



## **SIMILARITIES AND DIFFERENCES BETWEEN HUMOROUS AND SURPRISING PRODUCTS**

**Borgianni, Yuri (1); Hatcher, Gillian (2)**

1: Free University of Bolzano-Bozen, Italy; 2: University of Strathclyde, United Kingdom

### **Abstract**

Innovative products can be described as both useful and novel— or ‘unexpected’. Literature suggests that surprise combined with humour may be a powerful tool in creating the positive ‘unexpectedness’ than can enhance perceived value and foster meaningful relationships between product and user. Surprise and humour both rely on mismatches of expectations and unexpected outcomes, however, they are not inter-changeable. Their relationship when embodied in product design is not fully understood, and guidelines for creating surprising and humorous products with long-lasting impact have yet to be defined. The objective of this research was to analyse the mutual effect taking place between the perception of humour and the display of surprise embodied in products, and in particular the capability of humorous characteristics to boost the effect of surprise. Building on previous experiments in which a set of products were evaluated for surprise, we verified humour in the same products with a group of comedians and non-comedians. Results indicate that products evaluated as ‘funny’ positively influence their capability to evoke surprise, but other factors are likely to be highly influential.

**Keywords:** Surprise, Humour, Design methods, Creativity, Early design phases

### **Contact:**

Dr.-Ing. Yuri Borgianni  
Free University of Bolzano-Bozen  
Faculty of Science and Technology  
Italy  
yuri.borgianni@unibz.it

Please cite this paper as:

Surnames, Initials: *Title of paper*. In: Proceedings of the 21<sup>st</sup> International Conference on Engineering Design (ICED17), Vol. 8: Human Behaviour in Design, Vancouver, Canada, 21.-25.08.2017.

# 1 INTRODUCTION

It has been well established that companies must continually innovate to remain competitive, and that creativity should therefore be a priority throughout the product development process. An innovative product is typically described as not only useful but also novel, or ‘unexpected’. Designers of successful products often utilise this ‘unexpectedness’ factor to differentiate their products from competitors while delivering a high emotional impact upon potential customers. In a world full of increasing convenience and seemingly unlimited (and overwhelming) consumer choice, experience and the emotional connection between products and users is recognised as key to modern innovation (Jordan, 2002; Norman, 2005; Prahalad and Ramaswamy, 2004). Two ways in which designers might create unexpected and emotionally engaging products is through the embodied experiences of surprise and humour.

Both humour and surprise have been linked to creativity and intelligence (Peters, 1998, Isen et al., 1987, Ziv, 1976, Filipowicz, 2006). The two are in many ways similar phenomena — both rely on mismatches of expectations and unexpected outcomes. However, they are not inter-changeable. Humour typically involves an element of surprise (e.g. the unexpected punchline to a joke), but not all surprises are humorous (e.g. a surprise birthday party). Furthermore, surprise may be a positive or negative emotion depending upon the nature and context of the experience, whilst humour is generally perceived as a positive experience, albeit to varying degrees. In the field of advertising, Alden et al. (2000) propose that surprise becomes humorous when combined with warmth, playfulness and ease of resolution, and that surprise is the factor that makes incongruities amusing. Ming-Huang and Shih-Hung (2014) exploit constructs of humour in order to explain phenomena of delayed surprise.

Surprise combined with humour may be a powerful tool in creating the positive unexpectedness that can enhance the perceived value of a product, and may also foster meaningful relationships between the product and user (Ludden et al., 2012). Innovative products that surprise and amuse will not only attract users at the point of sale, or first interaction, but will continue to delight throughout the product’s lifetime. Although often considered ‘one time’ experiences, many jokes continue to be humorous upon repetition, possibly because they have established an association with positive emotions (Suls, 1972, Gavanski, 1986). Similarly, studies in the field of advertising suggest that creative design structures may retain their surprise factor across multiple exposures (Goldenberg and Mazursky, 2008).

