First impressions count: the importance of high-quality visuals in the Product Design Engineering discipline.

Blair Kuys, Christine Thong, Gavin Melles
Swinburne University of Technology, Melbourne, Australia

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ABSTRACT

Product Design Engineering (PDE) combines industrial design (ID) and mechanical engineering disciplines. Traditionally engineering disciplines focus more on the technical and less on the creative, however PDE is a unique combination of technical mechanical engineering and the creative industrial design disciplines.

Powerful product renderings help promote and excite the viewing audience and it is important to maximise the potential of each student project. These powerful visuals are standard practice in the 3D design industry, which underpins the importance for this standard to be followed through to the student cohort to make each student industry ready. When promoting student work in publications and at exhibitions it is the visuals that draw the viewer to the project. First impressions of a product are decided instantly and this will make or break the willingness for the viewer to delve deeper into the project or to simply move onto the next one. Over the past five years of teaching into this discipline the importance of quality visuals to help communicate final project outcomes has become more apparent. Too often we have seen quality projects backed up with significant engineering detail let down by poor-quality visual outcomes. This paper highlights the importance of high-quality visuals in the PDE discipline as well as show comparison studies of high-quality and low-quality product visuals of the same project to help the audience understand the importance and power first impressions make to this industry.

INTRODUCTION

Product Design Engineering is a unique course at Swinburne University of Technology in Melbourne Australia. The course provides a combination of ID and engineering studies. It was determined that this is a natural combination of these two diverse areas as products conceptualised in the area of ID would naturally require engineering for detailing the design and preparing for manufacturing.

The project outcomes from PDE students could be classified as ID outcomes. Both disciplines deal with similar projects however, project outcomes from PDE are backed up with significant engineering detail.

Engineering and ID studies are integrated rather than completing all engineering studies before commencing design studies or vice versa. The course design provides engineering knowledge in time for its implementation through ‘Project Based Learning’ in a design studio environment. For example, Thermo-fluid studies are completed prior to a project to design a portable air conditioning unit. Another example includes studies in machine design before designing a sustainable vehicle. It is important to note this level of integration, as this is what tends to be ignored/overlooked when the final outcomes are presented to an inexperienced audience. Projects in any design discipline don’t always get the space they deserve to fully communicate the effectiveness of the design. When student work is promoted the publications usually consist of 3–4 images and around 150 words of text. This is clearly not enough to fully justify one’s design outcome, which focuses greater importance to those 3–4 images being presented.

These images basically have to ‘sell’ the project and attract the viewer to read more into the design.

The major concerns in providing a course of this nature (PDE) were primarily related to training individuals to think constructively and analytically as an engineer while they also have to be innovative and open minded as a designer. The challenge of training the students was not as great a concern as the selection of applicants who would be able to adjust to this bilateral thinking on sciences and physics on one hand and design and graphic communication on the other. The gaps in the curriculum identified in the earlier years of the course were the lack of 3D visual programs for executing high-quality visual outcomes. These programs were commonly taught in the ID discipline leading to better quality visuals at a projects conclusion. This was an unfortunate problem PDE faced, as the strong engineering content for each project was not fully appreciated and the first impressions were usually negative when displayed alongside ID outcomes.

I. THE IMPORTANCE OF VISUALS IN ENGINEERING

The significance of good visual renderings in engineering disciplines has long been a focus of concern (e.g. Xang 2008). The particular significance of visuals in product and industrial design adds to this general concern for visuals a need for aesthetics and scenario-based renderings of product concepts (Cross 2008). McDonagh, Brusberg & Haslam (2002) suggest that potential user ‘bonding’ to a product is highly dependent on visual and not functional stimuli; this
concern with visuals for products is shared by design-related fields such as marketing (e.g. Bloch 1995).

Advancement in the capabilities of computer programs has lead to higher quality outputs. These programs are a natural progression in the product design process and are used to simulate the products function, its aesthetics and the way it operates within its physical environment.

