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# COMMUNICATIVE AFFORDANCE OF INDUSTRIAL DESIGN SKETCHING

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**ABSTRACT**
Design sketching, as a key designing technique and a rapid visual demonstration of design thinking, reasoning, and exploration, is being vastly utilized by industrial designers to communicate their thoughts and ideas about a design situation. Despite the significance of communicative aspects of sketching to a wide range of creative design activities and in particular, to the product design processes, it is not yet a well-instructed activity. It is argued that one aspect of the ambiguity associated with sketching is related to the absence of human figures of the intended user(s) interacting with the product. Our observations suggest that sketches being generated by the vast majority of industrial design students in Iran are not communicative to the extent they should. As a result, the communicative aspect cannot be fulfilled. In this paper, the affordance of sketches is examined based on their communicative features with a particular focus on using human elements. The paper concludes by discussing educational factors influencing sketch qualities and potential ways to fix the problem.

*Keywords: Industrial design sketching, communicative affordance of sketching, human elements in sketches*

## 1 INTRODUCTION

Industrial design (ID) has a long tradition of utilizing different kinds of graphical representations such as conceptual sketching and physical demonstrations like clay modelling and prototypes. Freehand design sketching, as a tacit design expertise, a key designing technique and a rapid visual demonstration of design thinking, reasoning, and exploration, is being vastly utilized by skilled industrial designers to communicate designers' thoughts and ideas about a design situation. Suwa and Tversky [1] explain that freehand sketches are important for crystallizing ideas in the very early phases of the design process, namely in putting ideas on paper in the search for promising ideas, new structures, concepts, relations and features. As indicated by Hurst & Hollins [2] and McGown *et al* [3], the earlier stages of the design process, including the concept generation stage, are typified by undefined knowledge  Sketches also provide the designer with access to earlier ideas and stimulate further development of ideas [4-5]. Therefore, sketching, as designers' idea stockpile, can betray its purpose, if they are not communicative at least to their designers. As proposed, utilizing appropriate human elements in sketching can contribute to the improvement of the design process. Galle and Kovács [6] express their hope that studies on sketching in the early stages of the design process provide a clear, overall picture of the design process.

### 1.1 Sketching

Goldschmidt [7] defines "sketching" as an inherently creative process through which new artifacts are brought into existence and argues that drawings are a kind of representation of perceptions, ideas, and images directly held in the mind. The term "sketch," ultimately derived from the Greek word "*schedios"* and as Erlhoff & Marshall [8] define, refers to a quick rough drawing or outline by hand in simple strokes. The focus of sketching is not to provide the viewers or the designer with the precise details of the object drawn, but to depict the essential features of it. Therefore, it is one of the most widely agreed fact that sketching is the quickest, yet the simplest form of visual expression and communication in any design-related discipline, even though styles of sketches may differ between different disciplines [9]. A sketch can also be defined as a "graphical notation", a system structured

into lines, strokes and other marks [10]; however, the concept of graphical representation does not encompass everything a sketch can offer. To say the least, design sketching is the externalization of designers' thoughts [11-13]. Temple [14] explains that design sketches are made for three reasons. All three reasons are of particular interest within the scope of this investigation:

1. To communicate the physical properties of an object generated in the mind;
2. To visually recall an object from memory; and
3. To make a rapid visual demonstration of what is thought.

Accordingly, it is expected that ID students satisfy this requirement, a necessity not often met within the Iranian context of design: the majority of ID students do not have the expertise to produce fully communicative sketches. It appears that ID students produce conceptual sketches as if they want to converse what the product actually is rather than depicting how a user may interact with the product, an approach we wish to call "vitrine or shop window approach" as opposed to "utilization approach" respectively. Figure 1 is an example of a conceptual sketch with the utilization approach, graphically describing a janitor's issues related to rubbish bins and tools being used.

*Figure 1. A sample sketch depicting tools being used by a janitor (Created by Ms Zahra Inanlou; an undergraduate ID student at the University of Art - 2009)*

## 2 THE STUDY

Although sketches are often ill-structured and ambiguous, nevertheless they can worth a thousand words if appropriate level of related elements is utilized in sketching; i.e., taking a more utilization approach. It is evidenced that one aspect of the ambiguity associated with students' sketches is related to the absence of the intended user, interacting with the product. Human elements add reality to the drawings as well as exhibiting the context of use. Since the senior author of this paper is a design lecturer who has been teaching industrial design at different universities in Iran, and for the last two years, has played a role as a member of design juries in some national design competitions where entries are received from almost all industrial design programs in Iran, it is seems fair to say that our observations suggest that sketches generated by the vast majority of ID students in Iran are not communicative to the extent they are desired to be, in terms of the utilization of human elements in sketches. In this paper, the affordance of sketches is examined based on their communicative features with a particular focus on using human elements.

