

AN EXPLORATION OF THE ROLE OF CREATIVITY IN CROWDFUNDING PRODUCT DESIGN PROJECTS

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ABSTRACT

Crowdfunding is becoming increasingly popular for funding projects, particularly in the domain of product design, by asking a large group of people. Previous studies have indicated that creativity plays a significant role in product design and is considered an important factor of success for new product design and development. However, these studies have not explicitly explored the role of creativity in crowdfunding product design projects. This paper investigates this issue by conducting a case study employing expert evaluations of selected successful and unsuccessful crowdfunding product design project samples. The results of the study show there is a positive relationship between the creativity of a product and the success of its crowdfunding campaign. Therefore, creativity can be considered a success factor of crowdfunding. The study also suggests creative products, especially useful ones, might have more potential to attract people's willingness to fund them. This paper has contributed to the research on design, creativity, product design and development, and funding business models. Most importantly, this paper has raised the significance of creativity in design and business.

Keywords: Creativity, Innovation, Business models and considerations, Crowdfunding, Product design

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1 INTRODUCTION

Creativity plays a significant role in modern society facilitating problem-solving, innovations and business commercial performance (Childs and Fountain 2011; Sarkar and Chakrabarti 2011). It can be described as associating elements into new and useful combinations that meet requirements (Childs et al. 2022). In product design and development, creativity is an essential element in early design stages involving divergent and convergent thinking activities, such as idea generation and evaluation (Han et al. 2018a; Childs et al. 2022). The outcome of such activities is a creative idea, which is often considered the first step leading towards innovation.

A number of design studies have explored tools and methods to better support designers in creativity focusing primarily on idea generation. This tends to involve conventional ideation tools, such as Brainstorming (Osborn 1963), Six Thinking Hats (De Bono 2017), TRIZ (Altshuller 1984), and design-by-analogy (Linsey et al. 2012). There are also several studies that have explored how to better support creativity in design from a more comprehensive perspective. For example, Childs et al. (2022) developed the Creativity Diamond framework for supporting innovative tasks by providing guidance on selecting suitable tools that can provoke additional ideas to augment creativity. Luo (2022) proposed the Data-Driven Innovation (DDI) paradigm to address uncertainties and facilitate creativity in the innovation process. Several computational tools have been developed to support creativity often utilising semantic networks. Engineering and technology focused semantic networks, such as B-Link (Shi et al. 2017) and TechNet (Sarica et al. 2020), have been developed to facilitate creative activities including idea generation, idea evaluation, information retrieval, and design representation (Han et al. 2021b; Luo et al. 2021; Sarica et al. 2021; Sarica et al. 2023). Nevertheless, designers have shown a tendency to prefer not to use these creativity support tools during design (Oman et al. 2013), which could lead to less innovative products and ultimately business failures. Therefore, it is important to promote the significance of creativity in various design contexts, which cultivates the awareness of creativity among designers.

Crowdfunding is considered an emerging and new business investment model, which is defined as the process of asking a large group of people (the public or the backers) to supply the investment of a project or business that needs investment (Forbes and Schaefer 2017). A crowdfunding project or campaign is considered “successful” when the campaign has reached its funding goal set by the founder or creator. A recent report by Mazur (2022) has indicated that the global crowdfunding market was valued at \$12.27 billion (US dollars) in 2021 and is forecast to double by 2027. In 2021, there were 1478 crowdfunding platforms in the United States, and have raised \$73.6 billion in total. However, it is also reported that only 22.9% of all crowdfunding operations are successful. Crowdfunding is used increasingly to raise funds for projects and businesses, as well as launch new products, in sectors such as design, technology, arts, music, film, and business finance, of which product design projects are among the most popular ones (Song et al. 2022). Therefore, product design project is selected as the sector for investigation in this paper.

