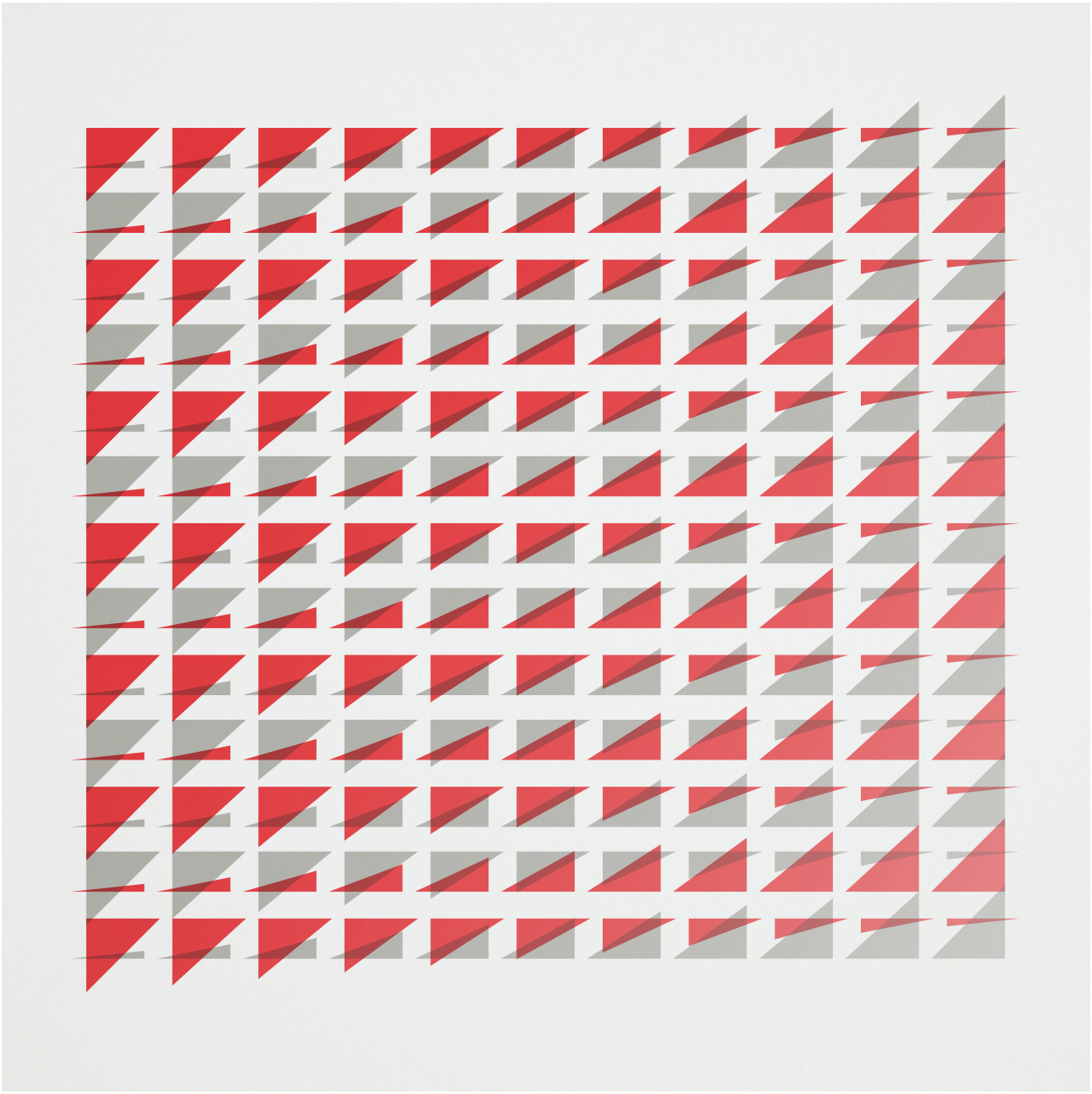
Design Effectiveness

Industry Report



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Industry Report

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RSM Erasmus
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Executive Summary

Emphasizing design, and including designers in new product development teams, contributes to new product success. Likewise, involving designers in developing web sites and corporate visual identity helps to improve firm image. Together, this translates to better firm performance. These are the main findings of research conducted in a large sample of Dutch firms from both manufacturing and service sectors.

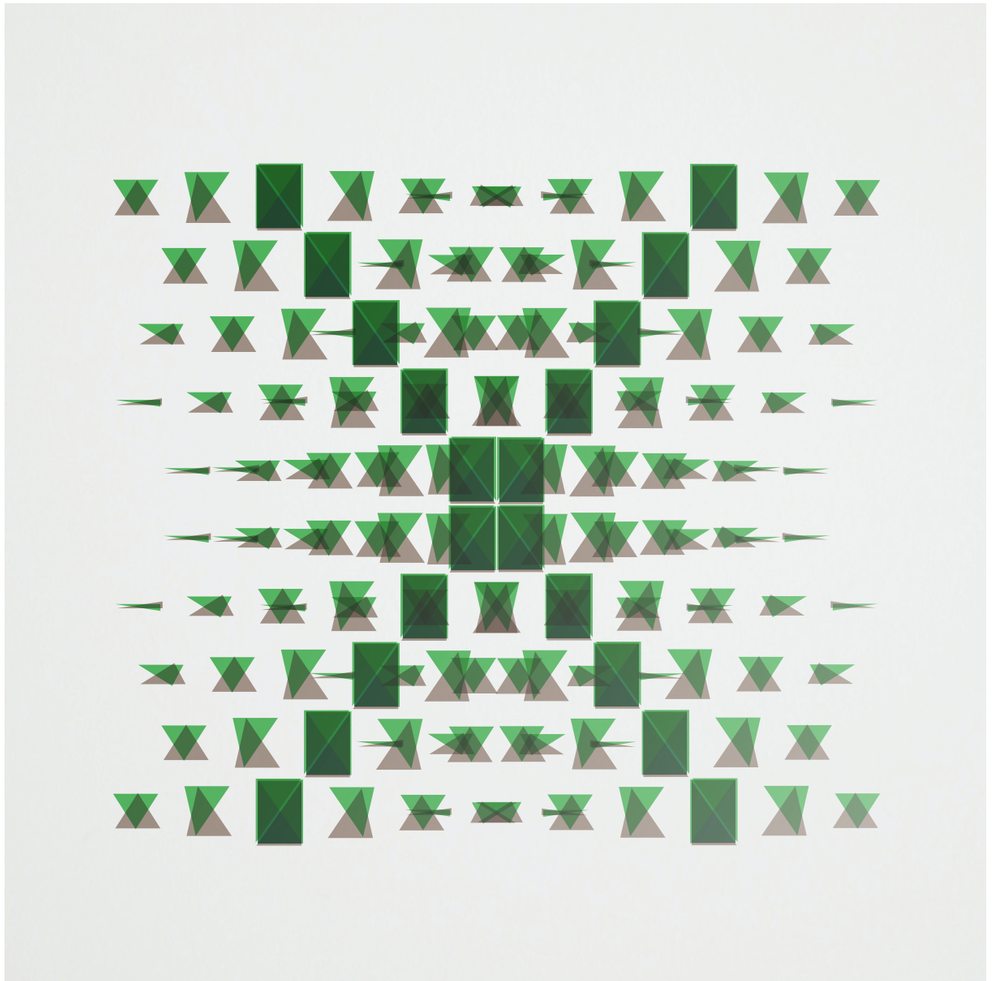
Two main design foci are identified in the study: experiential design, which is about appealing to the senses, supporting self-expression and evoking emotions, and functional design, which is concerned with technology, functionality and ergonomics. The more that designers are involved in new product development, the more attention will be placed on both experiential and functional design. Paying attention to both these types of design contributes to product financial performance.