The relationship between humour and surprise when embodied in product design is not fully understood, and methods to create surprising and humorous products with long-lasting impact have yet to be explored. The research outlined in this paper contributes towards a greater understanding of the relationship between the two emotional responses in product design. Building on previous research on the characteristics of surprising products, the authors conducted a preliminary investigation to determine the link between products that are perceived as surprising and products that are perceived as humorous. Definitions and theory of both phenomena and their affinities are provided in Section 2. Section 3 clarifies the scope of the present study, and the experimental design is illustrated in Section 4. Section 5 reports the outcomes of the investigation and presents the found relationship between humorous and surprising products, and discussions and final remarks are included in Section 6.

## 2 DEFINITIONS AND BACKGROUND

### 2.1 Meaning of humour

‘Humour’—the quality of being amusing or comedic— can be expressed in many different forms: an image, a written joke, a physical performance or even a product design. An ability to appreciate humour is something that is inherent in most people, and when we encounter something we find humorous, we experience positive feelings of surprise and amusement, which may or may not be accompanied by laughter (Mireault and Reddy, 2016). Humour is subjective and context-dependent; and its mechanisms have challenged philosophers and scientists for centuries. Today there are several complementary and competing theories which try to explain the social and cognitive processes behind humour:

- Superiority theory: we are amused by the misfortune of others (Bergson, 1911)
- Relief theory: humour is a release of nervous energy, reducing psychological tension (Freud, 1960)
- Incongruity theory: humour arises when two seemingly incompatible references overlap in a surprising yet satisfying way (Suls, 1972)

- Benign-violation theory: humour arises when our view on how the world 'ought to be' is challenged or violated, but the threat is perceived as benign (McGraw and Warren, 2010)

It is the incongruity theory that is most often associated with creative design, as an innovative product can be said to emerge from the combination of seemingly unrelated or incongruous ideas, or the discovery of a surprising analogy. Like a humorous joke, the resultant solution in a creative design process is unexpected and surprising. And, like humourists, designers are seeking combinations that are not only unexpected, but are also resolved in a way that is satisfying to their intended audience (Gero, 1996; Yi et al., 2013). However, like jokes, if the combination (or punchline) is too obvious, or too obscure or confusing, the solution will not be perceived as innovative (Berlyne, 1972; Giora et al., 2004; Wodehouse et al., 2014).

Theories such as the incongruity theory attempt to explain the overall phenomenon of humour. On a practical level, humourists will utilise a variety of tools and techniques known to generate amusement and laughter, such as wordplay, exaggeration, absurdity, repetition or irony (Schwarz, 2010; Attardo, 2014). Similarly, a designer may apply various design guidelines to achieve a desired outcome.

## 2.2 Meaning of surprise and triggers of unexpectedness

Although more acknowledged than humour, the role of surprise within design creativity is considerably disagreed upon. Firstly, while some scholars identify surprise as an independent dimension of creativity, others include it within the categories that classify various levels of novelty (Becattini et al., 2017). Secondly, according to a more psychological-oriented perspective, surprise cannot be directly embodied in creative outcomes, but instead is a phenomenon and emotional reaction displayed by people when faced with extremely creative products (Wiggins, 2006).

What is uncontested is the close relationship, if not identity, between surprise and any form of unexpectedness. Surprise emerges whenever an individual is exposed to a situation that violates expectations and/or when clear expectations had not been formulated beforehand. Given the role played by expectations, these clearly belong to individual experience and knowledge, and the experience of surprise is affected accordingly. For this reason, an overall measure of surprise is difficult to determine — some attempts consider a global scale within a given community and relate the extent of surprise to rarity of things or unlikelihood that something will happen (Dean et al., 2006).

This mismatch between what is expected and what is actually displayed represents a common trait between surprise and humour, with a special reference to the incongruity theory. Creating mismatches and inducing users to experience unexpected situations are seen as general rules in the development of methods supporting "design for surprise". Scholars are currently investigating the most common kinds of mismatches in order to create catalogues of surprise prompts. Sets of specific guidelines have been recognized in a variety of surprising artefacts. The initial list proposed by Ludden et al. (2008) has been refined and integrated by Rodríguez Ramírez (2014). With closer attention to design cognition, other attempts strive to provide a more abstract representation of the drivers that enable the presence of unexpected features (Becattini et al., 2015) in order to devise a more concise list of surprise triggers.