Many design products have experienced success through crowdfunding via platforms such as Kickstarter and Indiegogo. For example, Pebble Time, which is a colour e-paper smartwatch that has up to 7 days of battery, is the highest-funded project on crowdfunding websites with \$20.3 million pledged from almost 80,000 backers. Up until then, the Coolest Cooler, which is a multifunctional portable cooler that involves a blender and a speaker, had held the highest-funded project title with \$13.3 million. Another well know technology-focused product design crowdfunding campaign is Oculus Rift, the first truly immersive virtual reality (VR) headset, launched in 2012. The company that created Oculus Rift was later bought out by Meta (formerly Facebook) for \$2 billion in 2014. Whether the creativity levels of these products had contributed to their success needs to be further explored.

Although creativity is deemed to be a significant factor of design success, there is a lack of studies that have explored the impacts of creativity on crowdfunding projects, particularly product design related ones. Therefore, this paper is aimed at exploring the role of creativity in crowdfunding product design projects to provide insights into whether the success of crowdfunding project campaigns is related to the degree of creativity of the products involved. It will provide designers or creators of product design projects with useful suggestions for successful crowdfunding, as well as raise the significance of creativity in design. Here, we hypothesise that creative crowdfunding products are more likely to

lead to successful crowdfunding campaigns in comparison with less creative ones, according to research studies on design creativity and crowdfunding.

In the following section, related work on design creativity and crowdfunding is reviewed. Details of the case study conducted for testing the proposed hypothesis and its results are provided in Section 3. Discussion, implications and limitations of the paper are presented in Section 4 and conclusions in Section 5.

2 RELATED WORK

Creativity is a “loosely” defined term that researchers have provided definitions at various levels of scope. It could be described as an ability or capacity of a person, such as “the process by which something so judged (to be creative) is produced” (Amabile 1983), “the ability to come up with ideas or artefacts that are new, surprising, and valuable” (Boden 2004), “imagination with responsibility” (Childs and Fountain 2011), “discovery of new possibility and bringing it into being” (Martin and Wilson 2017), “the development of new, useful and surprising things” (Crilly and Moroşanu Firth 2019), and “production of novel, useful products, or ideas that are both original and feasible” (Toh and Miller 2019). When creativity is used to describe an idea, concept or product, it refers to the elements of the idea, concept or product, such as novelty, usefulness, and aesthetics. This is often applied to creativity assessment. For instance, Sarkar and Chakrabarti (2011) used novelty and usefulness for creativity assessment, of which novelty refers to something that is new and original, and usefulness refers to the subject’s social value. Chiu and Shu (2012) measured the creativity of a concept by employing novelty, which refers to originality and newness, usefulness, which refers to appropriateness, and cohesiveness, which refers to wholeness, detail and style. Srinivasan et al. (2018) used novelty and quality for measuring creative concepts, of which novelty measures the exploration of new solution spaces and quality indicates the fulfilment of requirements. Starkey et al. (2019) employed usefulness, which refers to surprise and originality, and uniqueness, which refers to utility, logic and value.

Although there exist many different definitions of creativity and various elements for measuring creativity, novelty and usefulness are considered to be the two key factors of creativity in design (Sarkar and Chakrabarti 2011; Fiorineschi and Rotini 2021; Han et al. 2021a). In line with other studies in design, this paper defines creativity as the novelty and usefulness of a product, which is the outcome of “the process by which something so judged (to be creative) is produced” (Amabile 1983). Here, novelty refers to originality and newness, while usefulness refers to value and feasibility.

In addition to developing tools for facilitating creativity as described in the preceding section, design creativity researchers have also investigated creativity in design from other perspectives. In areas related to product design, several studies have explored creativity in design competitions, such as the Red Dot Design, Good Design, and iF Design awards. Wang and Chan (2011) indicated that these design awards are often creativity-oriented. Han et al. (2018b) implied that there are more highly creative products than fairly creative products among the design award winners. Hölttä-Otto et al. (2018) indicated that innovative products have a high success rate of 77%. These studies have shown the importance of creativity in product design.

