

TAILORING DESIGN DEVELOPMENT AND IDEATION IN CATERING TO INDUSTRY DEMANDS

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ABSTRACT

Design development is one of the processes in the teaching and learning of industrial design. This process is important during the early stage of ideas before continuing to the next design stage. This study was conducted to investigate the comparison between academic syllabus and industry practices whether these processes are highly dependent on the idea generation and interaction related to the designer or to the student itself. The data were gathered through an observation of industry practice during conceptual design phase, teaching and learning process in academic through Video Protocol Analysis (VPA) method and interviews with industry practitioners via structured and unstructured questionnaires. The data were analysed by using NVivo software in order to formulate the results. The findings may possibly contribute to the teaching and learning processes especially in the improvement of industrial design syllabus in order to meet the industry demands.

Keywords: *design development, industrial design, industry demands*

INTRODUCTION

The employability of graduates in Malaysia has slightly increased from the past, which is one percent for both public and private universities, including polytechnics and community colleges (Rahman, 2016). Hence, due to the economic situation, nowadays graduates should have good employability skills parallel with their hard skills and knowledge that they have gained through their studies as part of achieving the employment requirements from of the industry (Ang, 2015; Harvey, 2001). Moreover, individual factors such as behaviour and attitude, the labour market and organisational practice might also affect the employability factor of the graduates (Yusof & Jamalud, 2015). According to Ang (2015), there is a gap between six critical skills among graduates, namely, commercial awareness or knowledge about the business (the most significant gap), self-management, computer literacy, information retrieval, planning, and resolving conflict.

In the creative industry, it is crucial for graduates to fulfill the requirements needed as the industry always relies on highly skilled workers to face workforce challenges. Graduates not only face challenges to meet the requirements of the creative industry but also need to ensure that their skills are relevant (Gilmore & Comunian, 2016; Haukka, 2011). Apart from that, the design process is part of the work that requires graduates to become high skilled workers in order to meet the requirements in the creative industry (Kamarudin & Sajilan, 2013). In addition, individual hard skills such as sketching contribute in resolving the design problem and enhancing the design outcome especially during the design process (Cham & Yang, 2005).

Sketching is a powerful tool and important medium for communication between designers and clients. This intangible activity exists during the design development stages, where the conceptual idea is still at the early phase. Designers suggest sketching as an efficient way to speed up the process of developing ideas in real life. Sketches are useful for designers who work in groups and it has been proven to deliver communication easily and faster for quick briefs and ideas during the activity (Md Hashim, 2015). There are many techniques or steps to produce reliable and informative sketches. Among these techniques, an ideation sketch is one of the useful techniques where designers develop an idea of a conceptual

product, transport and furniture (Martin & Hannington, 2012; van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2013). This type of sketch is mainly produced roughly by designers without considering the details.

This preliminary study identified different skills that contribute to a designer's and the Diploma in Industrial Design students' sketching abilities and explore how these skills might be related and equivalent to sketching techniques, ideation and idea development in industrial design process, specifically focusing on motorcycle design.

Cham and Yang (2005) suggested that the sketching activity during design can take many different forms, depending on the intent and type of idea manipulation they represent. It is clear that sketching serves a role in aiding cognition during the mechanical design process, and has the potential to impact the design outcome. This is supported by Verstijnen, Hennessey, Leeuwen, and Hamel (1998) who claimed that sketches are used to capture and communicate ideas generated during design, and have been closely linked with design thinking. In addition, Goel (1995) justified that sketches are inherent in the cognitive activities that facilitate concept generation and the ability to "think visually" is a necessary skill for developing innovative solutions.

RESEARCH QUESTIONS

- i. Which method is used for idea searching in the learning and teaching process in industrial design?
- ii. How creative industries develop the ideation process during the design development.

OBJECTIVES

- i. To identify the sketching techniques process in ideation and idea development in industrial design course.
- ii. To understand the equivalence of preliminary sketching development between the industrial design student and industrial design practitioner.

SCOPES AND LIMITATIONS

The scope of this project consists of a few steps and needs to be properly planned so that this project can achieve all the objectives. There are many processes involved in order to produce a product. The scope of work in this project covers the following:

- i. Literature review to obtain the needed information about design development and ideation processes from any possible sources such as internet, books and others.
- ii. Conducting interviews with key persons among the industry practitioners and analyses using NVivo software.
- iii. Observations through video protocol analysis (VPA) - The observations of industry practitioners and students of Diploma in Industrial Design were recorded in order for researchers to measure the equivalent of design development process.

