DESIGN THINKING AFFECT ON DESIGN QUALITY, AS DEFINED BY DESIGN AWARD RECEPTION

Soren Ingomar Petersen[1], Ab L. N. Stevels[2]
(1) Stanford University Center for Design Research, (2) Delft University of Technology

ABSTRACT

Does a product's success truly rely on design quality and how does design quality correlate to the strength of a designers' concept-arguments? A possible correlation between the Concept Aspect Profile (CAP_{Arg}) measuring designers' verbal arguments, Industrial Design Excellence Award (IDEA) reception and external performance metrics was examined to answer these questions. A Concept Impact-Model was constructed to capture the relationships between variables and using this model, the quality of the decision process behind the IDEA Award was examined for decision-quality, thereby determining reliability of the IDEA Jury as a link. Then, IDEA Award application forms were coded, using a Concept Aspect Profile CAP_{IDEA} and the baseline was compared with the Concept Aspect Profile for concept argument interviews, CAP_{Arg}. Once a strong correlation was detected, professional designers then rated IDEA Award performers according to the Design Quality Criteria. This established a designer's ability to recognize quality in four out of six criteria, supporting the validity of an objective juries ability to discern design quality. The research question is hereby answered in that the quantity of characteristic aspects in a design argument can act as a predictor of design award reception of external performance as measured by stock value and Web Citations.

Key words: Evidence based, design quality evaluation, decision-making, Concept Aspect Profile, design argumentation, design awards, web-citations, public awareness, trend setting, investors expectation, stock-performance.

1   INTRODUCTION

It is well known that the introduction of new products is vital for a company's continued growth. However, these new products are costly and have a consistently high failure rate. Therefore, a tremendous need exists for an early predicting capability in both consumer acceptance and in the financial potential of a concept. This circumstance presents a unique research opportunity for establishing a set of internal metrics in combination with developing an applied methodology with which to evaluate the relative strength of a proposed product concept. Such research could greatly aid designers and decision-makers in concept synthesizing, combination, selection and successive refinement iterations.

The following research question lends itself to examination. Do internal quantification metrics exist and are they capable of quantifying design concepts resulting from the conceptual phase of product development? If so, does a relationship exist between these metrics and other useful, reputable, external performance metrics? If this relationship is established, does a practical evaluation methodology exist that is appropriate for current development and decision-making procedures?

This paper present a synthesized comprehensive design definition, using design quality criteria from design awards as a yardstick for internal design quality. These design quality criteria combined, relate to the probability of IDEA Award reception. Though a constructed Concept Impact Map, the Concept Argument Profile can be used as an early predictor of a concepts performance as related to external metrics.

2 SYNTHESIS OF DESIGN DEFINITIONS

Does a set of industry-accepted Design Quality Criteria (DQC) internal metric exist? Do these DQC exhaustively capture design quality and provide an internal product design metric that correlates with industry-accepted external product performance metrics?

A review of design definitions, historical design movements and global design awards issues was done to answer this question. This led to using the selection of the IDEA Awards criteria, together with the Danish Design Prize criteria "Structure" and BMW Group's, Chris Bangle's emphasis on "Philosophy" as Design Quality Criteria (DQC). Strategy covers the Philosophy (underlying idea of the corporation as related to design), Structure (corporate structure of business unites and alliances) and Innovation (turning inventions into applications). Context covers the elements of Triple Bottom-line (Social, Environmental and Viability concerns). Finally, Performance covers Process (steps necessary to realize the design), Function (benefit the product provides) and Expression (styling communicating the product's reason for being, connection to users and the corporation's values). These criteria exhaustively covered the scope of seventeen global product awards, particular in regards to their industry applicability. See Table 1.

Table 1. Aggregated DQC criteria for concepts from Industrial Design Society of America, Danish Design Center, Bangle Chief Designer BMW Group.