Some of the positive effects of design are stronger if designers have a high level of freedom to explore concepts outside the scope of the project at hand. This suggests that, to improve performance, firms should look at giving designers greater freedom. Innovativeness in experiential and functional design also has a positive effect.

The combination of high experiential design emphasis and high customer involvement does not work out well for experiential quality of products. Customers can be expected to focus on features and functionality based on what they already know. Designers, on the other hand, can be expected to take a more innovative approach. When these two influences come together, the result is poorer experiential quality. Thus, when product experiential quality is important, it may be necessary to limit the extent to which customers are involved in product development. Alternatively, measures could be taken to ensure that customer involvement is not allowed to have detrimental effects on experiential design emphasis.

Designer involvement in the development of web sites and corporate visual identity results in a better image for the firm. This includes stronger perceptions of social responsibility, emotional appeal, financial success and being a good employer.

Introduction



This report presents the findings of a large-scale survey-based research project funded by the BNO (Beroepsorganisatie Nederlandse Ontwerpers), the Dutch Ministry of Economic Affairs and Pictoright. The focus of the research is the contribution of design to business performance. The research was conducted by the Rotterdam School of Management (RSM) in collaboration with the Delft University of Technology (TUD). The research team consisted of Prof.dr.ir. Jan van den Ende (project leader, RSM), Dr. Marina Candi (RSM), Dr. Gerda Gemser (TUD) and several research assistants at RSM. Thanks are due to Prof.dr. Erik Jan Hultink for his advice on the definition of the study. Special thanks are also due to almost 400 managers in Dutch firms, who generously contributed their time to take part in the survey.

To examine the use and effectiveness of design, four types of development were studied: products, packaging, web sites and corporate visual identity. The research model is shown in Figure 1, and indicates the sources of data for each area of study. At the far left, we start with firm orientation with respect to design and design innovativeness. A firm's design orientation and strategy of design innovativeness can be expected to have a direct influence on its performance and also on how tasks are executed. At the project level we have emphasis on design in product, packaging, web site and corporate visual identity development. At the next level we have project performance, for both products and firm image. Finally, at the far right, we have the firm performance level.

The project's coverage of the development of products, packaging, web sites and corporate visual identity means that a large portion of the activities commonly undertaken by designers is covered. The project deals with activities in the areas of strategy development, branding and communications to a limited extent. Strategy development is represented to some extent in the examination of the effects of design orientation and design innovation at the firm level. Designer activities relating to branding and communications are represented in their involvement in web site and corporate visual identity development. Evidence is found for the effectiveness of designer involvement in these areas.

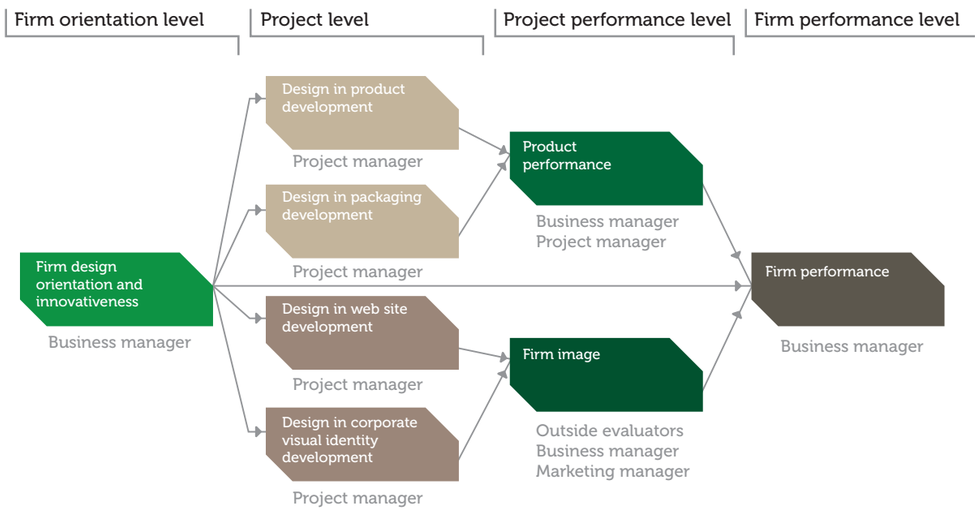
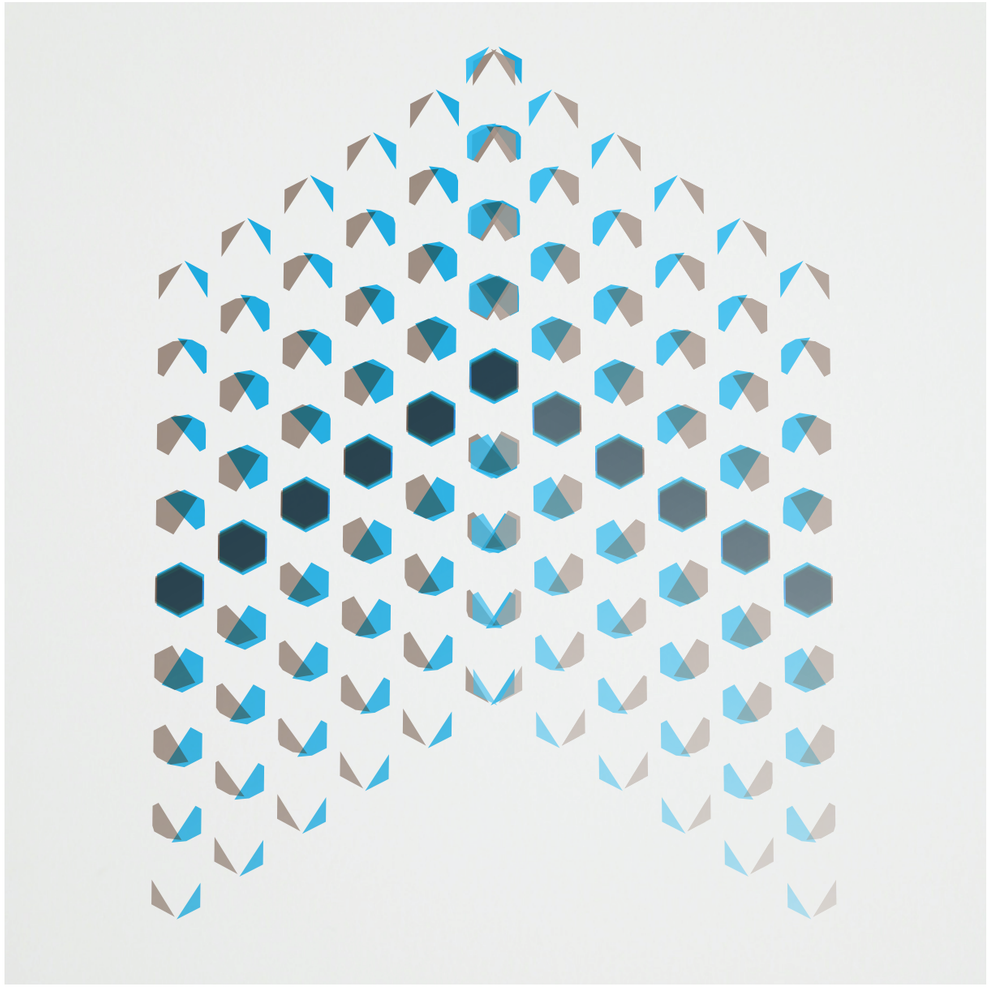


Figure 1: Research model with information about sources of data.