There are four types of crowdfunding: donation-based, lending-based, equity-based, and reward-based. Donation-based crowdfunding refers to charitable giving without expecting any returns; lending-based refers to peer-to-peer lending; equity-based refers to investing in return for a percentage of stake; and reward-based indicates investing in exchange for products, services or gifts (Forbes and Schaefer 2017). Among the four crowdfunding models, reward-based crowdfunding is the most popular type, which involves well-known platforms such as Kickstarter and Indiegogo. Therefore, reward-based crowdfunding is selected as the crowdfunding model for exploration in the paper.

A number of studies have investigated the factors contributing towards a successful crowdfunding campaign. Koch and Siering (2015) showed that project descriptions, images, videos, and whether the creator has previously backed other projects all impact crowdfunding success. Calic and Mosakowski (2016) found that a sustainability orientation in a crowdfunding project has a positive influence on its success. Kunz et al. (2017) indicated that the funding goal and period, the estimated time of delivery, social ties, investment preparation, presentation, the supply of multiple rewards, and the interaction with the crowd are factors that influence the success of a crowdfunding campaign. Forbes and Schaefer (2017) presented that choosing a suitable platform, setting an appropriate funding goal,

identifying reward options, and providing a video are the success guidelines for successful crowdfunding. [Chitsazan and Bagheri \(2019\)](#) indicated that there are four main crowdfunding factors: campaign characteristics (such as financial issues, operation of campaign, quality of campaign), network management (such as social networks), traditional investment criteria (such as characteristics of the product, market and the team), and contextual factors (such as culture and location). [Borrero-Domínguez et al. \(2020\)](#) revealed that successful factors of crowdfunding projects involve the experience of project members and the geographic location of the campaign. These crowdfunding studies have implied that the success of a crowdfunding project is related to the pledging conditions, such as funding goals and platforms, founder characteristics, such as experience and social networks, and project properties, such as descriptions and videos. However, whether creativity is a crucial factor influencing the success of crowdfunding projects has not yet been explicitly indicated.

A few studies have investigated creativity in the context of crowdfunding. For instance, [Kuo and Gerber \(2012\)](#) showed that crowdfunding could be used as a tool to support creativity, as internet-based crowdfunding platforms allow more people to participate in creative activities. [Oo et al. \(2019\)](#) indicated that creativity is an important attribute which crowdfunding backers are looking for. [Wang et al. \(2020\)](#) indicated that advertising the creativity underpinning a project is one of the main approaches to attract backers' attention. [Wei et al. \(2022\)](#) applied the concept of combinatorial creativity with the use of machine learning in crowdfunding projects and found a similarity network model for crowdfunding performance. Some of these studies implied that creativity is important for attracting backers but did not indicate whether creativity is directly related to the success of a crowdfunding campaign. Creativity has been used as a critical factor to measure new product design and development success while further explorations on how creativity affects the success of crowdfunding campaigns are needed.

3 CASE STUDY

3.1 Case study method and implementation

In order to explore the role of creativity in crowdfunding product design projects and provide insights on whether creativity is a successful crowdfunding factor, a case study has been conducted by investigating crowdfunding design products. This case study has employed expert evaluation to assess the creativity of selected crowdfunding products. Employing experts for creativity assessment has been commonly used in design, such as by [Sarkar and Chakrabarti \(2011\)](#) and [Han et al. \(2021a\)](#). The expert evaluation method requires far fewer participants to produce valid results in comparison with using non-experts for creativity assessment ([Achiche et al. 2013](#)). For example, [Charyton and Merrill \(2009\)](#) employed two experts for assessing design creativity.

