Selective Preference in Visual Design: A Case Study of Cover Designs of Industrial Design Magazine

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Abstract. The cover designs of professional magazines can reflect trends in visual design. Based on the cover designs of 27 issues of "Industrial Design" magazine from 1967 to 1974, the purpose of this study is to study how people recognize cover designs which purposely reflect Taiwan's design development and visual design trends. In particular the study explores the empirical selective preference of "Industrial Design" magazine's cover design and how matches between the designer's intension and user's preference support the assumption that visual design trend exists in these cover designs. In this study, the stimulus materials are cover designs as an "encoding" process, and the subjects are viewers as a "decoding" process, both of which draw on the visual significance of the cover design in terms of "Creativity in Layout" and "Balance in Proportion." Results showed that the selective preference of viewers differs with age, gender and education background. This study also purposes an approach of using MDS analysis to understand user perceptions and demonstrate that the results are worthy of further study.

Keywords: Visual design · User perception · Industrial Design Magazine · Taiwan design development

1 Introduction

Social communication (e.g. networking) is a relatively new term that has emerged over the last decade. It may appear to be a new concept that is a regrouping of the previously known concepts of social interaction, communication and language [5, 7, 9, 17, 18, 26, 30]. In this study, visual design was viewed as a form of social communication [1]. What is the point of visual design? Is it graphic design or is it art? What purpose does it serve in our society and culture? After studying how meaning and identity are at the core of every visual design definition, this study argues that the role and function of visual design is social communication [1, 6, 29, 35, 36].

Recently, social communication has received increased attention from the academic and business communities [17]. Both academics and practitioners emphasized that social communication in relationship development relates not only to the human community, but also to aspects such as business, management, arts, and even in different fields of therapy [7, 18, 26, 34]. Since social communication is constantly alert to the spoken and written appearance of novel words, the question presents itself: How did they miss visual design? How is it that the words denoting them and the work they produce are not included in a form of design work? Based on the communication and semiotic theory, this study argues that visual design should be approached semiologically and treated as a semiotic language rather than a form of art [1, 10–12, 27, 28].

The study analyzed how the meaning of visual design is constructed and communicated, and explains how visual design relates to construction of meaning by the designer and reproduction of meaning by the viewer [32–34], taking examples from advertising, magazines, illustration, website design, comics, greetings cards and packaging. Visual design as social communication looks at the ways in which visual design contributes to the formation of social and cultural identities, discussing the ways in which age, gender and education groups are represented in visual design, as well as how images and texts communicate with different cultural groups [1, 35, 36].

This study is carried out to test the hypothesis that subjects prefer a specific visual appearance of "Industrial Design (ID)" magazine cover design. It explores how visual design relates to both culture and human society, and investigates visual design as an integral part of our society and culture, which needs to be studied, acknowledged and understood as art is.

2 Background

2.1 A Research Framework for Visual Design as Communication

After examining a range of communication theoretical approaches, including those of Shannon and Weaver [31], Lasswell [16], Barthes [2], Derrida and Foucault [3], Lin et al. [22] a research framework combining communication theory with semiology and mental models was proposed to explore the issue of visual design (e.g. graphic, painting) as communication. In Lin's research framework, three levels of problems are identified in the study of communication: technical, semantic, and effectiveness. Jakobson's [15] communication model of six constitutive factors with six functions are included in the framework. The six constitutive factors are as follows: addresser, addressee, context, message, contact, and code. Each of these factors determines a different function in each act of communication: emotive, conative, referential, poetic, phatic, and metalingual [8, 15]. In addition, Norman's [24, 25] conceptual model that proposed three levels of design processing—visceral, behavioral, and reflective design - was also taken into account. Thus, to explore the issue of visual design as communication, communication theory should be combined with mental models. Based on previous studies [22], a research framework was proposed to explore the issue of visual design as social communication as shown in Fig. 1.
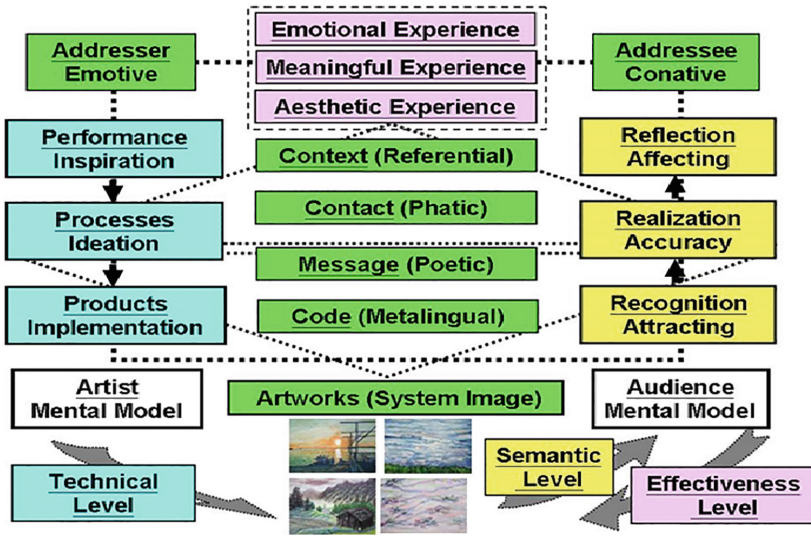
Fig. 1. A framework for social communication research [19]

