

DESIGN ARGUMENTATION PROFILE
a quantitative decision support framework for concept evaluation
in the early product development phase

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1 Introduction

In leading design companies, first concepts emerge through joint ideation by industrial designers and engineers. Within the development group, these concepts are internally down selected using feasibility and novelty criteria. When presenting first concepts to the decision-makers, industrial designers and engineers use story telling to relay these concepts. Comparing, evaluating, combining and deciding which concepts to choose are currently accomplished using a combination of subjective criteria, intuition and social power. The present situation makes the decision prone to situational mood swings, personal negotiation abilities, temporary corporate politics and context dependent preferences. This presents an opportunity for developing a framework for mapping design concepts and a method whereby evaluating the strength of these concepts is possible. It will enable the decision-makers to decide which concepts or aspects of a concept to proceed with based on more objective criteria.

2 Method

To improve upon the selection process, we propose using an evaluation tool, the “Aspect Concept Profile”. This is based on the recording of designer’s verbal presentation of their concepts, segmenting their story into a hierarchical framework of the key aspects of a product’s user experience and corporate design characteristics. (See figure 1 for aspects and their structure) To evaluate the framework I conducted field studies on product development projects in the early concept phase, with 13 designers and engineers. From here an interview guide was developed, containing questions from the IDSA award application and BMW Group DesignworksUSA’s process and sustainability system.

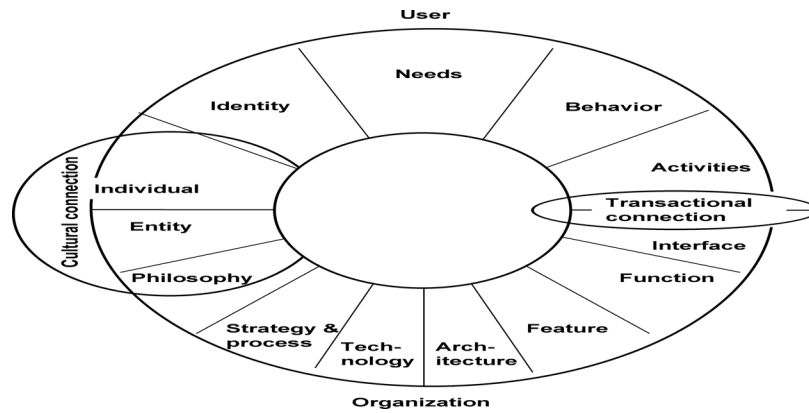


Figure 1 Circular Concept Aspect segmentation, describing how users and corporate providers connect at a transactional and cultural point

Using this guide, we conducted more than 52 interviews ranging from 2nd term university students to business professionals and including engineers and designers with over 30 years experience in product development and design. Their experience ran the gamut from consumer electronics, medical equipment and heavy machinery to launching Jupiter missions. By transcribing and tallying the information segments in each key aspect it was possible to map the design argument. The objective was investigating patterns for:

1. Underlying aspect profile (the cumulated of all interviews)
2. Cultural influence (patterns for various cultures)
3. Design vs. Styling (patterns in product and automotive cultures)
4. Engineers vs. Designers
5. Professionals vs. Students
6. Exploitory and Exploratory Concepts (incremental improvement of interface, function and features, investigating new behaviors and needs)

2.1 Assumptions

Based on experience from industry and a previous project studying innovation, we expected the Concept Aspect Profiles to show the following:

1. Concept Aspect Profiles resulting from the interview guide based on IDSA award application, and DesignworksUSA's sustainability and process, will show focus on corporate and user identity and their relationship to each other through their physical and cultural society
2. Cultures will influence the Concept Aspect Profile. Based on the universities reputation, Stanford would be showing emphasis on mechanical and user understanding aspects. Art Center showing emphasis on user identity, interface and corporate philosophy. The Danish Design School would show emphasis on need and function.
3. Comparing product design and styling, the first will show an emphasis on interface and usability, while styling will emphasize corporate and user identity
4. Engineers would have more of a focus on the tangible execution, while designers focus on the more intangible philosophical and user aspects
5. Professionals' focus on aspects related to the corporation, while students emphasize user identity and interface.
6. Comparing exploitory and exploratory concepts, the first will emphasize traditional

measurable tangible aspects. The second will focus on non-tangible, harder to measure aspects, with seemingly larger risk attached to them.