Strategy	Philosophy	Chris Bangle
	Structure	Danish Design Prize
	Innovation	IDEA
Context	Social/Human	IDEA / Danish Design Prize
	Environmental	IDEA / Danish Design Prize
	Viability	IDEA / Danish Design Prize
Performance	Process	IDEA
	Function	Danish Design Prize
	Expression	IDEA / Danish Design Prize

3. DESIGN AWARD AND THER REPECTIVE CRITERIA

The awards examined represented North America, Europe, Asia and Australia and showed each culture to have it's own unique perspective on the meaning of design quality. European cultures seem to appreciate process and function, while Asian cultures have a strong emphasis on philosophy, especially with regards to public education. Further studies are needed to understand the various nuances of these perspectives, however it appears that a design concept quantification methodology, based mainly on the IDEA award will primarily be valid in the USA.

Consolidating the focus of each continent's design awards provided the overview in Graph 1. The graph illustrates how the focus on various designs criteria changes from continent to continent.
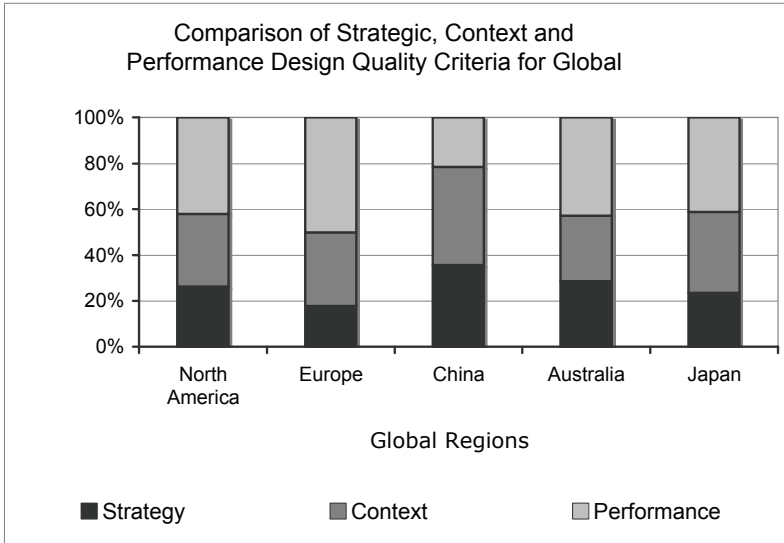
Graph 1. Distribution of focus on Strategy, Context and Performance for European, North American, Australian, and Asian industrial design awards.

3.1 Ranking of design awards

Investigating the public awareness of various design awards was conducted using Google Web. The resulting overview of Web Citations is depicted in Graph 2.
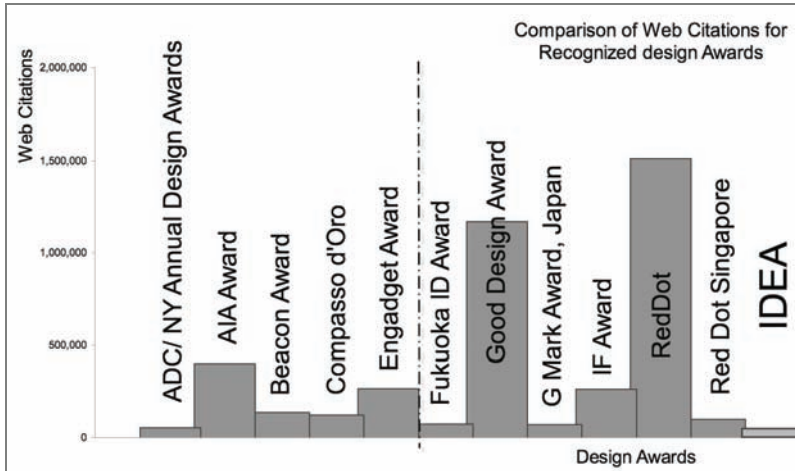
Graph 2. Comparison of the number of Web Citations for the highest rated architectural and design awards from the one hundred and three identified awards.

The top seven performing awards regarding public awareness all contained consumer products as a category. The IDEA Award (Dulles, Virginia) has high general acceptance in the North American market, is widely respected in the business community (featured yearly in Business Week) and commands designers' attention. Furthermore, the IDEA Award includes six of the nine Design

Quality Criteria and has published criteria and recorded accessible award winner records dating back to the year 2000.