For social communication, the artist goes through three key stages to express significance through his or her artworks: performance (inspiration), process (ideation), and product (implementation). For the viewer, there are three key steps to understanding the meaning of an artwork: recognition (attracting), realization (accuracy), and reflection (affecting). Recognition requires letting the viewer receive a message through perception in which the viewer can accurately receive a message through the artwork. The degree of realization measures how accurately the transmitted message expresses the desired meaning. Reflection concerns the ways in which the viewer's actions are influenced, thus showing how effectively the message affects conduct in the expected way [4, 19].

2.2   Taiwan Design Development

The evolution of Taiwan design development is a process of adaptive design, specifically a fusion of Dechnology (Design-Technology) and Humart (Humanity-Art). Taiwan design development is a fusion of Dechnology and Humart which could be represented as a smile curve as shown in Fig. 2 [23], from OEM (Original Equipment Manufacturer), ODM (Original Design Manufacture), to OBM (Original Brand Manufacture). The three stages also reflect the tendency of Taiwan craft and product design development, from "use" to "user", from "function" to "feeling", and from "hi-tech" to "hi-touch". Lin's study [23] is intended to explore the relationship between product designs (dechnology) and craft design (humart) which were merged into Taiwan design development. However, we now live in a small world with a large global market. While the market heads toward "globalization", design tends toward "localization" so we must "think globally" for the market, but "act locally" for design.
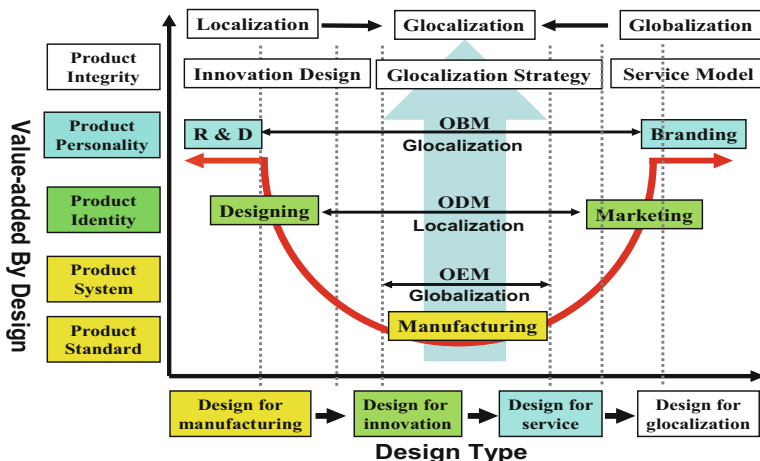
Fig. 2. Briefing diagram of Taiwan design development [23]

2.3 Industrial Design Magazine

Alongside the development of Taiwan design, the ID magazine has been published for over half a century. It is the first design related professional magazine that focused on Taiwan design development and documents completely and comprehensively the development of Taiwan's design and related subjects. ID magazine is the only publication among all the academic publications which focuses on the design field, obviously its influence on the development of Taiwan design has been significant. The first issue of ID magazine was published in December 1967; after publication of issue No. 27 on July 1974, it was suspended until January 1980. Issue No. 136 was published on July 2017 to celebrate the magazine's 50th anniversary as shown in Fig. 3. The front cover designs reflected Taiwan's design development; for example, from social development, technique advancement, and technological influence to international design interaction. Therefore, the cover designs of ID magazine were selected as examples in this study, some of which are shown in Fig. 4.