Data collection



Telephone surveys were conducted with managers from 163 Dutch firms. Telephone surveys were conducted with up to three managers in each firm: a project manager who had managed the development of a specific product and its packaging; a marketing manager who knew about the firm's web site and corporate visual identity development; and a business manager who could provide general information about the firm, its strategies, competitive environment and performance. The business manager also provided information about the performance of the particular product covered with the project manager. The business managers were persons with a broad overview of their firms, including product development in general. In many cases these were the firm's product development managers. In the smaller firms in the sample, these managers were sometimes the firms' CEOs or general managers. Finally, two master's students evaluated each firm's web site. This data collection strategy ensured that there were at least two independent evaluations for product performance and firm image as shown in Figure 1.

The firms included in the sample were drawn from a wide range of industry sectors, as shown in Table 1. A total of 28 firms from service sectors were included in the sample and, in the analysis, were not found to behave substantially differently from manufacturing firms.

Sector description	Number of firms
Food and kindred products	11
Apparel and other finished products made from fabrics; leather and leather products	5
Furniture and fixtures manufacturing	14
Paper, chemicals, rubber and miscellaneous plastics products manufacturing	26
Stone, clay, glass and concrete products manufacturing	7
Fabricated metal products, except machinery and transportation equipment	14
Industrial and commercial machinery, including transportation equipment, and computer equipment	35
Electronic and other electrical equipment and components, except computer equipment	9
Measuring, analyzing and controlling instruments; photographic, medical and optical goods; clocks	8
Miscellaneous manufacturing industries	6
Service sectors (e.g. financial services, communication services, insurance, hotels, health services)	28
Total	163

Table 1: Sectors represented in sample.

The firms included in the sample ranged widely in terms of size, as shown in Table 2, and the median size was 140 employees.

Size range	% of firms
10 of minder	13%
11-25	9%
26-50	12%
51-100	12%
101-200	18%
201-500	16%
501-1000	7%
Meer dan 1000	13%
Total	100%

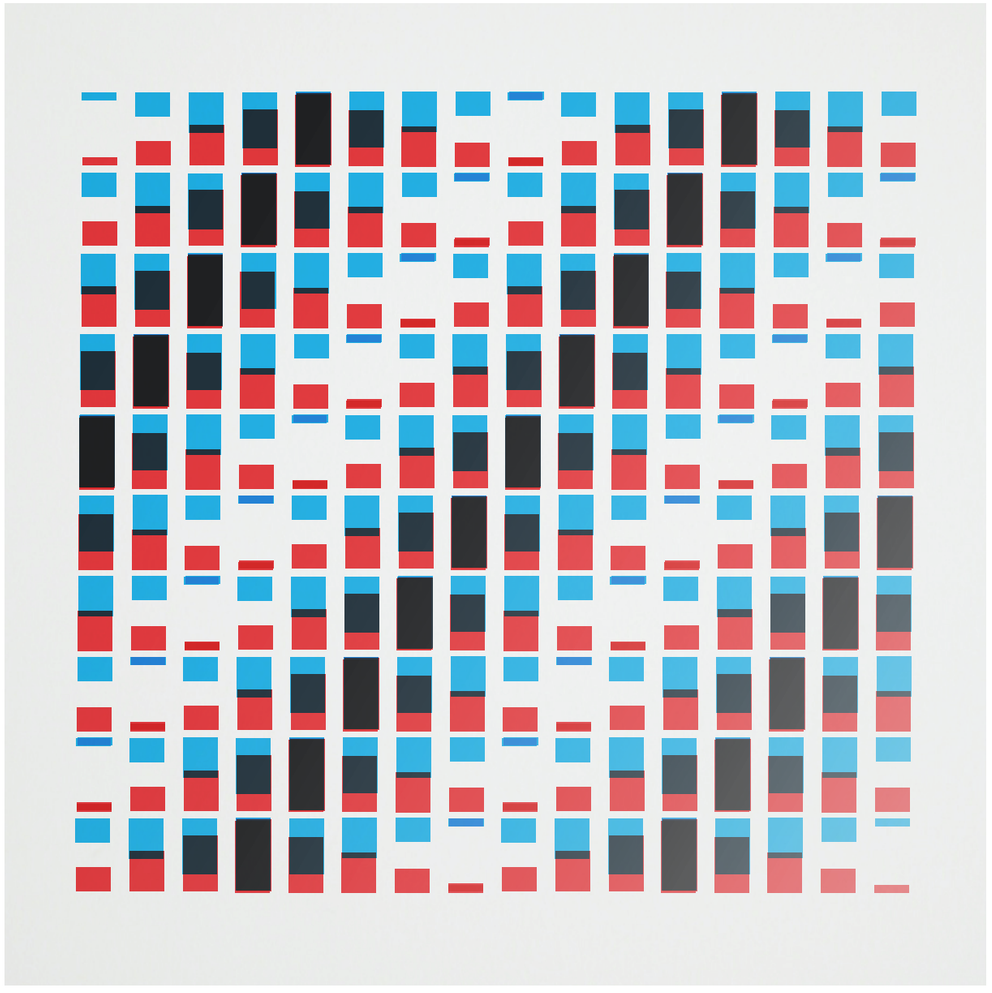
Table 2: Number of employees in sampled firms.

Type of respondent	Number of questions	Number of surveys completed
Project manager	160	132
Marketing manager	127	109
Business manager	143	131
Outside web site evaluator (2 per firm)	90	218
Total		590

Table 3: Types of surveys completed and numbers of questions in surveys.

Table 3 provides details about the number of questions in each of the three surveys and the number of surveys of each type that was completed. Based on the number of questions in each survey, a total of about 54.000 questions were asked of a total of 372 respondents. Each telephone survey took 30-45 minutes to administer.

What is meant by designers and design?



One of the challenges of this research was to create survey questions that would measure emphasis on, and use of, design in the development of products, packaging, web sites and corporate visual identity. Simply asking respondents to rate their emphasis on design or the amount of effort invested in design would have produced unreliable results, since the term design is understood in many different ways, including very broad definitions almost synonymous with development. Existing research was examined to obtain a set of design aspects that fall under the scope of work that might be conducted by designers. The result was the following design aspects:

Designers are persons with formal education in industrial design, graphic design, architecture, art or similar; or people with substantial experience in one or more of these fields.

* Design for technology
* Design for functionality
* Design for ease of use (ergonomic design)
* Design to appeal to one or more of the human senses (sensorial design)
* Design to evoke emotions (symbolic design)
* Design to support self-expression (symbolic design)

The data were analyzed to identify groupings among the above items and the end result is two categories of design, functional design and experiential design as shown in Figure 2. Functional design includes design for technology, design for functionality and design for ease of use. Experiential design includes design to appeal to the senses (sensorial design) and symbolic design, which in turn consists of design to evoke emotions and design to support self-expression. The results of the statistical analysis were that grouping ergonomic design with functional design or experiential design were equally valid options. We made the choice to group ergonomic design with functional design based on the conceptual link between ergonomics and functionality.