II. THE TIME IT TAKES TO MAKE A FIRST IMPRESSION

In a study from Princeton University (Willis and Todorov, 2006), a 100-millisecond (ms) exposure was used to measure trait inferences from facial appearances shown in photographs comparing them to judgments made in the absence of time.

The concluding statements made from this study show that judgments made after 100-ms exposure correlated highly with judgments made in the absence of time constraints, suggesting that this exposure time was sufficient for participants to form an impression (Willis and Todorov, 2006).

To validate the Princeton study, another study was conducted from the Human-Oriented Technology Lab at Carleton University, Canada. The study, Attention web designers: You have 50 milliseconds to make a good first impression! (Lindgaard, Fernandes, Dudek and Brown, 2006), reinforces the claims made from the Princeton study. This study relates closer to design and involved participants viewing website homepages sequentially for 500-ms each and rated the visual appeal of each page. The data obtained from this study suggests that 500-ms was a short enough time to form a first impression, but possibly also long enough to allow cognitive processing of specific attributes (Lindgaard, Fernandes, Dudek and Brown, 2006). Bornstein (1992) quoted in Lindgaard, Fernandes, Dudek and Brown (2006), led him to conclude that the mere exposure effect begins to wane at 50-ms stimulus exposure time (Lindgaard, Fernandes, Dudek and Brown, 2006).

These studies are used as evidence for the legitimacy of this paper as it correlates with the findings of presenting PDE projects. Therefore, it can be said that a PDE outcome only requires 50-ms to make a good first impression. If a good impression is not made, the chance of the viewer moving onto another project is highly likely.

III. COGNITION

Decisions made very quickly can be every bit as good as decisions made cautiously and deliberately (Gladwell 2005). The adaptive unconscious part of the human brain is capable of making very quick judgments based on very little information. The first impression made by the adaptive unconsciousness is not however always the correct impression. These preliminary impressions can be fallible, which underlines the intentions of this paper.

Although the field of design is subjective and each individual can have differing opinions on what they see as ‘impressive’ outcomes, a fallible judgment cannot be used as an excuse for students presenting their work poorly. It is obvious that first impressions can be fallible, making the potential to maximise one’s first impression of high importance.

In Gladwell’s book, BLINK: The power of thinking without thinking (2005), he argues that first impressions can be educated and controlled. He then goes on to say:

“We must understand those circumstances when rapid cognition leads us astray. Our first impressions are generated by our experiences and our environment (Gladwell 2005).”

The intentions of this study are to ‘control’, or make students aware of the importance first impressions make to the perceptions made about their outcomes. PDE students are usually compared with ID students. ID is a credible discipline in its own right and certainly has a role to play in the product development process. The emphasis on aesthetics and design beautification within ID is something that has hindered the ‘first impressions’ of PDE. Pedagogical developments in presenting design outcomes has been developed over the duration of the PDE discipline to give credibility to the design component of this course. Both ID and PDE are taught along-side each other in the same faculty, which leads to unavoidable comparisons.

Teaching staff including the authors noted that PDE was never as good as ID from a visual point of view, leading to a lack of understanding of the importance of the discipline within industry and the greater community. Creativity in design is of high importance and is required for both ID and PDE to ensure successful impressions. This ‘creativity’ was converted into quality visual output within ID but was rarely executed successfully within PDE. One key issue, which emerges in the examples below, is the capacity of ID students in their training to design with environmental scenarios in mind, an approach that is traditionally lacking in engineering but common in design related fields (e.g. Howard et al. 2002).

It is important to introduce appropriate computer software at the earlier stages of a student’s degree to ensure each student is capable of executing high-quality project outcomes. The ability to convert conceptual ideas into photorealistic images is fundamental for anyone to envisage the final design outcome. First impressions are imperative in a competitive environment such as design. If a client doesn’t like what they see they will quickly move on to other options. While noting that design is a subjective vocation, it is important to maximise the quality of the output to promote the outcomes in the best means possible.