This study focused on design development and ideation processes that involved teaching and learning in the automotive industry), focusing on motorcycle design.

METHODOLOGY

In this study, the researchers employed qualitative method to gather pertinent data and information in order to answer the research questions. For the data collection, the researchers conducted interviews with key industry practitioners during the conceptual design phase. The data was analysed by using NVivo software. In order for the researchers to measure the equivalent of design development process between two industry practitioners and students of Diploma in Industrial Design, two industrial design students were conveniently selected as the sample for the study. The observations were recorded through video protocol analysis (VPA) during the developing conceptual design phase and current learning and teaching process in the academic phase. From this study, the findings were established to interpret their skills in ideation and idea development sketching techniques.

The use of the VPA can show how the respondents make a sketch ideation and idea development through video recordings. In the process of design sketches, there are various methods of design. Jaarsveld and Van Leeuwen (2005) justified that in principle, the design process may depend on preliminary sketches in several ways. During the first stage, the sketches are used to decide which direction to pursue towards the solution. Secondly, the intermediate products enable the designer to present and compare alternatives, and these help the designer to see the consequences of a decision. Finally, the sketches enable the designer to evaluate the intermediate state of the design in relation to the design criteria and his or her own interpretations of the design task. Furthermore, sketches mark the junctions of a design process, and hence, an analysis of sketches is most likely to provide insights as to how the design evolved.

Yang (2004) posits that performance on the sketching tasks is correlated with design sketch activity, as captured through design log book, and also correlated with design outcome during a three-week engineering design class project.

Observational Study of Sketching Ability

Sketching activity during design development involves an exploration of many different forms, depending on intent and the type of idea manipulation. During the observations, the respondents consisting of students had completed a survey in order to assess their sketch skills on ideation and idea development. The surveys were conducted by introducing the respondents with one project brief. The respondents were given approximately one hour to complete the survey. The main questions examined were whether performance on these tasks correlates with the design development by industrial practitioners during the sketching techniques in the industrial design process. Suwa and Tversky (1997) suggested that drawing is not simply an illustration of design cognition, but an important vehicle for the design thought process.

Assessment of Sketching Skills

Performance on the sketching techniques task was assessed by determining an ideation and sketching activity on idea development according to the method which respondents preferred most. The task, namely a motorcycle design project, was participated by students and industrial practitioners or designers. The ideation task was undertaken by designers while developing an early idea of a motorcycle. It was mainly and roughly made and produced without any further details. The early idea development task was created to explain the form and structure of the design concept. It was made readable for everyone.

A clear sketch on the basics of the sketch's accuracy showed how they did the early ideation, and then through ideation they expanded it to an idea development before proceeding to the design development. The questions that arose were whether both respondents used the same techniques to develop ideation and idea development in sketching techniques. The survey was conducted to explore which equivalent sketching skills can be linked to design activity development in the industrial design syllabus among industrial design practitioners. The sketches for each respondent were arranged separately, as shown in Figure 1.