### 2.1 Research method

To investigate the extent to which sketches generated by ID students are communicative, nine master's ID students at the University of Art (UA) were asked to provide the authors with their unbound sketchbooks, generated during a semester-long design studio class, run under the supervision of the senior author of this paper. The purpose of the studio class was for the students to develop a range of innovative solutions for the given design problems. Each student was given a different design problem. Sketches had been merely generated to satisfy the course requirements; that is, students were

not informed that their sketches would be used for this investigation. As a result, the sketches represent the true outcome of the design studio class.
More than 700 pages of sketches were jointly addressed by the authors so as to come up with a limited number of suitable sketches for the examination. More than half of the sketches were of incomplete drawings, and therefore disqualified for the examination. Since the communicative affordance of the remaining sketches (n=300) was different, three categories of sketch affordance were developed, including: “STRONG”, “MODERATE” & “WEAK”. “Strong” refers to sketches which are professionally generated and clearly depict the user’s interaction with the product. The “Moderate” category represents a set of sketches that the user is shown, but it is difficult to identify the interaction happening or the interaction presented is misleading for viewers, considering the designer’s initial thought for the concept. “Week” refers to sketches drawn based on vitrine or shop window approach; that is, either the users are not drawn or the interaction depicted is vague or wrong. All remaining sketches were coded and independently juxtaposed within the three categories in two separate rounds by the authors. Interestingly, both authors could more or less associate 90, 150 and 60 sketches to “strong”, “moderate” and “weak” categories respectively. The insignificant difference was negotiated and resolved between the authors. Paired comparison analysis was then jointly utilized to half the number of sketches within each category. 10% of sketches, better representing the attributes of each category was independently picked and ranked; among which three final commonly-selected concepts were chosen for inclusion in the analysis. Figure 2 exhibits the nine sketches with their respective categories, selected and used in this research.

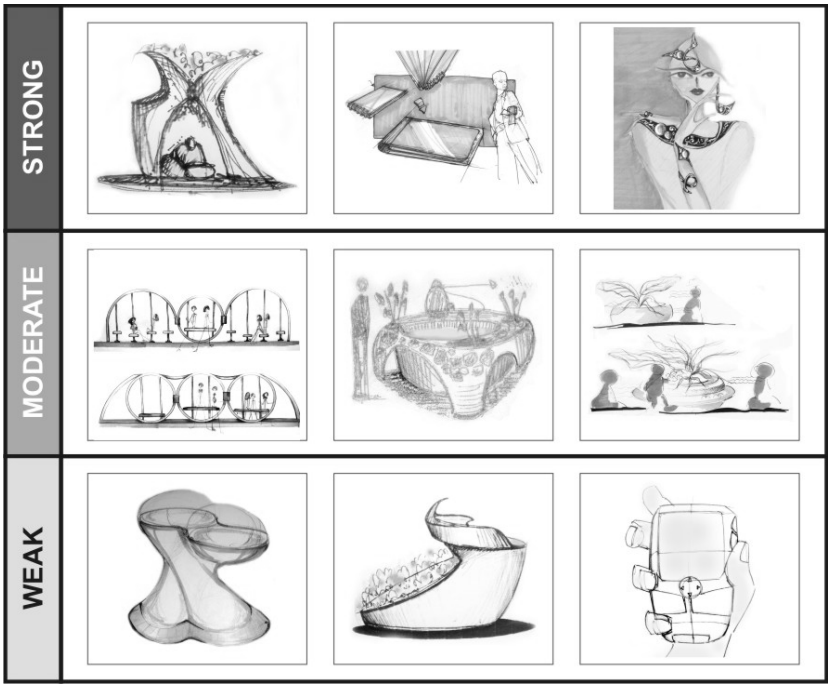


*Figure 2. Sketch categories based on their communicative features*

To investigate the extent to which the sketches can communicate their intended ideas and features, it was decided to ask master’s ID students at two universities to participate in the study. The participating universities were UA and Iran University of Science & Technology (IUST). A total of 14 postgraduate (PG) ID students from both universities (seven each, identically including five female and two male students) participated in two separate 60-minute data collection sessions. Those PG students who provided us with their design sketchbooks were disqualified to participate in this stage of the investigation. Nine A4-sized posters coded from 1 to 9 were created from the nine sketches selected to that effect and pined up to the wall for the students’ perusal at two participating universities. Also, post-study questionnaires were created and administered in each data collection session. The participants were instructed to inspect the posters first, then proceed to complete the questionnaire (Figure 3).