It is important to note that these criteria are intended for evaluation of a final product's design and not concepts. Comparing product and concept evaluation criteria however, show that these overlap to a large extent. The main difference between the two is that concept evaluations include emphasis on communicating and realizing various interface aspects.

Contingent on the existence of an internal performance metric for concept and design quantification, can these be mapped to relevant external performance success metrics? To help answer this, a Concept Impact Map was constructed.

4 CONCEPT IMPACT MAP

A Concept Impact Map, connecting the impact of internal metrics with external metrics, would aid the decision-making process for concept selection in the conceptual phase. Mapping was realized by identifying a connection from a designer's argumentation for a concept, as captured by the Concept Aspect Profile analysis (CAPArg)* [1] to Design Quality Criteria (DQC) as captured by interviews with designers. Then a mapping was then made connecting internal Design Quality Criteria (DQC) to external design quality, as measured by IDEA Award reception (IDEALEVEL). See Figure 1.
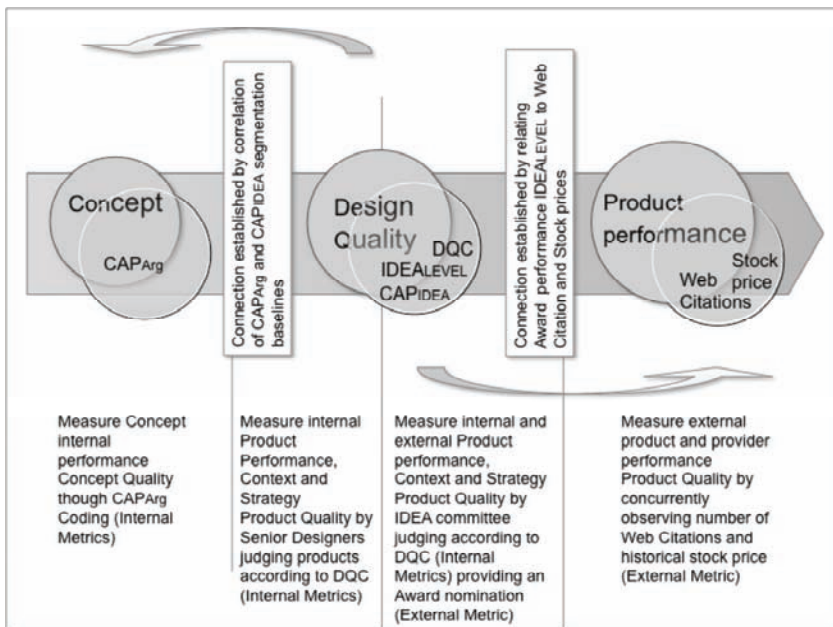

Figure 1. Concept Impact-Map. The baseline for the Concept Aspect Profile (CAPArg) maps to the baseline for the coding of the IDEA Award (CAPIDEA) applications.

*CAP analysis is a tool, segmenting a designer's concept argument into thirteen aspects, containing user – product – provider elements. The resulting aspect profiles reveal a concept's underlying character in regards to, among other things, innovativeness and design – styling focus.

IDEA Award applications are classified by a jury, based on the Design Quality Criteria (DQC), into the design performance categories: Gold, Silver, Bronze and Non-qualifying. It is important to consider that the IDEA award is restricted to addressing six of the nine DQC criteria identified. However, these represent all three overarching groupings, "Strategy", "Context" and "Performance" and a products performance in each group has equal weight when calculating the total score. The question now is, does Award reception then correspond to any external performance metrics?

5 RELATIONSHIP TO EXTERNAL METRICS

Selecting an external metric that best reflects a designs contribution to a corporation's success is a major undertaking. To simplify the selection, the authors therefore decided to focus on existing recognized metrics. Large mature corporations increasingly focus on the "Triple Bottom-line Approach" for scoring business performance. This approach includes the elements of environmental, social and viability [2]. For simplification reasons, environmental performance was eliminated. For social performance, design's trend setting ability, as measured by the number of Web Citations was selected. For viability performance, stock prices were selected to capture a designs encompassing contribution as reflected in the DQC criteria.