Fig. 3. Three main issues of ID cover designs magazine

Fig. 4. Some cover designs of ID magazine

3   Method

This study was designed to take into account the nature of visual design as a social communication issue, resistance to evaluating cover design and the context of visual design. It involved literature reviews, derivation of the cover design groups, and validation on cover designs according to the following steps [22]:

(a) A review of current literatures for visual design as communication and graphic design.
(b) Exploration of the nature of visual design as communication and grouping the cover design.
(c) Development of an evaluation framework for assessing the magazine of cover designs.
(d) Discussion for developing the framework and evaluation of cover design as communication.
(e) Conclusion of visual design as communication by evaluating cover designs.

Three different sessions were used as shown in Fig. 5. Session 1 conducted a literature review and established a research framework. In Session 2, a pilot study of evaluating "Industrial Design" magazine cover designs was conducted to group the stimulus and test the utility of the framework shown in Fig. 1. Then, a rating approach was used to evaluate cover designs with a questionnaire via website in Session 3. Multivariate data and protocol analysis were applied to study the visual design as social communication and the results of evaluating "Industrial Design" magazine cover designs were explored [4, 19].
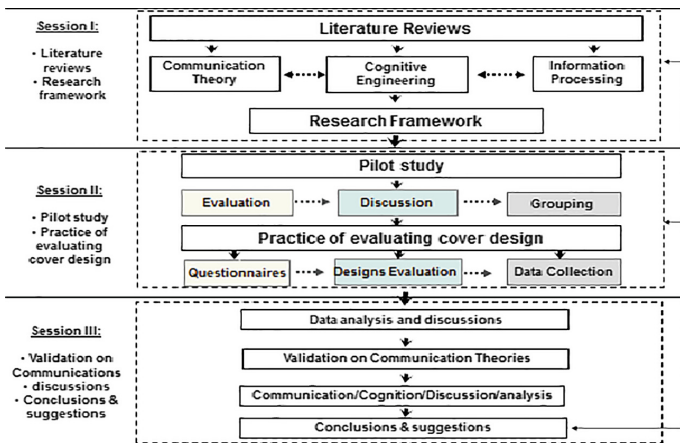

Fig. 5. Research framework for this study

3.1   Pilot Study for Identifying the Stimuli

The pilot study involved using questionnaires and interviews to identify the category of "Industrial Design Magazine" cover designs for evaluation. Cover designs from 27 issues of IDM served as the stimuli and were arranged randomly as shown at the left of Fig. 6. Forty professional designers and experts in visual design served as the subjects and were asked to group 27 issues of cover design into three categories then feedback on the reason why. The data provided by these 40 experts was collected and analyzed identifying three categories namely, graphic design, local feature and product design as shown at the right of Fig. 6. By analyzing the results from each category that reflected the changes in design which and utilized the design elements for the Taiwan design development in 1960s, the three categories of 27 cover designs were used as the stimuli for questionnaire interview.
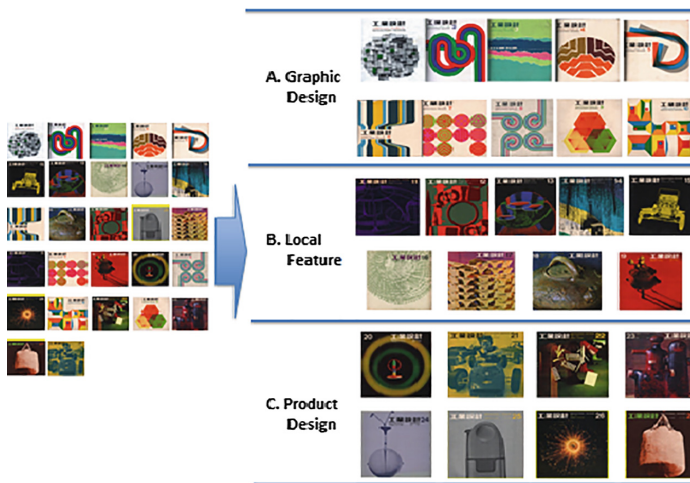