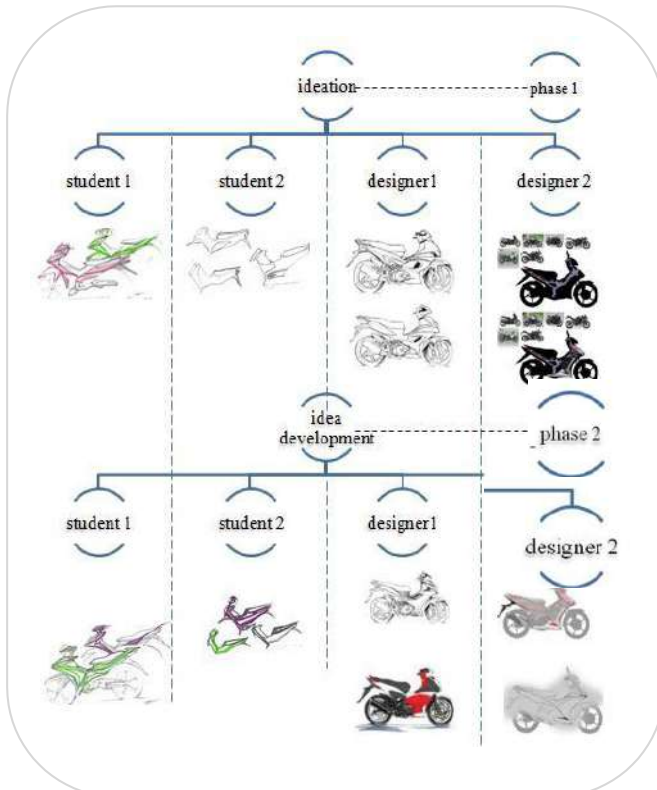


Figure 1: Analysis result - Representative sketches by students and designer

RESULTS AND DISCUSSION

Figure 1 shows the analysis of the results produced by Diploma in Industrial Design students and Industrial Design Practitioners at Modenas. The results from the observational study indicated that sketching designs were produced, using similar methods by both respondents.

Respondent 1 (student 1) produced design sketches based on the existing motorcycle design process. The respondent tried to carry out the existing ideation design from existing motorcycles and follow the

motorcycle frame. Respondent 2 (student 2) developed the ideation based on the motorcycle chassis form. The primary ideation sketches for the character of the motorcycle design were done in the form and shape of motorcycle chassis. In this drawing approach, the above analysis was the starting point. The drawings all begin with a basic block shape and an ellipse. Details were then added last. For the analysis of ideas development, student 1 and student 2 showed that they developed the idea through the ideation process. The designs were then continued for the outer body of the motorcycle (see Figure 2).

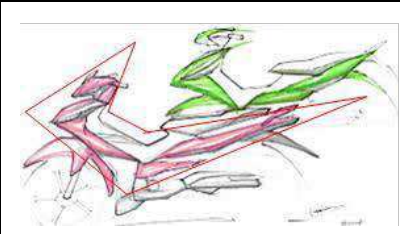
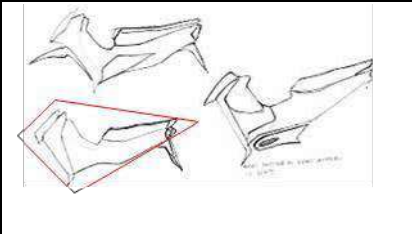
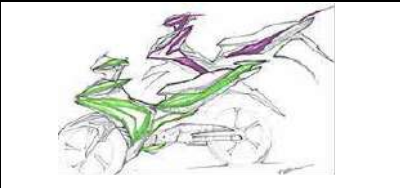
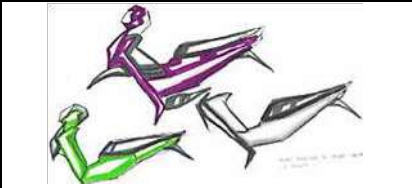
	
<p>Picture 1: Ideation - Student 1 shows that the ideation is developed directly through the motorcycle and developed the cover set.</p>	<p>Picture 2: Idea development - Student 1 shows that the idea development is developed more to the outer body. In the development of this student's design, there is no significant difference between self-ideation and idea development.</p>
	
<p>Picture 3: Ideation - Student 2 shows that the ideation is developed based on motorcycle frame. The respondent tried to identify the design of motorcycle through chassis form and shape.</p>	<p>Picture 4: Idea development - Student 2 shows the idea development through ideation. The resulting design still has no detailing.</p>

Figure 2: Students' industrial design ideation and idea development sketching techniques

According to Nagai and Noguchi (2003), the designers constantly translate non-visual textual specifications for a design into ones that are visual. Rodgers and Milton (2011) stated that during the concept stage,

designers have to visualise through a variety of techniques of yet non-existent product concepts. They are heavily involved in the process of taking a product from a description of users' needs and wants to develop brief, make initial sketches, prepare detailed drawings, and make models and working prototypes (Rodgers & Milton, 2011). In the early stage of ideation, designers have sketches based on the benchmarking of their research (see Figure 3).