5.1 Public awareness

Auditing the IDEA winning products' associated web pages, show IDEA Gold Award winners to command roughly a factor five more web citations than Silver Award winners, which then command roughly a factor ten more web citations than Bronze winners. Non-qualifiers performed slightly below Bronze winner level. This relationship remained consistent over the following thirty-month timeframe, although with a generally decreasing number of Web Citations.

The web citation count was observed daily for a period of three months, following the public announcement to evaluate the influence of hype potentially causing a reverse causality due to the publicity of the announced award winners. This showed that winner's Web Citation count superiority was inherent in the product offered and not the media hype. See Graph 3.
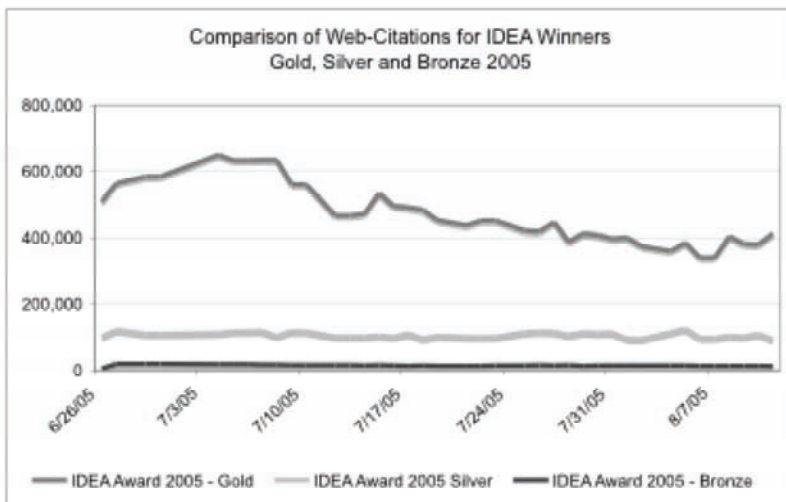

Graph 3. Development in the number of Web Citations with time, measured for
Gold, Silver and Bronze IDEA winning products over the period June 26 – August 14.

While investigating if the distribution was likely to be coincidental, award-winning products from the period 2000 to 2007 were recorded for a period of six to forty months. For five of the eight award

announcements observed, the Gold winning products performed better than the Silver and Bronze winners on Web Citations. In one year, Gold and Silver tied and in another, Silver winners out performed Gold. During one year, the number of Gold winners was insufficient for drawing conclusions. Comparing the findings for the winners with the non-qualifying IDEA entries revealed these to have a Web Citation count at a magnitude ten times lower than the Gold winners for 2005. This shows design quality's ability, as expressed by the DQC, to set trends.

5.2 Does Winning IDEA Awards indicate future higher stock prices?

Observing companies receiving IDEA Gold, Silver, Bronze or not qualifying for awards over a period of four and a half-year period (2000 – 2005), award-winning product's companies outperformed the S&P500 by 32% (outperforming by approximately 6.5% per year). See Graph 4.
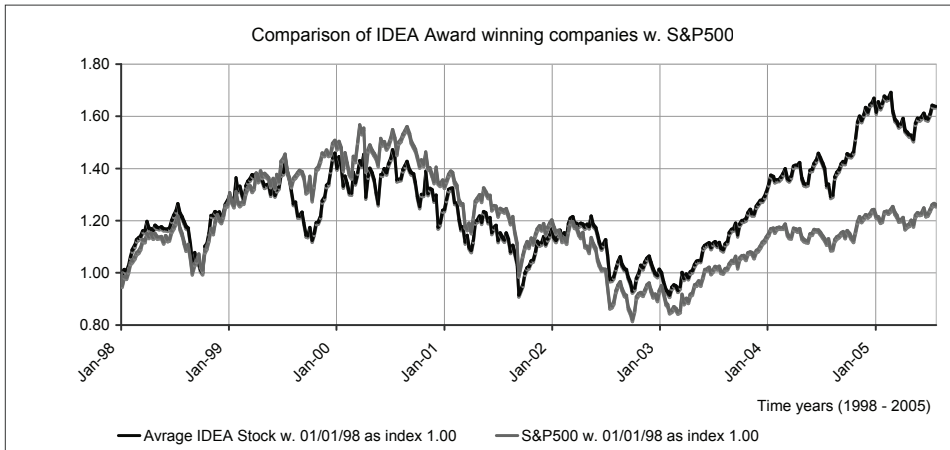
Graph 4. Comparison of S&P500 and stock prices of companies behind IDEA Award winning products in the period 1998 – 2005.