Not everything relies purely on first impressions. If the project/work on display is of interest to the viewer then they will most likely read further. However, the point this paper is making is to understand the importance of first impressions in order to maximise the acceptance of work being presented. The audience can never be determined so it is advisable to execute final outcomes to the highest possible quality to greater the chances of acceptance by the viewer. It is quite simple, if the viewer doesn’t like what they see within the first few seconds of viewing, they will move onto the next – regardless of how well resolved or how in depth the project is.
IV. COMPARISON CASE STUDIES

PDE students presenting their final outcomes for a tram design project created the following two images (Fig. 1 and Fig. 2). The first image was used for their in-class presentation, which was used to show the exterior form of their design. Upon first impression, this final visual does not excite the viewer, as there is limited contextual understanding of the design. The image lacks definition; it lacks character and does not portray a realistic visual. These comments were made to the students and they were constructively used to create the second visual. This visual was used for the final presentation and appears to be a completely different image. The actual product (the tram) is the exact same 3D computer model as used in the previous image, however this has been developed further to create a more realistic visual. By introducing a computer-rendering package (3D Studio Max), a realistic visual of the designer’s intent has been created.

Fig. 1. A 3D computer rendering that lacks definition and realism.

Fig. 2. A 3D computer rendering using the same computer model as Fig. 1 but developed further to create a higher quality visual.

The only difference between the first image and the second image is a slight manipulation of the perspective to fit within the background image. Apart from that, the product being displayed is exactly the same. It is the extra time put towards the visual resolution that has enhanced the image quality. The introduction of a background gives the image context. It ‘grounds’ the tram making it appear as if it is actually operating on this rail network. Advancements in computer technology and computer programs have given the image greater definition, displaying realistic shadows and reflections on the glass. These minor adjustments within the image have a significant impact. When presenting the two images side-by-side it is clear which has the most appeal and which image would have a greater impression at first glance. The small changes made from a visual execution point of view contribute to a superior visual outcome. Although these ‘small’ changes can be time consuming for the student, the increased impact level should never be underestimated. These so-called ‘small’ changes could be the difference between securing future employment, winning awards, or for a student, achieving a higher grade.

Another case study used to visually represent the intentions of this study is shown in the following two images (Fig. 3 and Fig. 4). The three-week project duration consisted of the development of an interlocking children’s toy with a strong focus on the visual execution. This was a quick computer modeling exercise used to increase student skills leading into the major project. The visual outcome was emphasised as the limited time didn’t allow for technical resolution. This project is an ideal example for this paper as it argues the importance of high-quality visuals for project outcomes that don’t necessary have solid technical resolution. Although the intentions of this paper are to emphasise the importance of first impressions for project outcomes to ensure the viewer gains a good first impression, increasing the chances of further investigation, it is necessary to highlight the importance strong visuals make to simplified projects. These ‘smaller’ projects show what a student is capable of producing in a short time frame. This is an important skill for students, as it shows their readiness for industry, which often consists of quicker project turnarounds than that of university projects.

Fig. 3. An example of a student’s project that lacks realism.
Fig. 4. An example of a realistic student rendering.

The two project examples shown are very similar as they are essentially blocks that interlock with each other. The first project received a Credit (65–74 out of 100). The second project received a High Distinction (85–100 out of 100). The assessment criteria dedicated 70 per cent of the marks towards the final visuals; this included the quality of the 3D CAD modeling, the overall aesthetics of the final design and the quality of the computer rendering. The other 30 per cent was dedicated to research and concept development for the project.

Due to the emphasis on the visual elements of this project, it is clear to understand why one example received a Credit, and the other received a High Distinction. The first example lacks lucidity, the shadows and material mapping are unrealistic and the student’s choice of materials affects the visual clarity of the overall design.

The second example could pass as a photograph of a children’s toy. The shadows are realistic by reflecting the colours of the blocks on the ground plane. The reflections seen within the central block give a clear understanding of the intended material, which makes this outcome easier for the viewer to associate with a physical product.