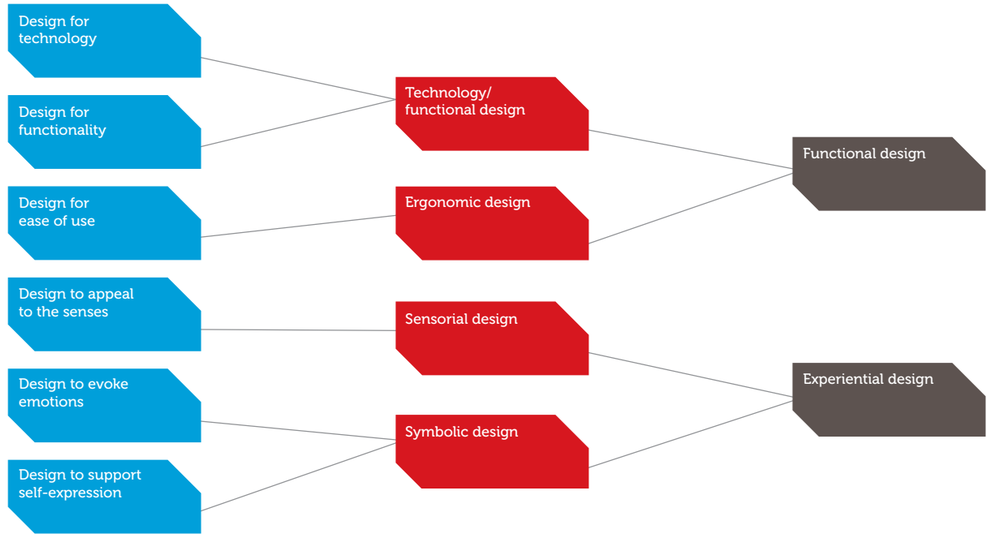
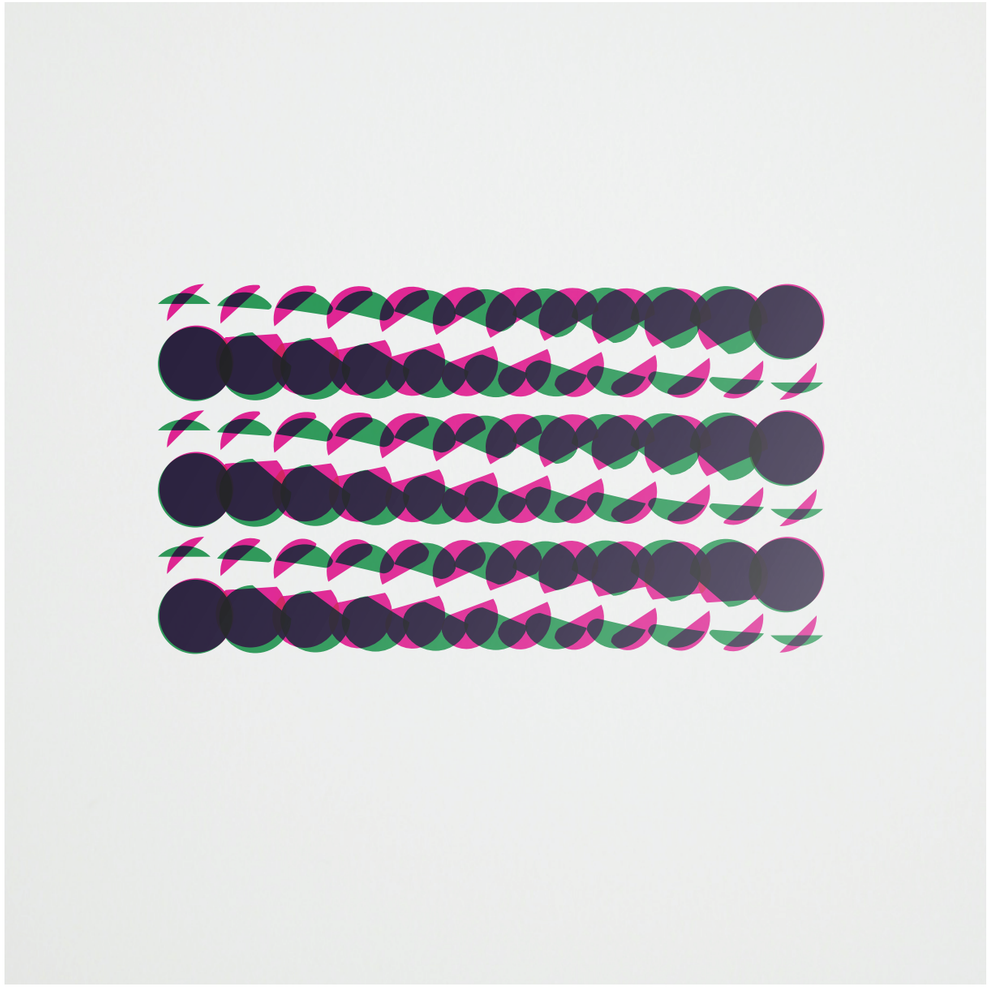


Figure 2: Types of design.

Design orientation



Project managers were questioned about a specific new product development project and the associated packaging, if applicable. Among the topics covered were emphasis on various aspects of design and the make-up of the project development team, with particular focus on the involvement of designers. Figure 3 shows that design emphases in the development of a specific new product are influenced by the orientation to experiential and functional design at the firm level and by the firm's experiential and functional design innovativeness.
Designer involvement in new product development is only influenced by experiential and functional design orientation, while a firm's experiential and functional design innovativeness do not lead to increased designer involvement. However, designer involvement contributes to project-level experiential innovativeness. Thus, it seems that designers also contribute to innovativeness, although this may not be recognized at the firm level
.
Project managers were questioned about the make-up of their project teams, with specific focus on the number of team members who were designers. They were also asked how the project effort was divided between designers and other team members.

Firm experiential orientation is a measure of the extent to which a firm views sensorial design and symbolic design as strategically important.

Firm experiential innovativeness is a measure of the extent to which a firm's products are radically different from competitors' products in terms of sensorial design and symbolic design.

Firm functional orientation is a measure of the extent to which a firm views technology, functionality and ergonomics as strategically important.

Firm functional innovativeness is a measure of the extent to which a firm's products are radically different from competitors' products in terms of technology, functionality and ergonomics.

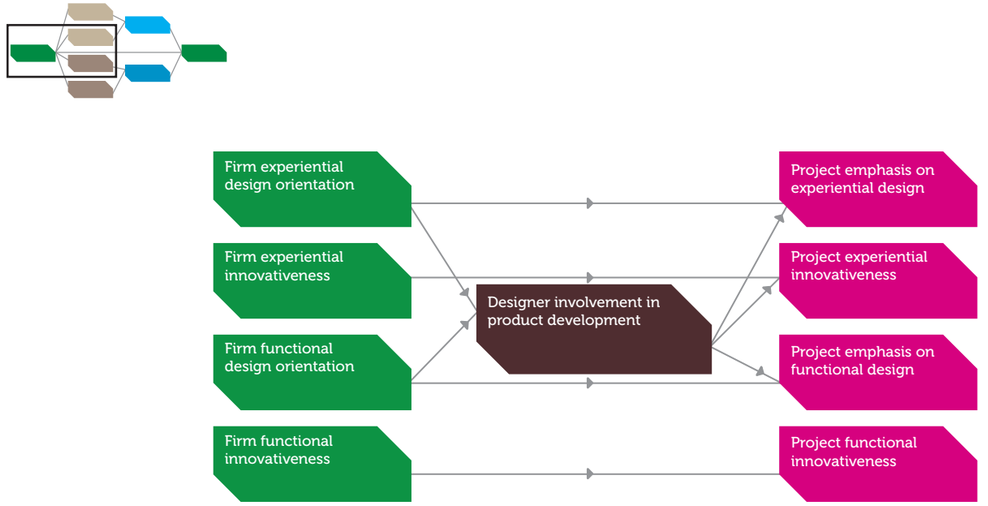


Figure 3: Relationships between firm orientation (left of diagram) and designer involvement (center) and design emphasis (right) in the development of a specific new product.

Summary statistics for designer involvement in the projects studied are shown in Table 4. Interestingly, 80% of the new product development projects included at least one team member or external participant who was a designer. This suggests that awareness about the potential benefits of including designers in new product development projects is quite high. In terms of overall hours spent on new product development projects where designers were involved, those designers did, on average, 19% of the work during the idea phase, 21% in the development phase, and 14% in the commercialization phase.