In this case study, five design experts, four males and one female, with a mean (*M*) age of 31.8 (standard deviation (*SD*)=2.9) and a mean design experience of 9.4 years (*SD*=2.3) participated in the creativity assessment task voluntarily. The five experts signed up with standard case study protocols providing consent for using the data. The Consensual Assessment Technique (CAT), which is known as the “gold standard” of creativity assessment proposed by [Amabile \(1983\)](#), was used as the basis for evaluating creativity in the case study. To be specific, creativity was assessed by measuring the novelty (refers to originality and newness) and usefulness (refers to value and feasibility) of a product, which is based on the definition of creativity indicated in the preceding. In addition, overall creativity was also assessed as an additional measurement to indicate the overall creativity of a product perceived by the experts, as it is challenging to accurately calculate the overall creativity of the product by summing up the product's novelty and usefulness scores. This is in line with the methods used by [Cropley and Kaufman \(2019\)](#) and [Han et al. \(2021a, c\)](#). Thus, the five experts involved in the creativity assessment evaluated the provided product samples by assigning ratings on novelty, usefulness and overall creativity based on their personal perceptions. A five-point Likert-type scale was used for the ratings, ranging from “Very Low (1)” through “Medium (3)” to “Very High (5)”.

As indicated, reward-based crowdfunding is selected as the model and product design project is selected as the sector for investigations in this paper. Thereby, 40 product design samples, 20 successful and 20 unsuccessful ones, were selected by the authors from Kickstarter which is one of the most popular reward-based crowdfunding platforms. The details of each product sample were extracted from the platform, including the name, descriptions, images, and video, as shown in Figure

1. The details of the samples were provided to the experts for evaluation. However, information relevant to the performance of the project's crowdfunding campaign, such as whether the campaign was successful, the number of backers, and the amount of fund pledged, was not included. Therefore, the experts were not able to identify which product sample was successful or unsuccessful in the crowdfunding campaign based on the information provided.

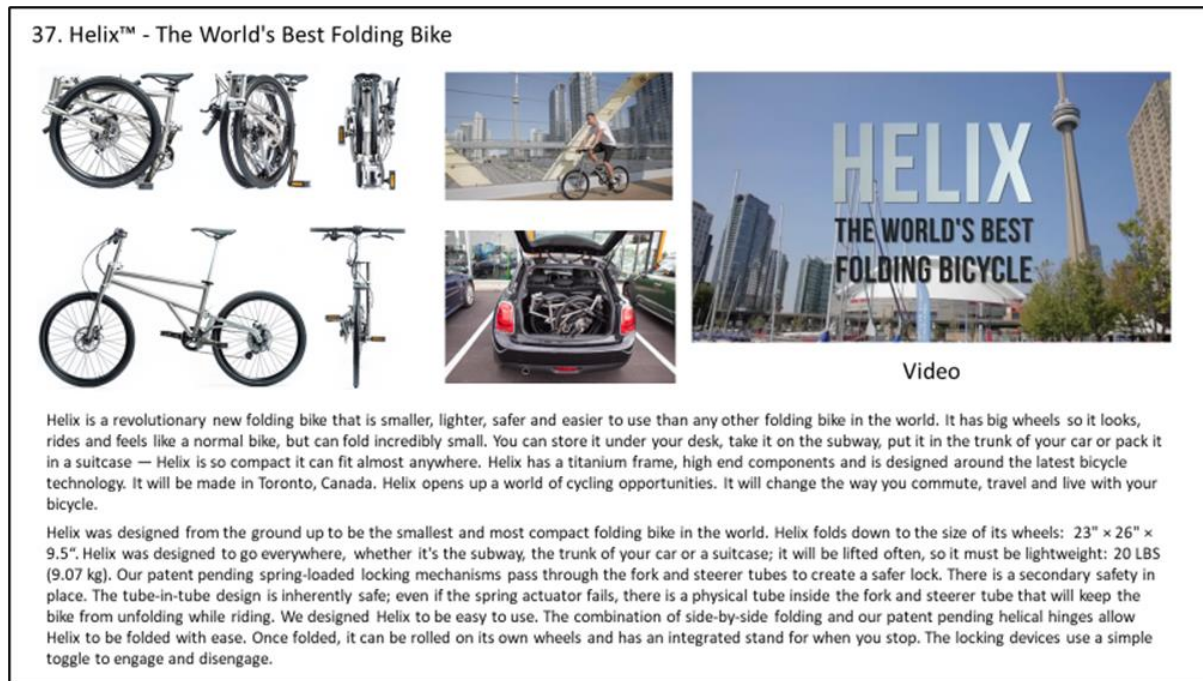


Figure 1. An Example of the crowdfunding product design sample

Before starting the creativity assessments, information regarding the case study and instructions for the evaluation was provided to the experts. The 40 product samples (20 successful and 20 unsuccessful ones) were mixed together to avoid potentially biased evaluation. Then, the five experts conducted the creativity assessment individually without contacting each other. Furthermore, they were not allowed to use internet or other means to search for these product samples. The assessment results were then collected by the authors for data analysis.