2.3 Interviews

Deciding which projects to include in the interviews was based on a combination of personal and random contacts and resulted in a somewhat impartial test subject selection. We selected for as wide a variety of projects as possible, going for breadth of projects analyzed rather than similarity of projects for determining consistency. Comparing similar projects was postponed till a later, more detail-oriented phase of the research.

The interview guide consisted of three main questions: Concept description, Stakeholders and Impact. Each question was formed as open-ended question and contained three to seven probing questions ensuring all interviews covered the scope of the IDSA's award application form, DesignworksUSA' Sustainable Management System's triple bottom line and design process.

Table 1 50 interviews using Concept Aspect Profile and 18 semi structured information-gathering interviews

Interview participants		
Students:		
Stanford:	Product students, graduation project	5
	ME engineering students, graduation project	5
Art Center	6-8th term product students	4
	6-8th term transportation students	4
	2nd term transportation students	2
Danish Design School	Product students, graduation project	3
Other design schools	Product student, 3rd year	3
Student interviews:		26
Professionals:		
Design company X	Senior designers	7
	Designers	3
	Auto design	2
	Project managers (designers)	1
	Brand manager	2
	Engineers	6
Misc. Engineers	Engineers	2
Client manager	Engineers	3
Professional interviews:		26
Total number of Concept Aspect profile interviews:		52

3 Observations

The following are the resulting Concept Aspect Profiles for the scenarios examined. The classification of concepts follows:

3.1 Underlying Concept Aspect Profile

When summarizing the data collected from the fifty-two interviews, the cumulative graph (see figure 2) will show the bias of the interview guide. The profile can therefore be used as a reference profile for evaluating individual interview's preference order of Concept Aspects.

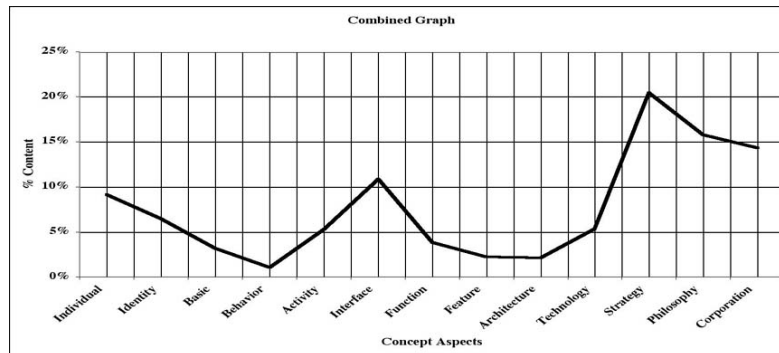


Figure 2 The accumulated Concept Aspect Profile for the fifty-two interviews.

Observations

The interviews have an emphasis on how individuals related to society, interface, corporate strategy, philosophy and corporate relationship to society. The distribution has a bias towards the physical and cultural meeting between user and corporation, though with a larger emphasis on the corporation. This is not surprising, since the interview guide and all interviewed participants primarily view the concepts from the corporation's viewpoint

3.2 Cultural Influence - Do cultural affect content of concepts descriptions?

To evaluate if the cultural context, in which the designers practice, influences the content of their concept design argumentation, interviews were conducted at Stanford, Art Center and the Danish Design School.

The interviewees were senior and recent graduated product students. Students at Art Center participated in corporate sponsored projects. Students at Stanford were non-sponsored projects. Student projects from the Danish Design School ranged from personal projects to limited corporate collaboration. All students worked as the single designer on the projects, however, all were in project room environments at their respective universities.