Is Wall Street award announcement disposed to hype? No, since there is no evidence of an immediate price change following award announcements. However, a consistent level of design quality, as reflected in steady award reception, is cumulative. Companies winning three to four awards see a yearly stock price increase of ten percent. While winning four or more awards results in an eighteen per cent yearly stock price increase.

Could other factors, co-varying with design, drive this effect? One such well-known factor is Branding. Comparing the top twenty-two brands performing consumer product companies, according to brand value [3] with their stock prices, showed design and branding to co-vary. Combined, they outperformed any other combinations and design performed better on it's own than did branding. This corresponds with previous studies [4]. The above shows design quality's ability, as captured by DQC, to produce medium and long-term financial growth.

5.3 Does the perception of industrial designers compare to the IDEA jury?

A comparison was conducted to establish if the judgment of an IDEA jury reflects the opinion of the design community. To simulate the decision of an IDEA jury, thirteen senior industrial designers were interviewed on the same IDEA applicants from 2005. The objective was to see if these designers could tell the difference between winning and non-qualifying products along the judging criteria and on which of the six IDEA criteria these differences could be observed.

Printed images of the designs, on 8.5" by 11" boards, were randomly presented to thirteen designers, in sets of five boards for per designer, together with a graphic scale enabling them to rank the product on the six criteria from one to five. The result of the interviews is shown in Graph 5.
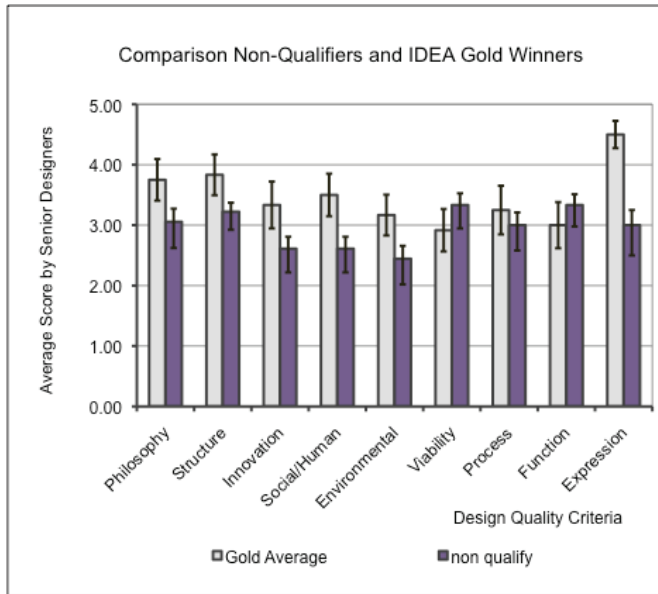
Graph 5. Comparison for IDEA Gold winning products with non-qualifying products, year 2005, p<0.05, based on designers' score of DQC

The observed difference in designers' evaluations is more pronounced between Gold and Non-Qualifiers than Winners and Non-Qualifiers. Designers can distinguish between Gold and Non-Qualifiers on four of six (67 %) of the Industrial Design Society of America (IDSA) judgment criteria. These are: "Philosophy," "Structure," "Innovation," "Social," "Environment" and "Expression." Except for "Structure," the areas that they can differentiate between are within their area of competencies. Designers' inability to differentiate between "Viability" and "Process," for the two categories, was as to be expected. The necessary information to evaluate these criteria was absent from the presented images available to them.