Designer involvement in new product development is calculated as the number of person-months worked on a product development project by designers divided by the total number of project person-months. For example, if there were 2 designers on a team of 5 and all worked full-time on the project, this comes out to designer involvement of 2/5 = 0.4.

	Proportion of projects
New product development projects in which at least one designer was involved	80%
If at least one designer involved:	
Average designer person-months on project as proportion of total project person-months	19%
Average proportion of idea phase work performed by designers	19%
Average proportion of development phase work performed by designers	21%
Average proportion of commercialization phase work performed by designers	14%
New product development projects in which external design firms were used	26%
If external design firm used:	
Average external designer person-months as proportion of total project person-months	34%
Proportion of new product development projects that included packaging	73%
If packaging included:	
Average proportion of packaging development by designers	23%

Table 4: Summary statistics for designer involvement in new product development projects.

Contribution of design to new product success

Project performance compared with competitors was a key area covered by the business manager survey. Three performance factors were identified. Firstly, product financial performance provides a measure of the financial returns gained from a product. Secondly, what will be referred to as product experiential quality encompasses a product's sensorial and symbolic quality. Thirdly, product functional quality refers to the quality of a product's technology and functionality and its ease of use. The contributions of designer involvement and design emphasis to product performance are shown in Figure 4. The greater the designer involvement in a product development project, the greater the project emphasis on both experiential and functional design. Detailed analysis revealed that the relationship between designer involvement and functional design emphasis primarily rests on the relationship between designer involvement and emphasis on ergonomics rather than functionality and technology.

Based on the findings shown in Figure 4, we can surmise that product development projects in which there is high emphasis on both experiential and functional design are more likely to perform well financially than projects in which these two types of design are not empha¬sized. Experiential design emphasis and functional design emphasis are relatively equal in terms of what they contribute to product financial performance. The results indicate that, on average, new product development projects with high emphasis on experiential design will result in 9% better financial performance than those which have only medium emphasis on experiential design. Similarly, products with high emphasis on functional design will have on average 10% better financial performance than those with medium emphasis. When taken together, we see that if both emphasis on experiential design and functional design in a project are high, product financial performance will be about 20% better than that of a project with medium emphasis on both. The overall conclusion is that firms that want to optimize the financial performance of their product development activities should emphasize both experiential and functional design.

Project emphasis on experiential design is the degree to which more importance was attached to, more resources were spent on, and more knowledge was available on sensorial design and symbolic design for the project under study compared with other development projects in the firm.

Project emphasis on functional design is the degree to which more importance was attached to, more resources were spent on, and more knowledge was available on technology, functionality and ergonomics for the project under study compared with other development projects in the firm.

Project experiential innovativeness is the degree to which the sensorial design and symbolic design of the new product under study were radically different from other that of products developed by the firm.

Project functional innovativeness is the degree to which the technology, functionality and ergonomics of the new product under study were radically different from that of other products developed by the firm.

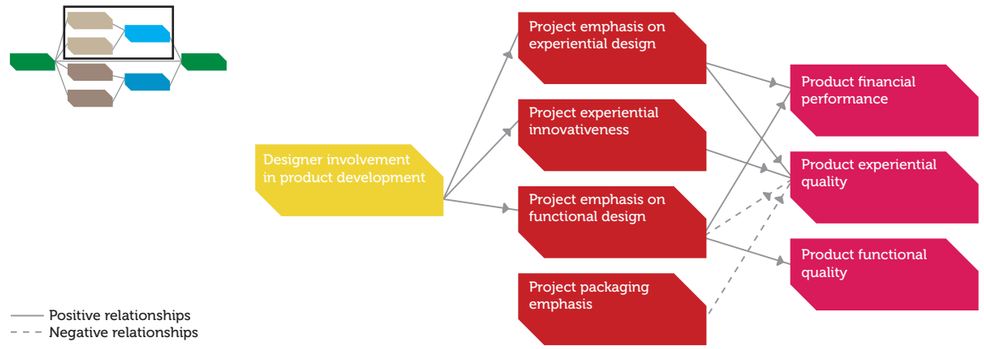


Figure 4: Relationships between the project level (left) and the project performance level (right) for new product development.

A product's experiential quality is improved by high emphasis on experiential design and experiential design innovativeness, and a product's functional quality is improved by high emphasis on functional design. This means that, not only do they directly affect financial performance, but emphasis on experiential design and on functional design each have positive effects on the corresponding aspects of product quality.

Conversely, project emphasis on functional design and packaging both detract from a product's experiential quality. This suggests a possible trade-off between emphasizing experiential design and functional design. Trade-offs between technology and aesthetics are commonly seen in products, and it is likely that what we are seeing here is indeed such a trade-off. The implications are that if a firm is more concerned with experiential quality than financial performance – as might be the case, for example, in the entertainment, hospitality or cultural sectors – it should emphasize experiential design over functional design. If financial performance is most important, a firm should emphasize both experiential and functional design in its new product development, despite the negative effect of functional design emphasis on experiential quality. Interestingly, there is no significant relationship between designer involvement in product development and packaging emphasis. This may be because in many of the cases studied product packaging was entirely utilitarian and, therefore, not particularly likely to be developed by designers. This explanation is supported by the fact that on average only 23% of the packaging development work was done by designers, as shown in Table 4. This may explain the negative relationship between project packaging emphasis and product experiential quality.

Conditions for improved product performance

Impact of experiential and functional design innovativeness

Experiential and functional design can be incremental, implying only minor improvements to existing design, or innovative, meaning a substantial departure from what a firm has done before. Design emphasis tends to contribute more to performance when experiential design or functional design is more innovative. There were many effects, too many to show all of them, but one example is shown in Figure 5. Here we see that the line for high experiential design innovativeness has a stronger positive slope than the line for low experiential innovativeness. Adopting a more innovative strategy is likely to raise the costs of product development. Nevertheless, our findings suggest that when experiential or functional innovativeness are combined with emphasis on experiential design, financial performance is improved. The practical implications are that firms should encourage and foster innovative experiential and functional design even if there are associated costs, particularly in projects that emphasize experiential design. In doing this, they are likely to achieve improved financial performance

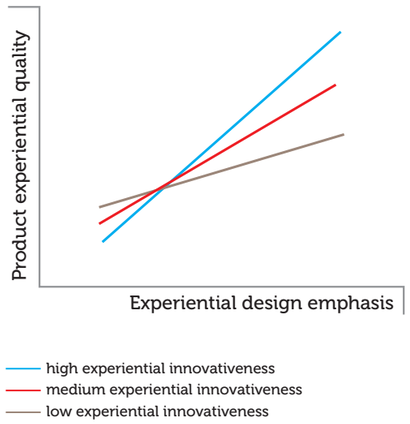


Figure 5: Example of the effect of design innovativeness.

designer influence and designer freedom

Designers involved in new product development can have varying degrees of influence on project decision making and varying degrees of freedom to pursue ideas outside the scope of the project at hand. The effects of designer influence on the relationships between experiential and functional design emphasis and performance outcomes were negligible.

When we consider the combination of designer freedom and emphasis on experiential design, functional design or packaging, we get some interesting findings.

The greater the extent to which designers are given freedom to pursue ideas outside the scope of the project, the stronger is the positive influence of experiential design emphasis on product experiential quality, as shown in Figure 6. No effects were found on functional quality or financial performance.

Allowing freedom for designers is likely to bring with it additional costs since designers are likely to spend time and resources pursuing ideas that fall outside the project scope. However, product experiential quality is positively influenced by designer freedom, which suggests that there are short-term benefits. Long-term benefits may also result, since allowing designers to pursue ideas outside the scope of the project at hand may lead to new opportunities being identified that can be implemented in later development projects.

