of competitive respond, depicted as a downward arrow. The opposite direction indicates potential strategic advantage, that may be expected from an innovation, depending on the difficulty to duplicate [10], as shown by the arrow on the far right side.

4 EDUCATION

The elective course 'Strategic Automotive' has been designed specifically to educate the application of management models that embed, aid and facilitate the, by tacit knowledge driven, styling process in corporate business structures. The foundation of the course lies in the previously described research program and its outcome. The management models are being applied to frame and explain automotive styling and its meaning in terms of brand identity, image and brand portfolio management. In return, the course provides an arena for further development of the models.

The educational challenge lies in the wideness of the topic for an equally diverse range of student profiles. The topic links business thinking, technology understanding, contexts and the meaning of form, at all levels of the company. It spreads across brands, disciplines and (business) cultures.

4.1 Students as a research group

The student group for the course is equally diverse. Being master students from each of the three IDE master programs, their areas of expertise range from strategy and marketing to interaction design, styling and engineering. About a quarter are international students. This spread, arguably, mimics that of the automotive styling studio.

Liem et all classified the respondents in their study in the field of automotive form into four categories from Novice to Expert, in which they classified students to be in the same category as practitioners with less than five years working experience in industry [5]. Karlajanen executed his experiments on methods for the analysis of products with regard to their brand typicality, in an educational environment as well. Within limitations, students may be considered a valid sample in this [15].

4.2 Course design

The course aims to synthesize a number of interrelated subjects into a comprehensive set of strategy design models, methods and styling skills. It builds on corporate, company and operational processes and focuses on the integration of tacit knowledge, technology, strategy, structure and design processes, through the application of management models.

The goal of strategy is to create a substantial differential advantage [16]. Since one criteria of strategy is consonance, referring to the continuous objective to respond to critical changes in the environment, design history provides the framework in which the education is embedded:

- Consecutive management principles from Kaizen to simultaneous and concurrent engineering, and balanced score cards, are placed in historical automotive contexts, ranging from GM's brand portfolio history to BMW's ever expanding model range and Toyota's technology strategy.
- Students acquire understanding of (automotive) business structures and how they affect strategy and its outcome, specifically its impact on car styling. The mix of proven and newly developed management models facilitates them with a toolkit to establish common ground between their various disciplines. The 'stylist' familiarizes with business and strategy.
- Lectures and case studies are combined with drawing exercises. Drawing exercises are meant to form an understanding of a car's leitmotiv, character and brand identity. The leitmotiv, a unique form element which makes the product into a visual whole [17], is to be discovered by drawing exercises by means of the hierarchy. The 'strategist' familiarizes with styling.

4.3 Course assignments

During the course students are expected to fulfill three consecutive assignments, the results of which must be presented in presentations and a paper. Students work in multi disciplinary in teams, each of which is being assigned to an automotive brand. A three phase project is being assigned:

- The first phase is an extensive analyses of the brand's identity, character, the leitmotiv and the coherence in between.
- Once the results thereof have been presented, the brand is analyzed again. No longer in its own merit, but in the context of the brand portfolio of which it is part. Shared technologies and platforms must now be considered, as well as the roles of the other brands in the portfolio.
- The third and finalizing part of the project is an assessment of the brand's form language in the aforementioned context. Dependent of the team's findings they must argue the validity of the current form strategy, or argue its faults and design a new form language.

5 RESULTS

5.1 Research results

In 40 student papers, written from 2006 to 2010, the AFH model is used and presented in different ways. A content analysis was conducted on the use of the model and the differences in presentation and outcomes. The study is setup by reading the reports and quantifying and qualifying the actual use and representation of the model. The reports form a dataset with a dispersed collection of car brands from high-end (Maybach) to low-end (KIA), a wide car range (Audi) to small (Lotus) an brands with a rich form heritage (Mercedes-Benz) or none (Th!nk).

The dispersed data set resulted in considerable differences of understanding and quality of use of the model. Where teams on brands with a rich heritage and a wide portfolio tend to look inward for form coherency, teams addressing brands tend to use the model in relation to direct competitors.