The projects at Stanford covered a wide range of product types and were: dating game, heated jacket, transformational furniture, maternity clothing and outdoor pathway light. The Art Center projects: backup power supply unit and earthmoving equipment, all industrial products. The projects at the Danish Design School all covered domestic consumer products: Computer interface device, personal time organizer and intelligent washing detergent packaging (see figure 3).

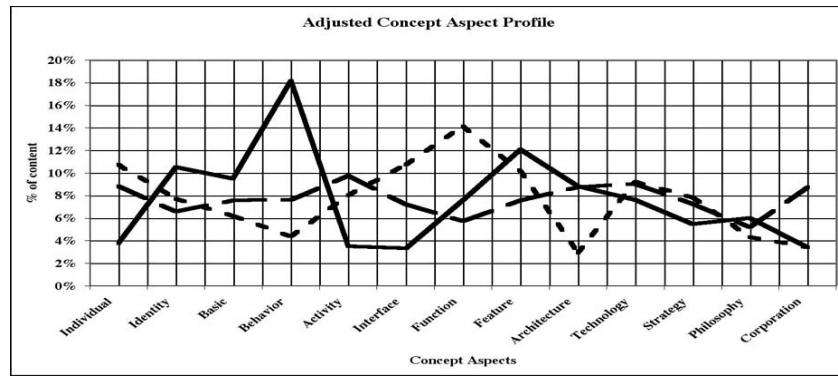


Figure 3 Concept Aspect Profile for Stanford, Art Center and Danish Design School graduate product students, adjusted for the bias of the interview guide. Stanford (solid) Art Center (broken line), Danish Design School (dotted line)

Observations:

Comparing the resulting average Concept Aspect Profile, adjusted for bias from each university, Art Center students emphasize aspects relating to the activity, technology and individual relationship to society. Stanford students emphasize behavior, features and identity. While Danish Design School students emphasize functionality, individuality and technology.

Whether there is a significant cultural and educational difference between the three universities and societies or to what degree the profile variation is due to the nature of their concepts, requires further research. The observations, however, correspond well with the reputation of and personal experience of the three universities.

3.3 Design vs. Styling – Do their concept arguments differ?

To study the Concept Aspect Profile for concepts resulting from a product design process compared to concepts resulting from a styling perspective; students in the product and transportation department at Art Center were interviewed.

Interviewees were senior students, working on corporate sponsored projects. The product students worked with the one sponsor, while the automotive students had various sponsors. All students worked as the only designer on their projects, however in a project room environment.

The product projects were: backup power supply unit and earthmoving equipment, all industrial products. The automotive projects were sports car, SUV, luxury sedan and super sports coupe (see figure 4).

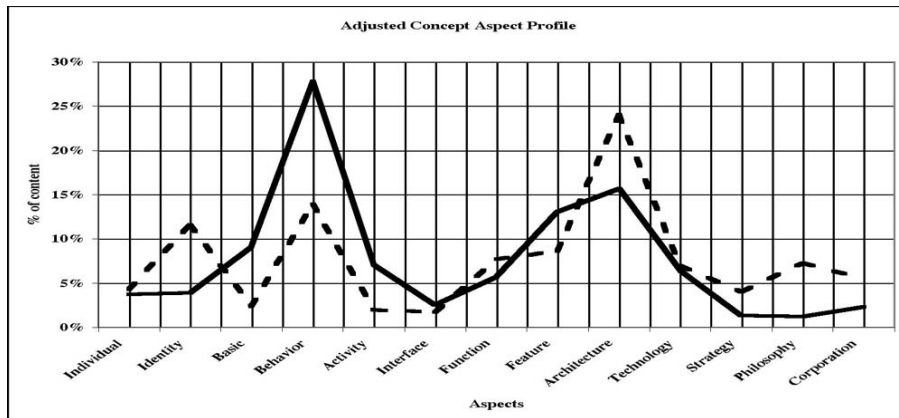


Figure 4 Concept Aspect Profile for Art Center graduate automotive (dotted) and product students (solid)

Observations:

Art Center product students emphasize behavior, architecture and features, while automotive design students’ emphasize architecture, behavior and identity. The difference is, the product designers focus is narrow while automotive designers include more aspects.