In summation, a random assembled group of experienced designers can judge products along four of six IDEA quality criteria and agree with the IDEA jury on these. Therefore, the IDEA Award can reliably be used as a measurement of Design Quality.

5.4 Assessment of the quality of design award decision-making
How good is the IDEA Award selection process at capturing design quality? For the IDEA Award to act as a link between designers' concept argumentation and external metrics, the jury's decision-making process has to be of "good quality". Here, Normative Decision Science is used as reference [5]. For good decision making to take place, one needs consistent information, alternative and preferences.

5.4.1 IDEA Actors and Information Exchange

First the actors and their communication were reviewed, mapping their relationships. See Figure 2.
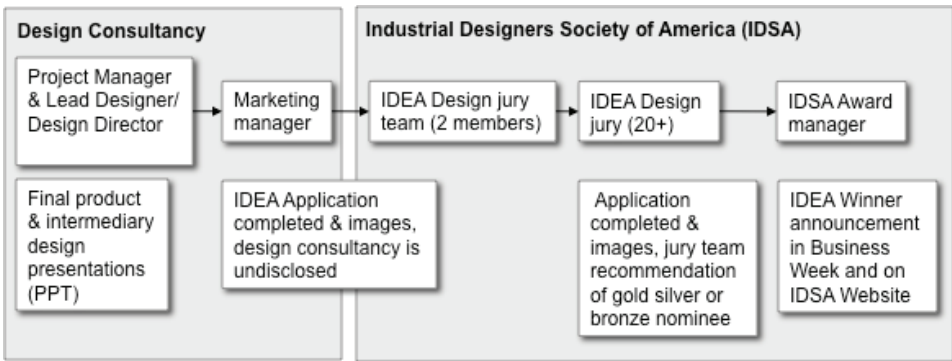

Figure 2. Mapping of actors and the information flow between these.

The design consultancies, not the clients, apply anonymously for IDEA Awards. The person responsible for PR/Marketing debriefs the consultancy's team members, on the project. Information reviewed is: Presentations to the client, final product, and client press material. This part of the information transfer is likely to suffer a certain degree of information loss as well as noise attributed to comprehension and memory of the PR/Marketing person. He/she may also have a bias as to how to promote the client or the consultancy. Based on this information, the PR/Marketing person completes the IDEA Application form and provides digital images of the final product/final presentation model/renderings.

The jury members are selected from prominent members of the design community whose design contribution has been exceptional. Jury members participate for one year only. IDSA, the permanent staff provides this information to the jury member weeks prior to the rendezvous for the judging. For each product category, two jury members down-select the candidates, based on a rating of the six IDEA Award DQC criteria. Afterwards, the complete jury meets to determine by consensus which products are worthy of which award. There is no preset number of awards, which have to be awarded in each category.

5.4.2 Interviewing Past IDEA Jury Members

The objective of interviewing two previous members on the IDEA jury was to provide insight into the process and the quality of the jury's decision-making. One limitation in the selection process is that the products are judged from images and written descriptions only, since no actual products are present. The quality of images and writing is inconsistent and affects the judges' ability to understand the design. The two former jury members explained how the award selection was designed to be fair and apolitical. In addition they believed the six judging criteria were exhaustive and addressed the key component of design quality.

In closing, based on these interviews it has been concluded that the award selection seems to be doing well on two of the three criteria for good decision-making, with inconsistency in quality of information as the only suboptimal element. This was promising insofar as using the IDEA design awards as a bridge between the analysis of design arguments, using and external metrics.

6 DESIGNERS' CRITERIA DEPENDENT PERCEPTION OF DESIGN QUALITY

6.1 IDEA Award reliability compared to design quality assessment in general

How good are the IDEA Award judges evaluation compared to regular design evaluations? When decision-makers make selection criteria explicit and specific, designers agree on performance to a larger extent, 95% of the times, vs. 50% of the time when judged without explicit evaluation criteria [6]. Studies in an educational environment further suggest that when criteria is presented and reiterated designer arguments correlate stronger to the Design Quality Criteria (DQC) than when no feedback is received [6]. This supports the quantitative research concluding that the IDEA jury's decisions are of high decision quality.