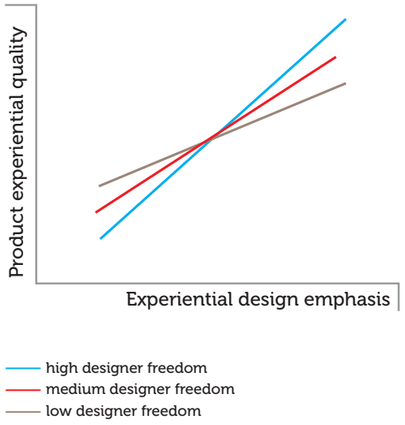


Figure 6: Effect of designer freedom on the relationship between experiential design emphasis and product experiential quality.

Recall the negative relationship between project packaging emphasis and experiential quality shown in Figure 4. When combined with designer freedom, this negative influence of packaging emphasis is substantially decreased. In Figure 7, we see that the line for high designer freedom are almost flat, meaning there is little or no negative effect. In the earlier discussion, we hypothesized that there might be a trade-off between experiential emphasis and packaging emphasis, probably due at least in part to the utilitarian nature of packaging. Here we see that if designers have a high level of freedom the trade-off seems to be diminished.

Designer influence is a measure of the degree to which designers influence decision making in all stages of the new product development process, including the idea phase, the development phase and the commercialization phase.

Designer freedom is a measure of the extent to which designers are provided the freedom and resources to pursue ideas that fall outside the scope of the project at hand.

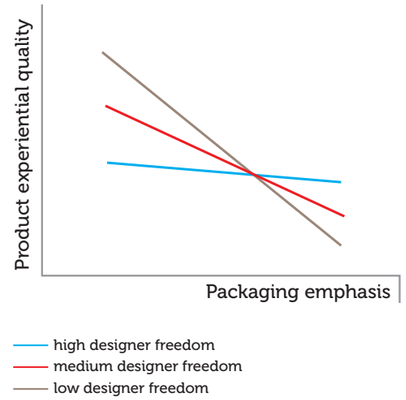


Figure 7: Effect of designer freedom on the relationship between packaging emphasis and product experiential quality.

Impact of customer involvement

Sometimes customers are involved in new product development. Customers can participate in defining the needs for new products and in the actual development and testing at various stages of implementation.

Somewhat surprisingly, the combination of customer involvement and high emphasis on experiential design weakens the effect of experiential design on experiential quality, as shown in Figure 8. The effect is positive for both high and low levels of customer involvement, but the slope in Figure 8 is steeper for low levels of customer involvement. A possible explanation is that if customers are involved in product development they are likely to focus on what they already know, and will have a preference for what is tried-and-true. Designers are likely to choose more novel designs. Thus, a conflict of interests may emerge between customers and designers, leading to decreased experiential quality.

Customer involvement is the extent to which customers participated directly in product development, were asked to try out what had already been developed (e.g. prototypes) and the extent to which product development incorporated direct observation of customers or users .

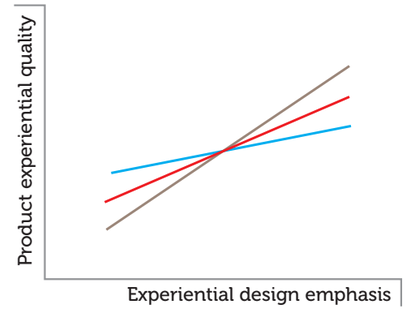
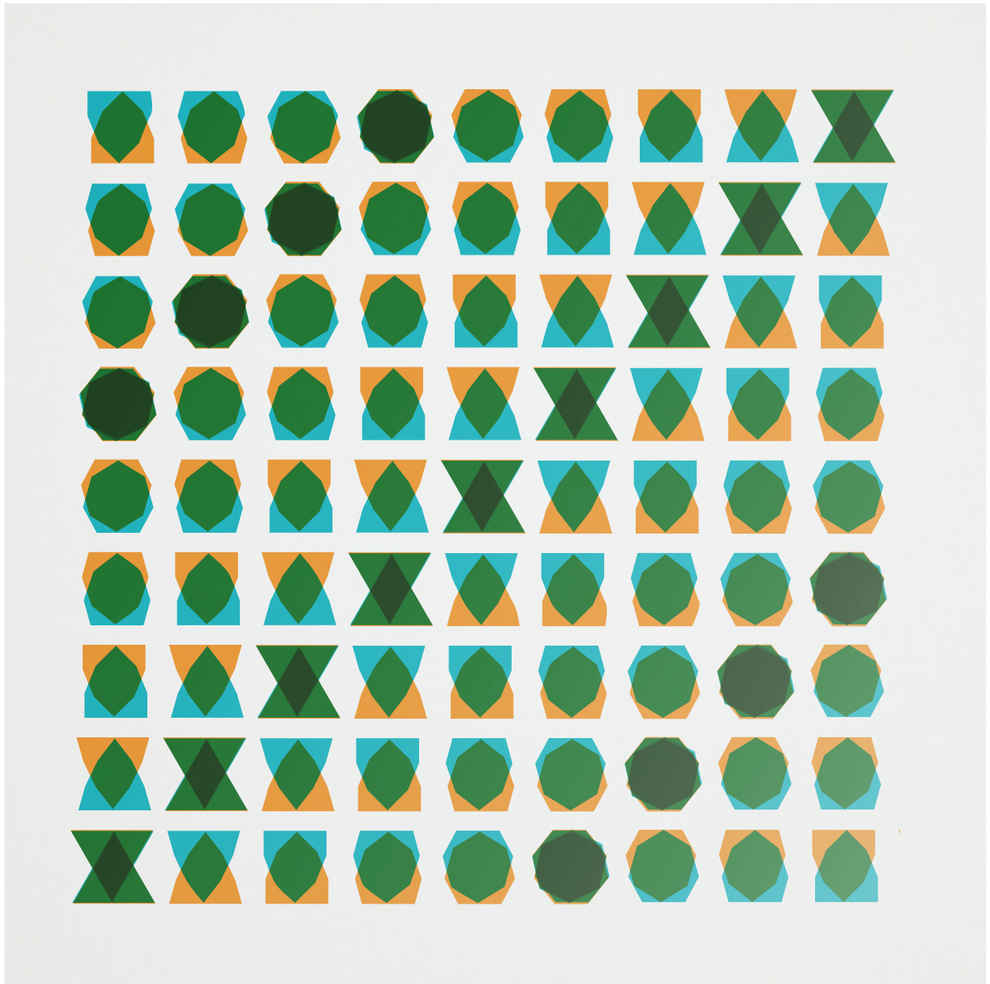


Figure 8: Effect of customer involvement on the relationship between experiential design emphasis and product experiential quality.

Design in corporate visual identity and website development



Marketing managers were asked about the make-up of the teams involved in web site development and in corporate visual identity development. They provided specific information about the number of team members who were designers. Designer involvement in web site development and corporate visual identity development was calculated by dividing the total number of designers involved in each of these efforts by the total number of employees involved.

Summary statistics for designer involvement in web site development and corporate visual identity development are shown in Table 5. The proportion of these projects involving at least one designer is large (91–92%) as well as the proportion of these projects in which external design firms were used (82–85%). This indicates that firms tend to view web sites and corporate visual identity as something that designers should be involved in developing. However, the development teams also involved persons who were not designers. The average proportion of team members who were designers was 64% for corporate visual identity and 66% for web sites and, thus, 36% and 34%, respectively, were non-designers.