To what degree the difference is due to the project mix, requires further research, however, the specific aspects of focus corresponds to personal observations. The stronger focus on architecture is not surprising, in this aspect. This aspect, to a large extent, drives their design opportunities. What is surprising though, is that “stylists” do not focus more on interface including, proportions, surface, details, texture and color. Are these aspect taken for granted? Are these aspects hard to describe? Do the questionnaires questions not favor these aspects?

None of the expected Concept Aspect Profiles occurred in this study. It was surprising to see stylists focusing twice as much on user behavior than product designers.

3.4 Engineers vs. Designers – Do they argue concepts differently?

To evaluate if there is a difference between the Concept Aspect Profile for engineers and designers, engineering and product graduate students at Stanford were interviewed.

The product student’s concepts are described under “Cultural Influence”. The engineering student’s project consisted of a mood-lighting and text-messaging concept for automobiles. While the product students worked alone on their projects, the engineering students worked in teams of two and three students on automotive corporate sponsored projects (see figure 5).

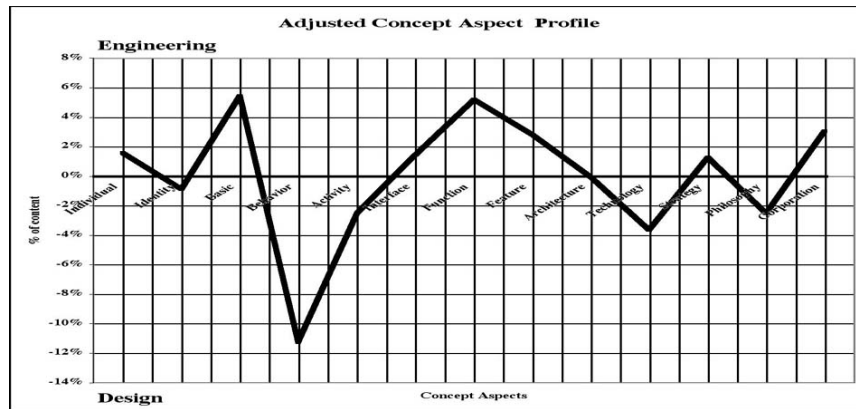


Figure 5 Concept Aspect Profile for Stanford graduating product designers subtracted from the engineering students

Observations:

Stanford product designers and engineers have similar focus on user identity, interface and strategy, Product designers have a stronger emphasis on behavior, technology and philosophy while engineering students having a stronger emphasis on basic needs, function and features as well as corporate identity.

The product students overwhelming focus on behavior surprised us and the nature of their projects didn't seem to explain this. Engineers have a larger focus on need and function, probably reflecting the traditional belief that function addresses a need. Aspects addressing the corporation behind the concepts show a similar tendency, 15% focus, as in the corporate sponsored projects at Art Center.

Expect for the aspect users relationship to society, the results correspond well with the expectations. Engineers focus on the tangible and designers on the intangible.

3.5 Professionals vs. Students – Do concept arguments alter as one matures?

To evaluate if students and professionals concept aspect profiles are different, it was necessary to compare their arguments when working on the same project. Due to internships and collaboration between Art Center and industry, it was possible to obtain data addressing this issue.

The sample represents two professionals and two students working on earth moving equipment, one student and five average professionals working on a medical product (see figure 6).