## 2.3 Leveraging humour and surprise to boost design creativity

The authors believe that dimensions of humour and surprise can occur in any aspect of the creative design process simultaneously. With reference to the 4Ps' model (see its dimensions in the bullet list below), which describes the loci in which creativity can be leveraged or manifest (Rhodes, 1961), the domains in which both humour and surprise can be included are:

- Person: the capability designers to use constructs of humour and/or surprise;
- Place: the design environment and setting;
- Process: the process that is followed;
- Product: the output of the design task, for which humour is currently most overlooked.

To date, most design research on humour has focussed upon its ability to enhance creativity during the design process. There have been a number of studies around this topic, with interventions including the participation in improvised comedy prior to ideation (Kudrowitz and Wallace, 2010; Ludovice et al., 2013); showing humorous videos during brainstorming (Wodehouse et al., 2014); and ideation methods modelled on humour creation processes (Wodehouse et al., 2014; Hatcher et al., 2016).

Less attention has been paid to the value of embodied humour in the design of products and services. Yu et al (2014) identified key principles for the design of humorous products. They propose that humour

can be embodied through cognitive incongruity, emotional superiority or relief from social violation. In this sense, according to the above product-oriented surprise guidelines, design creativity has benefitted from humour and surprise in very different ways. Providing a greater understanding of the possible coexistence of humour and surprise in products is the core objective of this paper.

## 2.4 Humour and surprise in design literature: further relationships

Ludden et al. (2012) discuss the link between humour and surprise in relation to sensory incongruities in product characteristics. They used ‘appropriate’ (close) and ‘inappropriate’ (non-close) connections to create rubber ducks and roll-on deodorants with surprising sensory properties, and recorded participants’ surprise and amusement when interacting with these products. Results showed that while both appropriate and inappropriate incongruities were surprising, appropriate incongruities were rated as more amusing and likeable, suggesting that the resolution of the surprise (e.g. through humour theory) is key to creating positive user experiences. Similarly, in a study of the influence of surprise in mousetrap design, Rodríguez Ramírez (2012) found that surprise lowered the desirability of the products unless that surprise was accompanied by positive emotions.

With a closer look at the strategies that enable creativity through unexpectedness, a designer can trigger a humour response from a user by employing techniques such as creating unexpected functions, self-deprecating products and visualizations of taboos. Some of these humour principles bear resemblance to the drivers potentially leading to surprising products outlined in Becattini et al. (2017), as shown in Table 1. These similarities provide some indication of the relationship between embodied surprise and humour in design.

*Table 1: comparison of characteristics relevant to design that feature surprise and humour, highlighting affinities between the two domains*

| <b>‘Surprise’ triggers (Becattini et al., 2017)</b> | <b>‘Humour’ characteristics (Yu and Nam, 2014)</b>   |
|---|--|
| Habits (mismatch with social routine)               | Cognitive incongruity (unconventional use); relief from social violation (bizarre consequence) |
| Ethics (mismatch with morality)                     | Relief from social violation (visualization of taboos, destructive play)                       |
| Aesthetics (mismatch with perception of beauty)     | Cognitive incongruity (unconventional shape)   |
| Unexpected behaviour                                | Cognitive incongruity (unexpected functioning)   |
| Absence of an expected feature                      | -  |
| Unexpected combination of features                  | -  |
| Unexpected modification of a feature                | Cognitive incongruity (unconventional shape)   |

As highlighted in the table, many affinities between surprise triggers and humour characteristics can be found. However, it can be observed that the identified humour characteristics represent a subset of the surprise characteristics. From a theoretical viewpoint, this supports the hypothesis that humour is a catalyst of surprise reactions. However, they may also be guided by other drivers, as discussed at the beginning of this subsection and the initial intuitive arguments presented in the Introduction.