	
<p>Picture 5: Ideation – Designer 1 developed the ideation with detailing.</p>	<p>Picture 6: Idea development – Designer 1 completed his idea development with colour to show the actual presentation in design.</p>
	
<p>Picture 7: Ideation – Designer 2 used patchwork approaches to get an early idea.</p>	<p>Picture 8: Idea development – Designer 2 traced the development design based on patchwork technique.</p>

Figure 3: Industrial design practitioners' ideation and idea development sketching techniques

Designer 1 had identified the context, depth and breadth of his design approach. The designer tried to adapt the analogical thinking to transfer an idea from one context to another context. Direct analogical thinking brings together a problem from one domain with familiar knowledge to another domain as a way to gain insight. Designer 2 also developed his ideation through patchwork approaches. He used some motorcycle designs that were available as a guideline. According to Rodgers and Milton (2011), successful designers use a variety of techniques for generating concept design proposals that address the requirements laid out in the PDS (Product Design Specification).

The word cloud analysis of the groups' project objectives provided an overview of the values and priorities that have shaped their projects' design process in industry (Figure 4). This interview was divided into five variables.

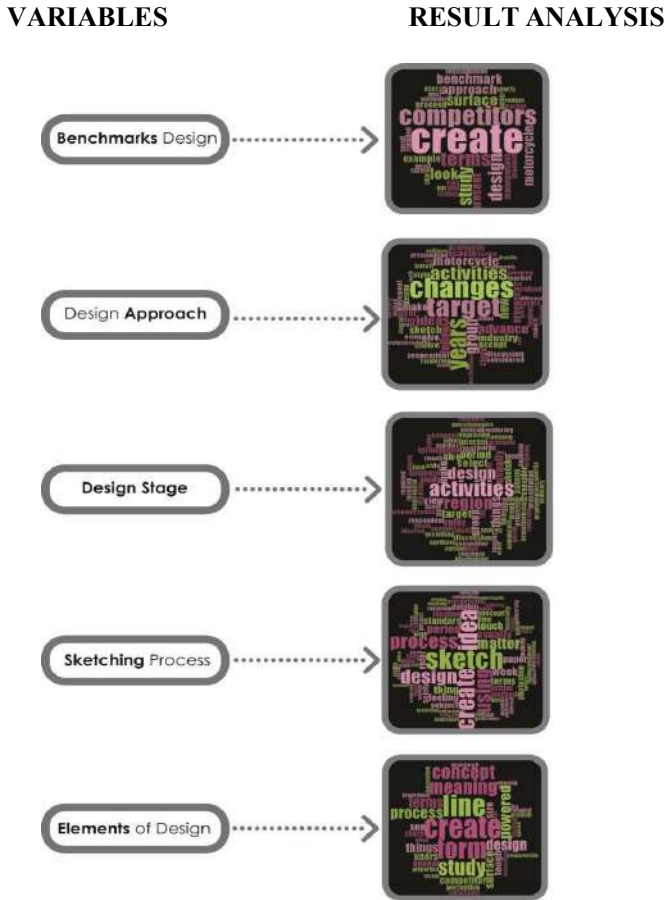


Figure 4: Visualisation of the most frequently used words to describe the flow of design process in industry

Table 1: Percentage Coverage by Variables

Node	Percentage coverage
Nodes\\Benchmarks design	9.44%
Nodes\\Design Approach	20.69%
Nodes\\Design Stage	25.44%
Nodes\\Element of Design	13.09%
Nodes\\Sketching Process	28.73%

The table above shows the percentage of the number of words generated through interviews with respondents. The interview results were analysed using NVivo software and the results were in accordance with the variables that were classified during the interview process.

Sketching words, indicating the level of requirement in the design was high at 28.73 per cent, followed by the design stage at 25.44 per cent. The use of design approaches in the design showed 20.69 per cent. Design approach involves techniques or methods used by the respondents in the design process. The results of the assessment carried out in this study showed the use of the methods by the respondents were nearly identical.

Design elements have to be prioritised as the ideal process. Elements of design showed 13.9 per cent usage, while it was 9.44 per cent for the benchmark. The word frequency analysis result in this study showed that the five variables were very important and linked to the design process flow, especially in the process of ideation and idea development. The results clearly indicated that 'sketching' is the most dominant technique used for the design approach. However, the empirical investigation revealed that design elements were still being prioritised ranging from 'usage' at 13.9 per cent and 9.44 per cent for 'benchmark'.