3.2 Case study results

A Cronbach's alpha analysis is conducted to measure the internal consistency of the rating scores from the five experts. As shown in Table 1, the Cronbach's alpha values of the ratings of novelty, usefulness, and overall creativity are 0.870, 0.731, and 0.792, respectively. This has suggested better, good, and good internal consistency for novelty, usefulness and overall creativity, respectively. This indicates the expert evaluation results are reliable. In the following study, each of the measures (novelty, usefulness, and overall creativity) of a product sample rated by an expert is considered an individual data sample. Overall there are 200 data samples for novelty, 200 for usefulness and 200 for overall creativity in total, which are used for further analysis.

Table 1. Results of the Cronbach's alpha test

	Novelty	Usefulness	Overall Creativity
Cronbach's Alpha	0.870	0.731	0.792

A Point-Biserial Correlation test is conducted to provide insights into the correlations between the degree of creativity (including novelty, usefulness, and overall creativity) of a product and whether its crowdfunding campaign is successful. Please note that, in this study, the five-point Likert-type scale variables are used as continuous data. There are three sets of continuous variables in this study: the ratings of novelty, usefulness and overall creativity. The performance of the crowdfunding campaign is used as a dichotomous variable, which has two categories “successful” and “unsuccessful”. The results of the correlation test are presented in Table 2. In the table, the point-biserial correlation coefficient ranges from -1 to +1, of which a positive coefficient indicates a positive association between a continuous variable and a dichotomous variable, a negative coefficient indicates a negative association, and a zero coefficient refers to no association. The Point-Biserial Correlation test is a special case of Pearson’s Correlation test, and therefore the interpretation of the strength of the Point-Biserial Correlation coefficient (r_{pb}) is based on the guide proposed by [Dancey and Reidy \(2007\)](#). Thereby, $0.7 \leq |r_{pb}| < 1$ indicates a strong correlation, $0.3 < |r_{pb}| < 0.7$ shows a moderate correlation, and $0 < |r_{pb}| \leq 0.3$ suggests a weak correlation. A result is statistically significant when the p-value $* p < 0.05$, and statistically highly significant when $** p < 0.01$.

Table 2. Results of the point-biserial correlation test - crowdfunding performance

	Novelty	Usefulness	Overall Creativity
Crowdfunding Performance (Successful/Unsuccessful)	0.295**	0.450**	0.484**

* $p < 0.05$; ** $p < 0.01$.

As shown in Table 2, the Point-biserial Correlation test conducted has indicated the relationship between novelty, usefulness, overall creativity, and the crowdfunding performance (successful or unsuccessful), respectively. There is a statistically highly significant positive and weak correlation between novelty and the performance of crowdfunding ($r_{pb} = 0.295^{**}$), a highly significant positive and moderate correlation between usefulness and the performance of crowdfunding ($r_{pb} = 0.450^{**}$), and a highly significant positive and moderate correlation between overall creativity and the performance of crowdfunding ($r_{pb} = 0.484^{**}$).