Two master's students evaluated the firm image of each of the participating firms based on an examination of their web sites. They indicated the degree to which they thought each firm was socially responsible, emotionally appealing, sold good products and services, had a clear vision and good leadership, was financially successful and was a good employer based on their examination of the firms' web sites.

Firm image is the degree to which a firm is perceived to be socially responsible, emotionally appealing, sell good products and services, have a clear vision and good leadership, be financially successful and a good employer

	Proportion of projects
Web site development projects in which at least one designer was involved	92%
If at least one designer involved:	
Average number of designers on project as a proportion of total team size	66%
Web site development projects in which external design firms were used	82%
Corporate visual identity development projects in which at least one designer was involved	91%
If at least one designer involved:	
Average number of designers on project as a proportion of total team size	64%
Corporate visual identity development projects in which external design firms were used	85%

Table 5: Summary statistics for designer involvement in web site and corporate visual identity development.

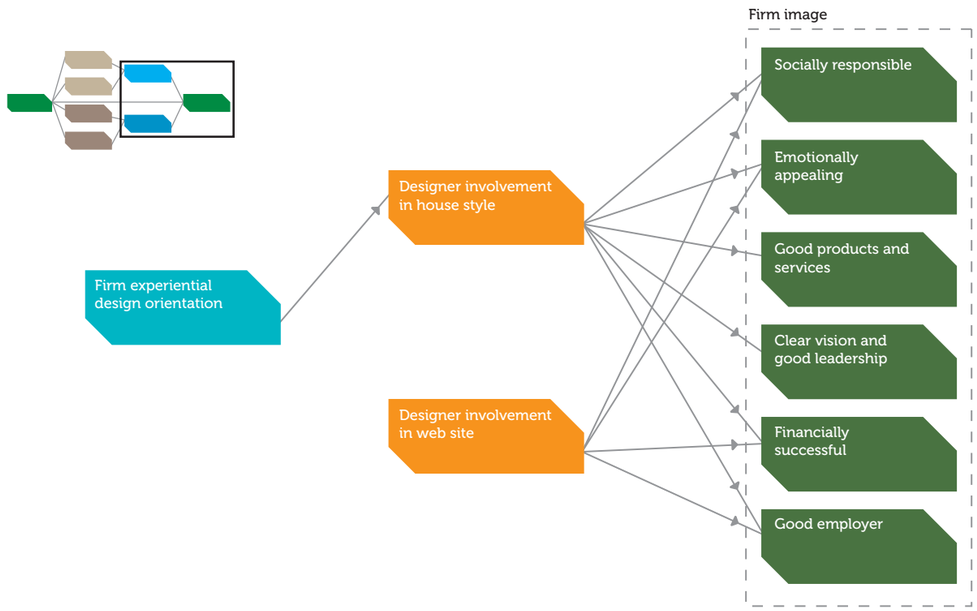


Figure 9: Relationships between designer involvement in web site development and corporate visual identity and firm image.

As shown in Figure 9, the greater the involvement of designers in both web site development and corporate visual identity development, the better the outcome in terms of how the firm was perceived Designer involvement in house style development was positively related with all perceptions of the firm. Designer involvement in web style development was positively related with perceptions of social responsibility, emotional appeal, financial success and the impression that a firm was a good employer. Designer involvement in web style development was not found to contribute directly to the impression that a firm sold good products or services or that it had a clear vision and good leadership.

Figure 9 also shows the relationships between firm experiential design orientation and designer involvement in corporate visual identity. Interestingly, there was no statistically significant relationship between a firm's experiential design orientation and designer involvement in its web site design. This may reflect the fact that web site development is often driven by a firm's IT department rather than being based on overall firm strategy. Firm functional orientation was not related to designer involvement in corporate visual identity or web sites, and so is not shown in Figure 9.

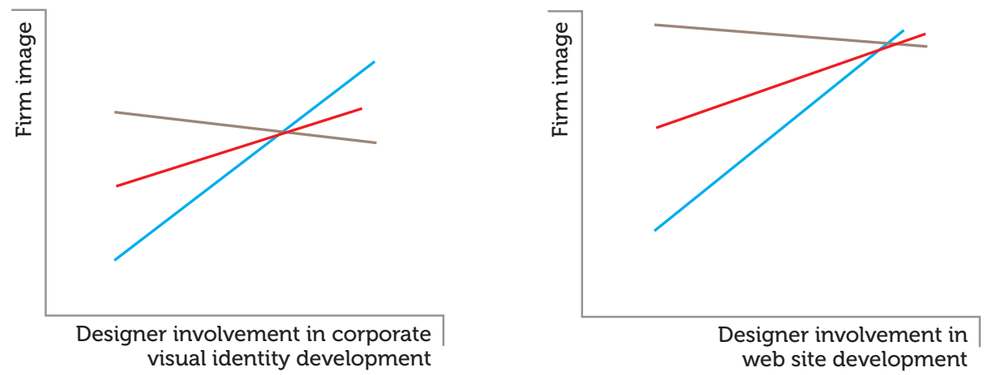


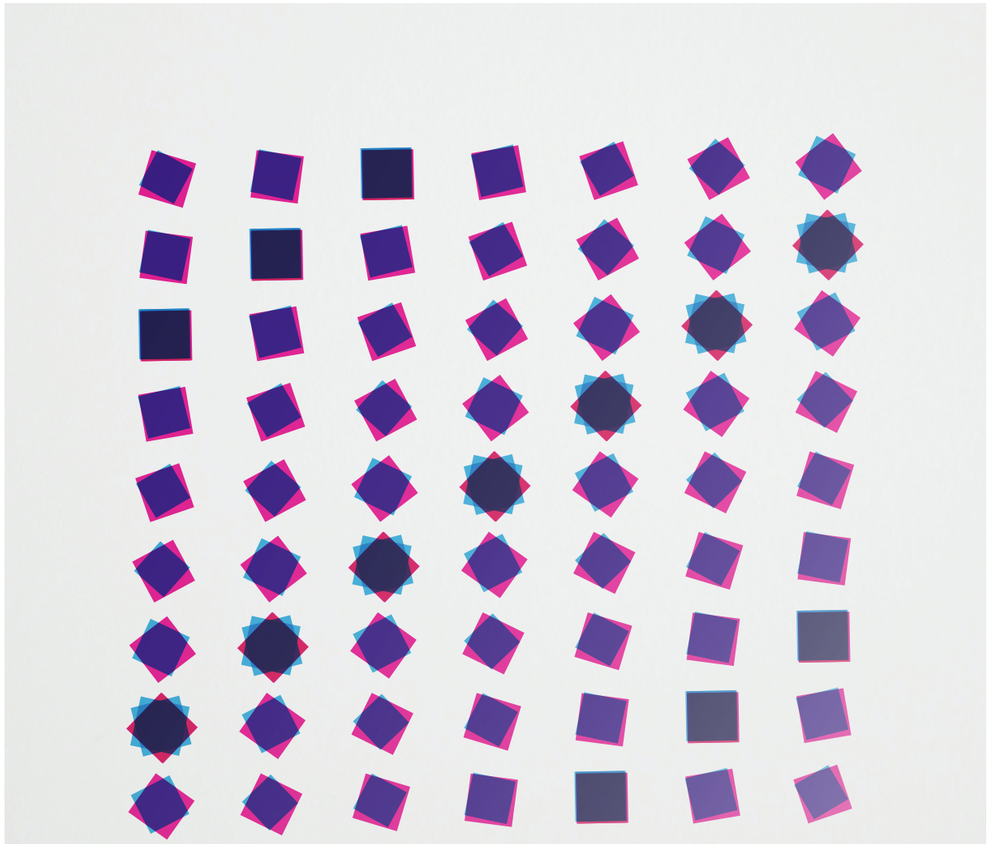
Figure 10: Effect of firm experiential innovativeness on the relationships between designer involvement in the development of web sites or corporate visual identity and firm image

Conditions for improved firm image performance

The relationships between designer involvement in web sites and corporate visual identity and firm image were both affected positively by firm experiential innovativeness. When firm experiential innovativeness is high, designer involvement has a positive effect on firm image, but when experiential innovativeness is low the effect is negligible. This suggests that firm image will benefit more from designer involvement in web site development and corporate visual identity development if a firm adopts an innovative strategy to experiential design (see Figure 10).