Fig. 6. The three categories of stimuli for 27 cover designs

3.2   Participants

All the study participants were from the web community (e.g. FB, LINE) in Taiwan. There was a total of 490 participants of whom 259/53% were male and (231/47%) female; ages of under 20 (193/39%), 21–45 (139/28%), 46–60 (102/21%) and 61–65+ (56/12%); backgrounds design-related (195/40%), engineering-related (58/12%), business-related (60/12%) and others (177/36%); education backgrounds undergraduate (142/28.98%), graduate (161/32.86%), and other (187/38.16%). The participants were told the purpose of the study and were then asked to select their preference based on their understanding of content of each cover design based on the questions.

3.3   Procedure

This study was conducted on the internet. Social network groups were invited to participate as subjects and those who agreed were instructed to follow the experimental procedure [22]. On the website, the purpose of the experiment was explained to the subjects and the 27 issues of ID cover designs in three categories were presented. The subjects were then asked to identify the total image of the ID cover designs and then rate them with the following five questions:

1. Please identify which best fits the concept "Harmony in Color" for the cover design?
2. Please identify which best fits the concept "Creativity in Layout" for the cover design?
3. Please identify which best fits the concept "Balance in Proportion" for the cover design?
4. Please identify which best fits the concept "Overall in Design" for the cover design?
5. Please identify which cover design do they most prefer?

The 27 issues of ID Magazine cover designs together with the questionnaire were published on the website: https://docs.google.com/forms/d/1YVgOIPbJy9hZttrZauXOF-HA-rzoIsACj1QghsFI3_s/edit?ts=5bcdd7ba

Typically, each subject completed the experiment within 5 min.

4   Results and Discussion

4.1   The Distribution of Selective Preference

Results from experiments indicate that it is possible to draw conclusions regarding the cover designs from data such as those obtained [14, 36]. The distribution of responses to 27 issues of cover design by gender, age, education and background were summarized and analyzed. In order to understand visual design, many studies have proposed the key factors related to the graphic design principles such as color, layout, proportion, balance, rhythm etc. In this study, the participants were asked to select the most fitness of "Harmony in Color", "Creativity in Layout", "Balance in Proportion" and "Overall in Design", then select their most preferred cover design. Taken gender as an example, Fig. 7 summarized the distribution of all participants' responses to the 27 cover designs.
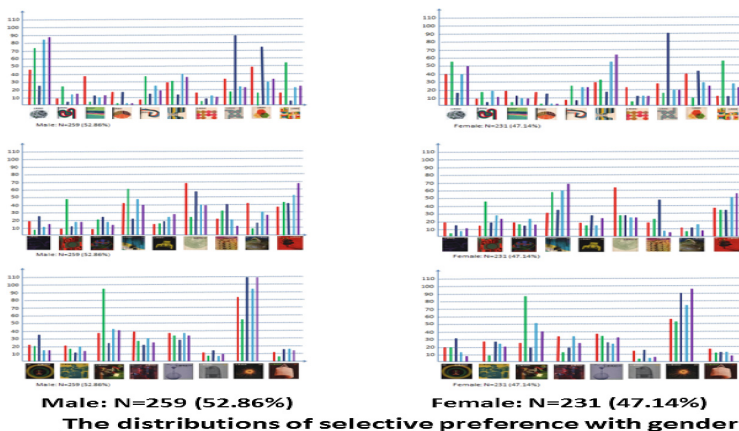
Male: N=259 (52.86%)   **Female: N=231 (47.14%)**
The distributions of selective preference with gender

Fig. 7. The three categories of stimuli for 27 cover designs (Color figure online)

Table 1 summarized the first three and the last three rank issues of cover design for the male subjects, while Table 2 is for the female subjects. In the Table 1, "Q1–5" represents the five questions and 26(32%) in second column indicates that the cover design of issue no. 26 issue was preferred by 32% respondents. The information of Table 2 is the same as Table 1.