## 2.2 Findings

As discussed, sketching is the major activity in the early idea-generation stage of the design process, supporting the creative process of developing new product concepts. In an attempt to meet the objectives of this study, an investigation was formulated to find out if the inclusion of the related human elements contributes to the communicative aspects of sketching. Findings are discussed in the following paragraphs.


*Figure 3. PG students from UA & IUST, inspecting the posters (left) and responding to the questionnaire (right)*

The participants were asked to indicate their assessment of communicative affordance of sketches by rating the extent to which the nine posters exhibited can communicate what they are, i.e., intended by their designers. For the calculation, the envisaged categories of "strong", "moderate" & "weak" were scored as 3, 2, and 1 respectively. As there were 14 students participated in the study, the maximum score a concept could obtain, equals to 42 (the strongest) and the minimum is 14 (the weakest). The participants' evaluation of communicative aspects of sketches is shown in Figure 4. The lower section of the Figure also exhibits the authors' ranking order for the sketches from the strongest sketch (Poster 1) to the weakest sketch (Poster 9). It is obvious, with one exception (Poster 7), that our initial juxtaposition of sketches was nearly accurate and came in agreement with that of the participants'.

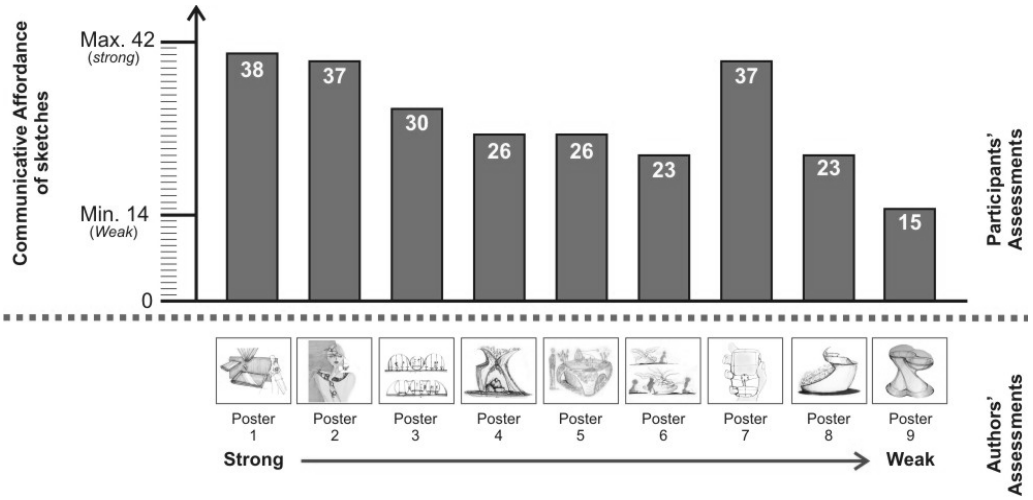


*Figure 4. The participants' & authors' general assessment of the communicative affordance of sketches*

The participants were also asked if they can conjecture what each of the nine sketches actually is. It was envisaged that responses can fall in any categories ranging from “Accurately Identified” to “No or Wrong Identification”. Four categories envisaged were: “Accurately Identified”, “Closely Identified”, “Distantly Identified”, and finally “No or Wrong Identification”. Figure 5 illustrates the results which describe the frequencies at which each concept obtained within each of the four categories mentioned above. Regardless the exceptions discussed in the following paragraphs, there seem to be a fairly strong correlation between the appropriate inclusion of related human elements in sketching and the communicative affordance of the nine concepts. This lends support for the positive effect of human elements integration in sketching.