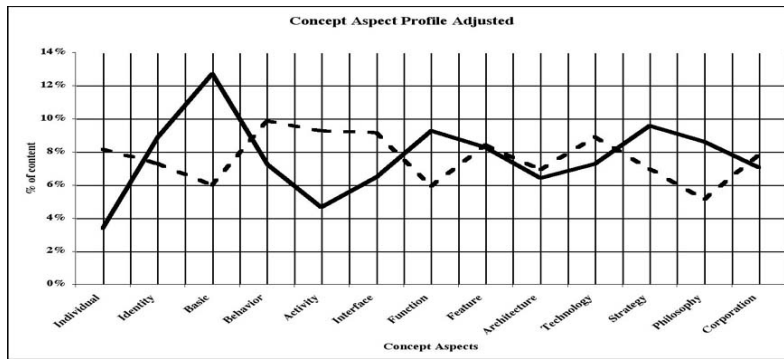


Figure 6 Concept Aspect Profile for graduating product students (dotted line) and product designers (solid line) working on the same project

Observations:

When comparing these groups’ profiles, professionals have a stronger focus on basic needs, function, strategy and philosophy, while students focus more on the individual’s relationship to society and interface.

The findings correspond with our expectations, except for the professional’s strong focus on user needs. Whether this represents pre-branding and lifestyle thinking needs further research.

3.6 Exploitory and Exploratory Aspect profiles

Comparing aspect profiles for professionals and students working on exploitory and exploratory concepts

The product students are the same as in “Design vs. Styling”, “Engineering vs. Design” and Professionals vs. Students (see figure 7).

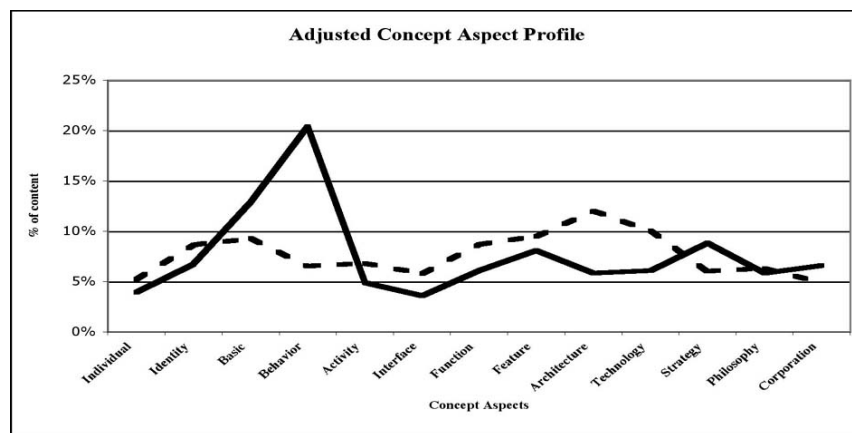


Figure 7 Concept Aspect Profile for students and professionals working on explorative (solid line) and exploitive concepts (dotted line), adjusted for bias from the questionnaire.

Observations:

The aspect profiles for exploratory and exploitory are similar, except for behavior. Focus on user behavior is three times as strong for exploration. Need and strategy, is also stronger for exploratory concepts. That unfamiliarity with a new concept causes an increase in focus on

strategy is logical. That an increased focus on need and behavior is higher is reasonable, however unexpected.

When evaluating the focus of exploitory concepts, we see that these have twice the focus on architecture, one and a half times the focus on technology and a fifth more focus on features. These findings also seem reasonable for projects emphasizing incremental concept improvements.

Conclusion

The Concept Aspect Profile offers an approach for development of quantitative methods for recognizing desired concept patterns. It recognizes patterns for professionalism (with focus on basic needs, function and strategy) vs. amateur level design concepts and exploratory concepts (focusing on user behavior, needs and strategy) vs. exploitory concepts (focusing on architecture, technology and features). Addressing the difference in engineers and designers concept argumentation, the Concept Aspect Profile confirms the engineer's tendency to focus on the tangible while product designers have a stronger emphasis on behavior, technology and corporate philosophy.

The part of a concept that contributes most to its success depends on the design brief and its ability to describe a viable opportunity. Having discovered three patterns, discipline specific characteristics, maturity and exploration, the next step is to identify additional key areas and to simplify the process of creating the Concept Aspect Profiles.

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