In addition, an Independent Sample t-test has been conducted to measure the statistical differences between the mean novelty, usefulness and overall creativity scores of the successful and unsuccessful crowdfunding product data samples to provide more insights. As shown in Table 3, the mean novelty score of successful product data samples ($M=3.03$, $SD=1.06$) is higher than that of unsuccessful ones ($M=2.35$, $SD=1.15$). The Independent Sample t-test has shown that there is a highly statistical difference between the mean novelty scores of successful and unsuccessful product data samples with medium effect size, $t(198)=4.35$, $p<0.001$, $d=0.62$. The test results also indicated that the mean usefulness score of successful products ($M=3.80$, $SD=1.10$) is statistically significantly higher than that of unsuccessful ones ($M=2.60$, $SD=1.29$) with large effect size, $t(193)=7.09$, $p<0.001$, $d=1.00$. The mean overall creativity score of successful products ($M=3.26$, $SD=0.87$) is also statistically higher than the mean overall creativity score of unsuccessful ones ($M=2.23$, $SD=0.99$) with larger effect size, $t(198)=7.79$, $p<0.001$, $d=1.11$. The comparison analysis results demonstrate that successful crowdfunding products have statistically higher novelty, usefulness, and overall creativity scores than those of crowdfunding products which are unsuccessful.

Table 3. Results of the independent sample t-test - novelty, usefulness, and overall creativity

	Successful		Unsuccessful		df	t	p	Cohen’s d
	M	SD	M	SD				
Novelty	3.03	1.06	2.35	1.15	198	4.35	<0.001	0.62
Usefulness	3.80	1.10	2.60	1.29	193	7.09	<0.001	1.00
Overall Creativity	3.26	0.87	2.23	0.99	198	7.79	<0.001	1.11

4 DISCUSSION

According to the case study results, as indicated in Tables 2 and 3, the overall creativity degree of a crowdfunding product has a positive relationship with the performance of its crowdfunding campaign. In other words, if a product has a higher overall creativity score, the product has a moderately higher chance of success in its crowdfunding campaign. In terms of the two key factors of creativity in design, if a product has higher novelty and/or usefulness scores, the product's crowdfunding campaign has a higher chance of success. However, the relationship is weak between a product's novelty score and whether the product could succeed in the campaign, while the relationship is moderate for usefulness and overall creativity.

The case study results show that the creativity degree, including its two key elements: novelty and usefulness, of a product does positively contribute towards the success of a crowdfunding campaign. Therefore, creativity could be considered a successful crowdfunding factor, while novelty and usefulness could be considered successful sub-factors. In addition, the results show that the usefulness of a product tends to have a stronger relationship with its crowdfunding performance in comparison with the product's novelty. This indicates that the usefulness of a product contributes more towards the success of its crowdfunding campaign compared with the novelty of the product.

In order to provide more insights into the relationship between creativity and crowdfunding performance, the five experts were also invited to rate their willingness to back the 40 product sample projects using the same five-point Likert-type scale as indicated in the preceding. The Cronbach's alpha value of the ratings of the willingness to back the projects is 0.873, which has suggested a better internal consistency among the five experts. A Pearson's Correlation test is then conducted to measure the strength and direction of relations existing between novelty, usefulness, overall creativity, and the willingness to back the project, respectively.

Table 4. Results of the Pearson's correlation test - willingness to back the project

	Novelty	Usefulness	Overall Creativity
Willingness to Back the Project	0.492**	0.765**	0.717**

* $p < 0.05$; ** $p < 0.01$.

The results of the Pearson's Correlation test are shown in Table 4. The interpretation of the strength of the Pearson's Correlation coefficient (r_p) is based on the same guide proposed by [Dancey and Reidy \(2007\)](#) which is used to interpret the results of the Point-Biserial Correlation test in the preceding. As shown in the table, there is a statistically highly significant positive and moderate correlation between novelty and the willingness to back the project ($r_p = 0.492^{**}$), a highly significant positive and strong correlation between usefulness and the willingness to back the project ($r_p = 0.765^{**}$), and a highly significant positive and strong correlation between overall creativity and the willingness to back the project ($r_p = 0.717^{**}$).

The Pearson's Correlation analysis implies that there is a moderate relationship between a product's novelty and whether the design experts would like to fund the project, while there is a strong relationship between a product's usefulness, as well as its overall creativity, and whether the experts would like to fund the project. Thereby, based on the case study conducted and the additional analysis performed, this paper implies that the experts consider creativity as an important factor of a product in the crowdfunding campaign while deciding whether to fund the project, and the experts are more likely to fund products that are creative. It is also implied that the experts consider the usefulness of a product more important than its novelty while making funding decisions.