CONCLUSION

Sketching techniques were successfully developed for detection of equivalent method used by designers and diploma students during design development. Sketching is the simplest means of a process that supports the creative process of generating ideas and an idea of an individual. Without

being bound by any rules and conditions, sketching ideas is a unique work to the designers in industrial practices or students themselves and it is not an idea that needs to be reproduced. Although design development processes between industrial design syllabus and industry practitioners are in equivalence, the practitioners do not start from concrete parts of analysing ideas. The designers produced an idea with objectives and reasons, searching for ideas with sketching from the first idea up to the final stage in the design process while students need to start from the early stage of sketching process in developing ideas to support every creative process, related and equivalent to sketching techniques, ideation and more detailed idea development towards finalising the solution and contain clear design solutions in industrial design process. The identification of specific idea generation will add to new knowledge in this area. It is also beneficial for designers and educational institutions as they can identify and overcome the problems in preliminary design development. The findings may contribute to the teaching and learning process especially in industrial design course.

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REFERENCES

- Ang, M.C.H. (2015). Graduate employability awareness: A gendered perspective. *Procedia of Social and Behavioral Sciences*, 211, 192-198. <http://doi.org/10.1016/j.sbspro.2015.11.083>
- Cham, J. G., and Yang, M. C. (2005, September). *Does Sketching Skill Relate to Good Design?* Paper presented at the International Design Engineering Technical Conferences & Computers and Information in Engineering Conferences, Long Beach, California. Doi: 10.1115/DETC2005-85499.
- Gilmore, A., and Comunian, R. (2016). Global aspirations and local talent: The development of creative higher education in Singapore. *International Journal of Cultural Policy* 22(1), 58-79. <http://dx.doi.org/10.1080/10286632.2015.1101085>
- Goel, V. (1995). *Sketches of thought*. Cambridge: MIT Press.
- Harvey, L. (2001). Defining and measuring employability. *Quality in Higher Education*, 7(2), 97-109.
- Haukka, S. (2011). Education-to-work transitions of aspiring creatives. *Cultural Trends*, 20(1), 41-64.
- Jaarsveld, S., and Van Leeuwen, C. (2005). Sketches from a design process: Creative cognition inferred from intermediate products. *Cognitive Science*, 29(1), 79-107.
- Kamarudin, H. S., and Sajilan, S. (2013). Critical success factors of technopreneurship in the creative industries: a study of animation ventures. *Review of Integrative Business and Economics Research*, 2(1).
- Martin, B., and Hannington, B. (2012). *Universal Methods of Design*. Beverly, USA: Rockport Publishers.

- Md Hashim, A. (2015). The application of experimental aesthetics in social psychology to marketing research in the motorcycle industry. In B. Mohan (Ed.), *Construction of Social Psychology*. Lisboa, Portugal: Science Press.
- Nagai, Y., and Noguchi, H. (2003). An experimental study on the design thinking process started from difficult keywords: Modeling the thinking process of creative design. *Journal of Engineering Design*, 14(4), 429-437.
- Rahman, D. (2016, July 14). Making Malaysian graduates more employable a reality. *The Star online*. Retrieved from <http://www.thestar.com.my/opinion/online-exclusive/whats-your-status/2016/07/14/making-malaysian-graduates-more-employable/>
- Rodgers, P., and Milton, A. (2011). *Product Design*. London: Laurence King Publishing Ltd.
- Suwa, M., and Tversky, B. (1997). What do architects and students perceive in their design sketches? A protocol analysis. *Design Studies*, 18(4), 385-403.
- Van Boeijen, A., Daalhuizen, J., Zijlstra, J., and van der Schoor, R. (2013). *Delft Design Guide*. Amsterdam: BIS Publishers.
- Verstijnen, I. M., Hennessey, J. M., Leeuwen, C. v., and Hamel, R. (1998). Sketching and Creative Discovery. *Design Studies*, 19(4), 519-546. [https://doi.org/10.1016/S0142-694X\(98\)00017-9](https://doi.org/10.1016/S0142-694X(98)00017-9)
- Yang, M. C. (2004, September 28-October 2). *An Examination of Prototyping and Design Outcome*. Paper presented at the ASME Design Engineering Technical Conferences, Salt Lake City, Utah, USA.
- Yusof, N., and Jamalud, Z. (2015). Graduate employability and preparedness: A case study of University Malaysia Perlis (UNIMAP), Malaysia. *Malaysian Journal of Society and Space* 11(11), 129-143.