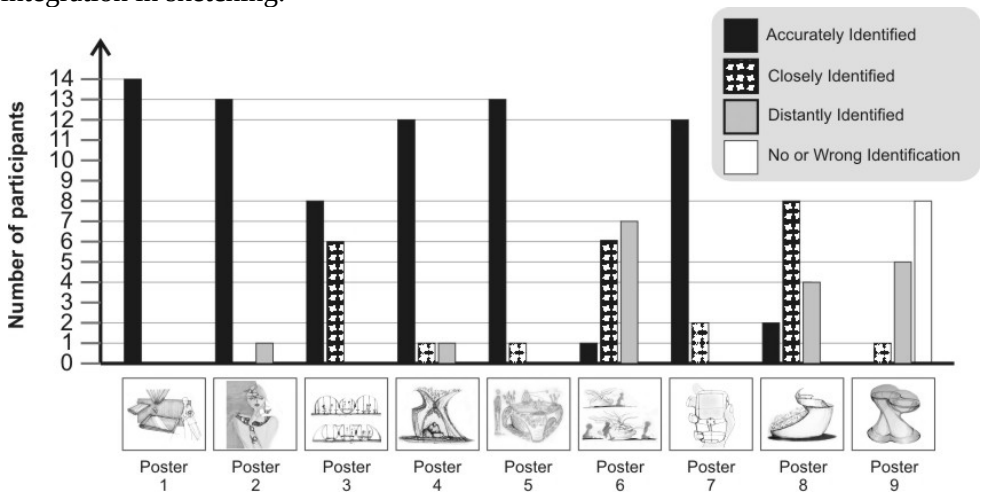


*Figure 5. The frequencies at which each concept obtained within each of the four categories as indicated in the legend*

Sketches can be misleading if inappropriate human elements are integrated into the concept. The findings show that even though there are marked differences between sketches with strong to weak communicative affordance (e.g., Posters 1 & 2 vs. Posters 8 & 9 respectively); however, there are instances where sketches with strong and moderate communicative capability missed to reveal their intended functions and users. For example, Concept 3 (Figure 6a) was originally created by its designer to be used as a bench at one of the campuses of the University of Art; however, due to the utilization of inappropriate human elements, almost 50% of participants conjectured the context of use, as a kindergarten. Also Concept 6 (Figure 6b) which is genuinely intended to be a flowerbox used in a residential unit; however, due to the inaccurate scaling proportion related to the users drawn and the product itself (Users are drawn as if they are kids playing around the flowerbox, whereas they are intended to show members of a family in the context of an apartment), half of the participants could just distantly and mistakenly conjecture the context of use, as a playground.

There are a number of other exceptions to be discussed here; however, as authors are requested to aim at an indicative length of six pages for the full papers, this precludes us to offer an exhaustive evaluation of all exceptions. Also, this brief treatment will suffice for present purpose to make the point that using appropriate human and contextual elements is very crucial to get the message of sketches across.

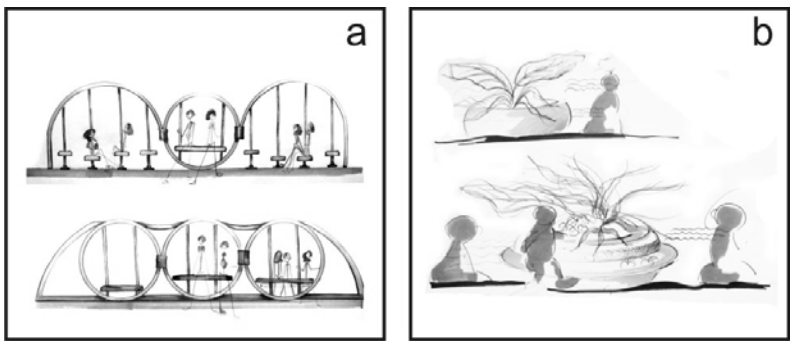


*Figure 6. Product users are inappropriately drawn as if they are kids seating on benches in a kindergarten (a) or playing around a flowerbox in a playground (b).*

## 4 CONCLUSION

The purpose of this paper was to examine if the inclusion of the related human elements contributes to the reflective conversation of sketching. Findings do suggest the lack of proper training that resulted in the creation of less communicative sketches amongst Iranian ID students. Educational factors must be seriously taken into account enabling ID students to generate more communicative sketches, enhancing the communicative qualities of sketches for their own future references or negotiations with others. There are a number of ways to assist ID students generating more communicative sketches:

- Communicative aspects of sketching with respect to the integration of contextual and human elements must be clearly taught and emphasized by design educators;
- Group discussions and sketch criticism must be encouraged and facilitated by design educators to address the elements of sketching effectiveness and ways to enhance the reflective conversation of sketches; and
- Professionalism in sketching for ID students must be mandated and evaluated by design educators.


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