The importance of high quality visuals is exemplified again by project work generated in a second year design studio class. Over a four-week period, PDE students designed mixer style tapware that continued to foster product design process skills while learning about metal die casting in an applied manner. This project also presented students with the opportunity to enter their tapware designs into a competition run by industry leaders, Phoenix tapware. Much of the assessment criteria used to judge and academically assess the project was the same, however some evaluation results did differ quite substantially. Design work for the competition was judged purely on presentation visuals, while academic evaluation also took into account sketch folios, mock-ups and detail drawings for manufacture.

The entry featured in Fig. 5 is a prime example of how influential powerful product visuals can be. The work featured here was awarded second place in the competition, but only received 66/100 in academic assessment, with 25 students scoring higher. In the supporting documentation, there was a lack of technical and ergonomic consideration, with further resolution of manufacturability and assembly with standard plumbing components required. However, the product renderings depict lifelike material finishes, realistic product perspectives and complementary contextual settings to maximise the potential of the design.

Fig. 5. An example of good visuals describing a student’s tapware concept.

Fig. 6. An example of unclear visuals describing a student’s tapware concept.

In contrast, the work featured in Fig. 6 shows a well resolved concept that received 86/100, the second highest result in the class, but failed to even gain an honourable mention in the competition. The product renderings used in the visuals are dull in colour, tone and contrast, lack material realism and are set in cluttered contexts. Product form and detail of the concept is hard to decipher in the individual images. Clarity in communication through the product visuals is compromised by cluttered and confusing layouts, using text that does not convey an appropriate aesthetic to the target market. The supporting material of the design showed excellent technical documentation, resolution of manufacture and careful ergonomic consideration.

While the aesthetic nature of each design may be open to a level of subjective evaluation, both scored similarly in academic assessment criteria regarding appropriateness of styling for the target market. This is strengthened by verbal feedback on competition entries from selected members of
the judging panel identifying both product concepts as having aesthetic qualities appropriate for identified demographic.

By analysing the example images we can define the reasoning why one image appears better than the other. The visuals need to act as representation and communication of the designer’s intention and no assumptions about what their audience knows or understands can be made. A layperson has little chance to understand a discourse based on sources of inspiration, because they are familiar neither with the sources nor the development of the project (Eckert and Stacey 2000).

The images identified as successful within this paper communicate better to a broader audience how the project outcomes would appear if developed into an actual product. This gives the viewer a sense of acceptance, as they can envisage the final outcomes. The two negative examples lack realism, making it more difficult for the audience to relate to reality.

Visual communication in PDE defines the product intentions within the space it is presented in. The outcomes of individual designs are defined through the product development process, which is not seen in the final visual outcomes. The viewer recreates the design from the description, so communication depends on the viewer sharing the designer’s purpose relating to a clearer meaning.

Physical skills of the designer are used to enhance the communication of the work on display. Contextual backgrounds as seen in Fig. 2 give meaning to the subject, which distinguishes it from Fig. 1. Higher resolution renderings and appropriate colour selections create a stronger realism, making it more difficult for the audience to relate to reality.

CONCLUSION

The comparison studies used in this paper demonstrate the effectiveness of presenting high-quality visuals in the 3D design disciplines, especially the PDE discipline as the extensive engineering detail that goes into a product is usually overlooked upon first impressions. Engineers typically train with less of a focus on aesthetics in visuals, but within the PDE discipline this is of high importance. There is a need to focus on high-quality visuals in PDE to help promote and ‘sell’ the innovative ideas that are produced.

The importance of executing projects to the highest possible quality to ensure the viewer engages with the work on display is of high priority. PDE is a unique discipline that consists of significant engineering detail, which tends to be overlooked when final project outcomes are presented. High-quality visual output is identified as the catalyst to attract the viewer when presenting work in a competitive environment.

This paper stresses the power high-quality product renderings have in helping promote and excite the viewing audience. A mere 50-ms exposure time is all that stands between potential success stories, or an unknown lost opportunity.

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