A second reason for differences in application of the model, is the difficulty in identifying, qualifying and quantifying the different form levels appropriately. Not all teams addressed all levels of the hierarchy, which may be due to the inexperience of the students.

The student papers have given, over time, a clear view on which elements of the model are being understood and applied appropriately, and which parts may be redesigned. Improvements of the hierarchy model in the latest version, Figure 2, include:

- Simplification by reducing the number of levels from 6 to 5
- 'Theme & coherency' applies to the relationship between all levels (leitmotiv). This is also where further styling objectives, not addressed in this paper (e.g. attention drawing) are embedded.
- Clarified terminology; the 'form language' level has been renamed 'surfacing' because form

language may also refer to a brand's overall styling.

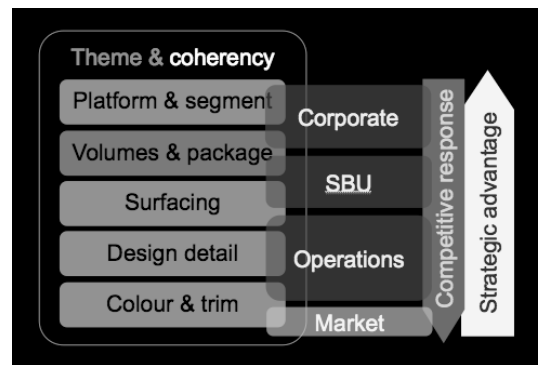- Color coding and better graphics.

Figure 2. Automotive Form Hierarchy, current version.

The build up of form levels in the hierarchy still requires consideration. The split between the upper form levels, so designed because of their relation with company levels, seems illogical from a mere form theory.

5.2 Educational results

The course in itself has also undergone changes, initiated by either the course results or student comments in their personal evaluations.

- Teams are no longer formed by students themselves but by the course leader. Next to the obligate spread over IDE programs, teams are no longer allowed to be of a single nationality, the parallel with automotive business environments is more realistic. Furthermore all teams combine 'experienced' master students with those who just began their master. The research result shows that teams consisting out of 'freshmen' only, have difficulty with the vast topic.
- Student presentations no longer take place on a single day. Teams suffered from earlier delays and do not enjoy full attention. Furthermore there is little benefit of cross learning. In the new course edition, every single lecture is preceded by one team presentation, which must be representative for both the course's and the student's progress up to that point. Students have expressed both the usefulness thereof for learning, and a higher 'inspirational' effect.
- The drawing exercises are no longer separate lectures. They are now integrated in every lecture and have been intensified. Discovering and understanding a leitmotiv has proved difficult for most students, regardless of their respective programs. Yet, the value is recognized.
- The final deliverables are now, for each team, one presentation, a poster and a final paper. Personal evaluations, important for the course evaluation, are handed in separately.

Every lecture now has the same structure. A student team kicks off with their presentation, followed by questions and the lecturer's assessment. The main component is the lecturer's presentation, described previously under 'course design'. Each lecture ends with drawing exercises in search for leitmotivs, product character and brand identity.

5.3 Limitations and conclusions

Students as a sample are valid only within limits. In the classification of Liem [5], they represent only one category out of four. Further experimentation, involving the remaining categories, must be considered in order to establish the extent of the model's value.

The spread of the data set in terms of the wide collection of automotive brands, each a unique case, provides a rich insight in the use of the model. However, all brands have been researched once which makes it more difficult to compare results. Would brands have been assigned twice over time, one could more easily compare different approaches of the application of the model in practice.

The current status of the model is not final. Within the educational context it functions clearly as an analysis tool. The user is helped by the model to analyze automotive form strategies. It also supports understanding how styling is directed on different structural form levels, that both constrain and guide the style of a car. In this context it provides understanding how to assess automotive form which is valuable.

Alumni who are now working in the automotive industry, specifically in styling, have expressed the value of the broad range of subjects of the master in IDE [18], an approach that is being followed in the Advanced Automotive Design specialization as described in this paper.

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