However, with the limited number of product samples and expert assessors concerned in this paper, it is suggested that although there is a strong relationship between the creativity degree of a product and the willingness of the experts to fund the project, the relationship between the creativity and its crowdfunding campaign performance is only moderate. Therefore, a further Point-Biserial Correlation test is conducted to explore the correlation between the willingness to back the project of the experts and the performance of the crowdfunding campaign. The result shows there is a statistically highly significant moderate and positive correlation between them ($r_{pb} = 0.417^{**}$). Thus, it implies creative

products might not necessarily lead to success in crowdfunding campaigns. However, creative products, particularly useful ones, are more likely to attract design experts' willingness to fund the crowdfunding project. This could be considered a reflection of the results indicated by [Oo et al. \(2019\)](#) and [Wang et al. \(2020\)](#) that creativity plays a significant role in attracting backers in crowdfunding campaigns.

The outcomes of this paper have complied with the hypothesis proposed which indicated that a highly creative crowdfunding product is more likely to succeed in its crowdfunding campaign compared with a less creative product. It is also shown that the usefulness of a product tends to be more important than its novelty in successful crowdfunding campaigns. Therefore, the main findings of this paper suggest that the creator or founder of a crowdfunding campaign should enhance its product's creativity, particularly its usefulness, to increase the possibility of crowdfunding success, while still maintaining high-quality pledging conditions, founder characteristics, and project properties.

However, the results of the case study conducted might be influenced by the limitation of the number of product samples used. Therefore, more product samples, including more product varieties, from several different crowdfunding platforms, such as Kickstarter and Indiegogo, will be collected for further research and analysis. Another limitation is the number of design expert assessors employed, of which more experts are planned to be employed in future studies to provide more reliable results. As indicated in the preceding, crowdfunding is a process of asking a large group of backers to fund a project that needs investment, while design experts are different from general backers due to the differences in their knowledge, experience and understanding towards design products. The design experts employed in the case study might not truly reflect the general backers' understanding of design creativity and willingness to fund crowdfunding projects. Thereby, general backers will also be recruited in future research to further study design creativity and crowdfunding performance, involving additional elements such as the number of backers who participated and the funds pledged.

5 CONCLUSIONS

Reward-based crowdfunding is becoming an increasingly popular business model for supplying the investment of a project that needs investment by asking a large group of people, particularly in the domain of product design. Although creativity plays a significant role in product design and is considered an important design success factor, previous studies have not provided enough evidence to demonstrate the relationships between design creativity and crowdfunding product design projects. To provide more insights on this, a case study has been conducted in this paper by employing expert evaluations of selected successful and unsuccessful crowdfunding product design project samples. For the limited numbers of samples and expert assessors, the results of the study have indicated that there is a positive relationship between the creativity of a product and the success of its crowdfunding campaign. Moreover, the usefulness of the product is considered related more closely to its crowdfunding success compared with the product's novelty. A creative product, especially one possessing high usefulness values, is more likely to succeed in its crowdfunding funding campaign in comparison with less creative ones. Therefore, this paper shows that creativity is considered a success factor of crowdfunding. In addition, the paper also suggests creative products, especially useful ones, might have more potential to attract people's willingness to fund them. However, this is informed based on the experts' evaluation results, which might not be a generalisable result that could be applied to the general public. Future studies for addressing these limitations and exploring the area further have been indicated in the discussion section.

The paper has presented a contribution to the body of knowledge in research on design, creativity, innovation, product design and development, and funding business models. The results obtained have provided useful insights into the role of design creativity in reward-based crowdfunding. In practice, it suggests crowdfunding creators improve the degree of design creativity of a product to enhance its crowdfunding performance and increase its success rate. Most importantly, this paper raises the significance of the role of design creativity in design-related, as well as business-related, research areas and professional practice.

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