A stepwise multiple regression analysis was used to establish the regression model of the most preferred cover design. The results are as follows:

$$\text{The most preferred (male)} = -\,0.010 - 0.060 * \text{f1 (Harmony in Color)} - 0.059 * \text{f2}$$
$$\text{(Creativity in Layout)} + 0.051 * \text{f3 (Balance in Proportion)} +$$
$$1.153 * \text{f4 (Overall in Design)} \tag{1}$$
$$R2 = 0.961, \ p < 0.001$$

$$\text{The most preferred (female)} = -\,0.033 - 0.159 * \text{f1 (Harmony in Color)} - 0.068 * \text{f2}$$
$$\text{(Creativity in Layout)} + 0.043 * \text{f3 (Balance in Proportion)} +$$
$$1.164 * \text{f4 (Overall in Design)} \tag{2}$$
$$R2 = 0.930, \ p < 0.001$$

The model showed that "Harmony in Color" and "Creativity in Layout" had a negative correlation to the most preferred, while "Balance in Proportion" was slightly linked to the most preferred; so the most preferred of cover design was mainly affected by the overall in design rating. The higher the "overall in design" rating was, the higher the most preferred was.

Table 1. Summary of ranking data for male

Male	Rank no. 1	Rank no. 2	Rank no. 3	......	Rank no. 25	Rank no. 26	Rank no. 27
Q1	26 (32%)	16 (26%)	09 (19%)	....	02 (4%)	13 (3%)	05 (3%)
Q2	22 (37%)	01 (28%)	14 (24%)	....	25 (3%)	03 (2%)	27 (2%)
Q3	26 (42%)	08 (34%)	09 (28%)	....	03 (4%)	07 (3.5%)	02 (1%)
Q4	26 (37%)	01 (32%)	19 (20%)	....	03 (4%)	25 (3.1%)	04 (0.1%)
Q5	26 (42%)	01 (34%)	22 (16%)	....	17 (4.2%)	07 (3.9%)	04 (0.4%)

Table 2. Summary of ranking data for female

Female	Rank no. 1	Rank no. 2	Rank no. 3	......	Rank no. 25	Rank no. 26	Rank no. 27
Q1	16 (27%)	26 (24%)	01 (17%)	....	18 (5%)	02 (4%)	05 (3%)
Q2	22 (38%)	14 (25%)	01 (24%)	....	18 (3%)	07 (2%)	04 (0.4%)
Q3	08 (39%)	26 (35%)	09 (19%)	....	07 (5.2%)	18 (4.8%)	02 (3%)
Q4	26 (32%)	14 (26%)	22 (22%)	....	07 (6%)	03 (4%)	04 (0.4%)
Q5	26 (41%)	14 (30%)	01 (21%)	....	18 (4%)	25 (3%)	04 (0.4%)

4.2 Discussions

In this study, the selective preference data were subjected to the MDPREF procedure, and a cognitive space was constructed [13, 20, 21]. The purpose of MDPREF analysis is to transform the selective preference data into a multidimensional configuration. How well the configuration fits the real differences of paired objects depends on the stresses and dimensions. The higher the number of dimensions is, the lower the stress is and the better the configuration fits the preference of the stimulus. The stress values of two-dimensional configurations are .678 and .224 for the male subjects, and .664 and .208 for the female subjects, respectively. The stress values indicate that the two-dimensional space seemed most appropriate for the preference data. The locations of 27 cover designs on the plane defined by the dimensions 1 and 2 are plotted in Fig. 8 for the male subjects, and Fig. 8 for the female subjects [13, 20, 21].

In Figs. 8 and 9 the distance between any two plotted points (cover designs) can be interpreted as an indicator of similarity or dissimilarity. The projections of 27 cover designs aligned to the five questions (attributes) are shown in Figs. 10 (male subjects) and 11 (female subjects) ranked according to the first three and the last three. The features for grouping cover designs together can be used to interpret the meanings of dimensions [20, 21].
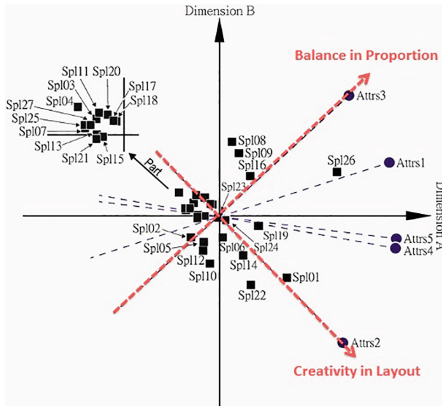
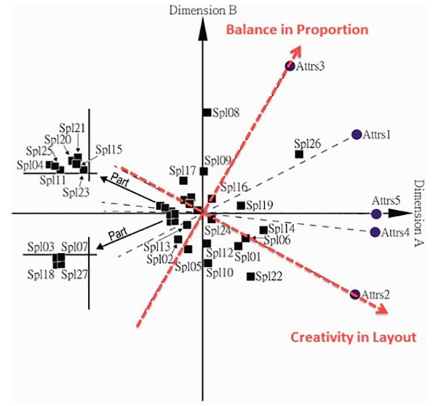**Fig. 8.** The cognitive space of male subjects