Evaluating the relevance of the individual Design Quality Criteria was confirmed at a $p<0.05$ confidence level for the criteria "Philosophy," "Structure," "Innovation," "Social," "Environmental," "Planning" and "Expression". "Viability" is confirmed with a significance of $p<0.20$ confidence level. However, the effect of multiple IDEA Award winning makes this connection significant as well. The findings from the Danish Design Center's "Design Ladder" further document the design performance relationship to "Viability" as related to revenue and export ($p<0.05$ confidence level). Finally, the degree to which multiple IDEA Award winning has an influence on financial performance, suggests that good "Planning" affects design performance.

6.2 Designs' argument correlate with criteria in the IDEA award

Comparing the baseline for concept arguments (CAPArg) and Design Quality Criteria as defined by the IDEA Award (CAPIDEA) proved to be positive, with a correlation coefficient of 0.66 and significance of $p<0.05$. Hence, IDEA Award reception can act as a Design Quality Criteria measurement.

Evaluating the relevance of the Concept Aspect Model coding reveals that 38% of the initially proposed CAP aspects show to be statistically significant for differentiating between IDEA Gold winners and non-qualifiers. The percentage is lesser, 23%, of all winners (Gold, Silver and Bronze) compared with non-winners. Based on this, the coding effort could be reduced by focusing on the above findings. Comparing Winners in general with Gold Winners suggests that the aspects "Individual" and "Function" are likely to be more important than "Activity," "Planning" and "Philosophy," since these only become significant at the Gold Award level. Based on the findings, it is however not possible quantify this difference or further judge their relative internal importance.

7 CONCLUSION

The research establishes that a product's success, as measured by the number of generated web citations and stock performance, correlates to design quality, as measured by Design Quality Criteria, which correlates with the strength of designers' concept-arguments as captured by the Concept Argument Profile. Open questions remain regarding the frameworks validity outside the examined North American organizational, cultural and present temporal sphere.

This work has contributed significant new insights into:

- Designer's competencies as experts, with and without explicit criteria
- Global interpretation of Design Quality Criteria (DQC)
- Internal Design Quality Criteria, creating a construct relating DQC to external metrics
- Web Citations relationship to designer awareness and their ability to create trends
- Connections between design arguments, as captured by CAP, DQC, IDEA Award performance and investors expectations (stock prices) and general awareness (Web Citations)

REFERENCES

[1] Petersen Soren Ingomar, Design Argumentation Profile A Quantitative Decision Support Framework For Concept Evaluation In The Early Product Development Phase, *ICED05, 2005*

[2] Michael W Toffel, Natalia Hill, Kellie A McElhaney, Designing Sustainability at BMW Group: The Designworks/USA Experience, *United Nation Global Compact, 2002*

[3] Interbrand, Brand Valuation, from Brand and Branding An Economic Book*, Interbrand 2004*

[4] Pearl Jayne Intangible Investments, Tangible Results*, MIT Sloan Management Review, Fall 2001 Volume 43 No. 1*

[5] Howard Ron The Foundation of Decision Analysis*, Stanford, Fall 2004*

[6] Petersen Soren Ingomar Design Quantification, Design Concept Argumentation as Related to Product Performance Metrics, *Stanford University 2009*

Contact: Soren Ingomar Petersen
Stanford University
Center for Design Research
Bldg 560, Stanford, CA 94306
USA
Tel: 650-868-0014
Fax: 650-725-8475
E-mail: ingomar@stanfordalumni.org
URL: http://cdr.stanford.edu

Soren Ingomar Petersen is president of ingomar&ingomar a business definition consultancy, assisting corporations quantifying product portfolios, evaluating design team performance and quantifying design concepts. Main research interest is the integration of design considerations with business plans and design briefs, improving design and communication in the conceptual phase.