Designer freedom did not significantly affect the relationships, which indicates that designer freedom to explore ideas outside the scope of the current web site or corporate visual identity activity at hand will not result in improved firm image.

Design and firm performance



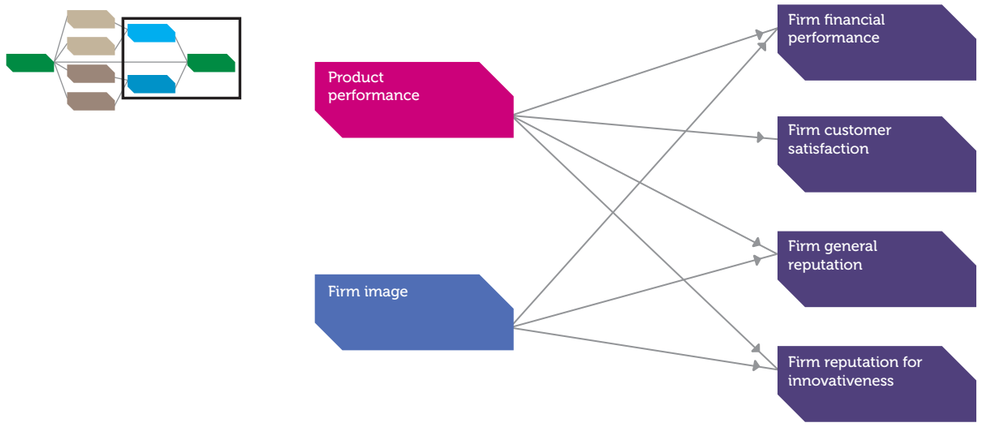


Figure 11: Relationships between product performance and firm image and measures of firm performance.

The business manager survey included several questions to measure firm performance. Four performance factors were identified: firm financial performance, customer satisfaction, general firm reputation and firm reputation for innovativeness. The relationships between these performance measures and the project performance level of Figure 1 are shown in Figure 11.

Figure 11 clearly shows that product performance and firm image have positive effects on the various aspects of firm performance. A multitude of factors influence firm performance, both internal and external to the firm. Furthermore, the performance of one product may not be replicated for all of a firm's products. So what we see in Figure 11 is an indication of a general trend between product performance and firm performance that may not hold for all products. Likewise, the firm image shown in Figure 11 is based on only one expression, namely that of firm web sites.

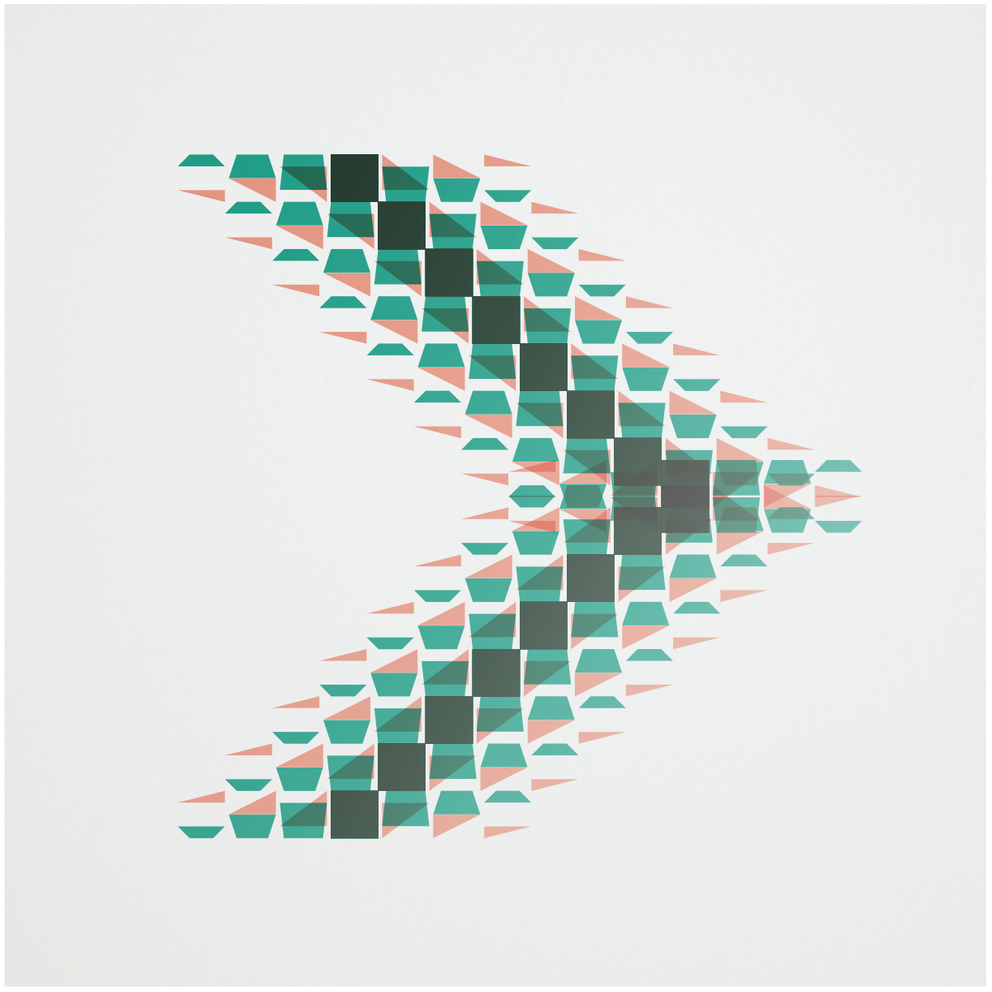
Firm financial performance is a measure of how well the firm has performed compared with competitors in terms of increasing sales, profitability, return on investments, return on sales and reaching financial goals.

Firm customer satisfaction is a measure of how well the firm has performed compared with competitors in terms of customer satisfaction, delivering value to customers, delivering what customers want and customer retention.

Firm general reputation is a measure of the degree to which a firm is trusted, and is viewed as a preferred employer, as socially responsible, as a preferred supplier and as a good investment option.

Firm reputation for innovativeness is a measure of the degree to which the firm is viewed as highly innovative.

Conclusion



This report covers research conducted in a large sample of Dutch firms to explore the effectiveness of design. The overarching conclusion of the research is that design emphasis and designer involvement in firm activities are likely to result in improved performance at both the project level (product/service development, web site development, corporate visual identity development) and at the overall firm level. This is likely to be affected in various ways by other key factors such as design innovativeness, designer freedom and customer involvement. Therefore, it is important to take a comprehensive view, in which such factors are taken into account, when making decisions about design emphasis and designer involvement to ensure the best possible outcome.

The main practical implications of this research are listed in Table 6.

Involving designers in new product development leads to greater emphasis on experiential and functional design
Emphasis on experiential and functional design leads to improved new product performance
Particularly if:
Designers are given a high degree of freedom to explore ideas outside the project scope
Experiential design is innovative
Functional design is innovative
Customer involvement is limited
Involving designers in web site development and corporate visual identity development leads to improved firm image
Particularly if:
Experiential design is innovative

Table 6: Summary of practical implications.

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