Fig. 9. The cognitive space of female subjects

Fig. 10. Projections of ranking data for males

Fig. 11. Projections of ranking data for females

The meanings of dimensions also can be interpreted directly according to the relationship of attributes in the cognitive space. The dimensions can be interpreted by attaching the attributes' transformed vectors to the cognitive space more objectively through MDPREF analysis. For example, the correlation between the "Balance in Proportion" and "Creativity in Layout" is .0736 corresponding to an angle of 86° [20, 21]. Thus, the vectors of "Balance in Proportion" and "Creativity in Layout" can be represented as a two-dimension cognitive space as shown in the Figs. 7 and 8 for male and female subjects respectively. However, the correlation between "overall in design" and "the most preferred" is .978 and .957 for the male subjects and female subjects which means that the two attributes are almost the same. Therefore, another stepwise multiple regression analysis was used to establish the regression model's "overall in design" for the selective preference of cover design. The results are as follows:

$$\text{Overall in Design (male)} = -.017 + 0.623 * f1 \text{ (Harmony in Color)}$$
$$-0.455 * f2 \text{(Creativity in Layout)}$$
$$+0.075 * f3 \text{ (Balance in Proportion)} \qquad (3)$$

$$R2 = 0.786, \ p < 0.001$$

$$\text{Overall in Design (female)} = -0.009 + 0.451 * f1 \text{ (Harmony in Color)}$$
$$+0.539 * f2 \text{ (Creativity in Layout)}$$
$$+0.092 * f3 \text{ (Balance in Proportion)} \qquad (4)$$

$$R2 = 0.734, \ p < 0.001$$

The model shows that the "Harmony in Color" and "Creativity in Layout" were the key attributes for the overall in design while "Balance in Proportion" had a slight effect on "Overall in Design". The previous result showed that the most preferred by the subject's selective preference was mainly affected by the "Overall in Design". The "overall in design" rating depends on the visual design principle of "Harmony in Color", "Creativity in Layout" and "Balance in Proportion", thus the visual design principles play an important role in the preference in cover design [14, 20, 21].

Based on the MDPREF analyses, the two-dimensional cognitive space can be interpreted as follows: the first dimension can be represented as "Creativity in Layout" and the second dimension which focuses on balance is a scale of "Balance in Proportion." The MDS analysis used in this study is only the first step in testing the utility of MDS as an approach for understanding the cognition of users' selective preference in cover design. Further studies are needed [20, 21].

5   Conclusion and Suggestion

Along with the rapid growth and development in information technology and multimedia, the question of whether the traditional visual design principles will change or not is an issue worthy of in-depth study.

Therefore, this case study of comparisons between the cover design intentions and viewer's preferences are purposely a reflection of visual design trend. An approach was proposed that applies some techniques of Multidimensional Scaling to study the cover designs of ID magazine from 1967 to 1974. The methods of this study included pilot study, expert interview, questionnaire and Multidimensional Scaling to analyze the visual features of ID magazine's cover design in order to understand the visual design trend. Results from the experiments indicate that a two-dimensional cognitive space of exploring cover design was configured. Two key factors "Creativity in Layout" and "Balance in Proportion" which affect the cover designs are identified and discussed.

Throughout this study, the totality of graphic language and its specifically graphic variables are emphasized. Although this study may appear to be subjective theoretically, it is suggested that the MDS approach will be validated by more testing and evaluation of cover design and exploring the visual design trend in the further study.

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