## 3 CLARIFICATION OF OBJECTIVES

As mentioned in previous sections, this study aims to verify whether simultaneous phenomena of humour and surprise take place when individuals are exposed to unusual products. More specifically, the scope is a preliminary assessment of the ability of the former to enhance the effect of the latter. The authors have highlighted that many surprise triggers mirror processes behind humour — which may be considered a partial, although meaningful, set of unexpectedness drivers.

Previous sections have also pointed out how the emergence of surprise can be considered a predominantly individual phenomenon, as personal knowledge and experience is critical in shaping expectations. Consequently, violations of said expectations may occur according to the individual’s ability to navigate products and situations that are not commonly encountered in daily life. In the study, previous experiments available to the authors were utilised, in which evaluators identified the most surprising artefacts among a set of potentially bewildering, bamboozling or startling product depictions.

These evaluations have been used as proxies of the degree of surprise displayed by the analysed products. More details are provided in the next section.

Although individual sensibility can also be deemed relevant, humour originates from an artistic context and follows more well-established procedures and techniques than the display of surprise. It should therefore be verified if the humour content embodied in products can be expressed as an objective measure, or if subjectivity is still extremely significant in humour perception. To explore these questions, the authors verified agreement on the humour embodied in the same products with a group of comedy writers and performers, who are well aware of the fundamentals of humour as an art discipline. Hence, they were considered experts in the field.

## **4 DESCRIPTION OF THE EXPERIMENT**

### **4.1 Potentially surprising products used in previous tests**

As indicated in Section 3, the authors have exploited preliminary information about the level of surprise displayed by a set of products. Specifically, the outcomes of two different testing campaigns have been acquired:

- A sample of 12 unusual lamps has been deployed in (Becattini et al., 2017) in order to verify the completeness of a set of triggers potentially leading to the design of surprising artefacts. 23 analysts within the field of design or industrial engineering defined which lamps they considered surprising and clarified their reasoning. The number of evaluators whose expectations were confounded by each lamp is reported in Table 3 of the same publication — these results can be considered a proxy of the capability of the products under investigation to generate surprise.
- A large-scale exploration of individual reactions to potentially surprising items has been performed in order to acquire knowledge about cognitive processes underpinning surprise phenomena. The results of this test are partially documented in (Becattini et al., 2016). In order to describe their individual reaction and explain their reasons for unexpectedness, 100 anonymous evaluators have preliminarily selected 3 out of 10 products, which they judged as the most surprising. The frequency of each product within the top 3 positions, which could be extrapolated by having the whole set of outcomes available, can be interpreted as a measure of surprise in this case.

As inferable from the above information, the main aim of both tests was not the assessment of the level of surprise evoked by products, which could be considered a side result of the two experiments.

The authors decided to utilise these results and assess the level of humour in the same products with a different set of evaluators. Different evaluators were used because the respondents' knowledge of humour constructs and techniques was not known a priori, and because anonymous respondents participating in the large-scale survey could not be re-contacted. On the other hand, it was considered potentially misleading to submit the new participants questions about their perceptions of both surprise and humour. Two phenomena could potentially take place:

- Some people may not thoroughly discern the difference between humour and surprise definitions.
- In cases of frequent equal evaluations of surprise and humour, some respondents could resort to automatically providing equal evaluations for both properties, especially for products appearing at the bottom of the list.

The existence of these biases, which derive from authors' assumptions, should be verified in future work. It is also necessary to clarify the following:

- The surprise evaluations arising from the above experiments were recorded and calculated differently and cannot be considered equivalent. Specific measures have been undertaken to overcome this issue, as explained later in the paper.
- A product, namely the *Levitating Lamp*, was included in both sets of potentially surprising objects.

### **4.2 Questionnaire to assess humour content of products**

The products belonging to the two mentioned samples were assessed in terms of their ability to evoke humour. To the authors' best knowledge and a literature investigation, no standard procedure to evaluate product humour exists. Authors have therefore employed a qualitative ordinal scale, which has been previously used in (Kudrowitz and Wallace, 2010) to rate cartoon captions. Such a Likert scale includes three different levels of humour, namely *not funny*, *somewhat funny* and *funny*.

It was the authors' intention to replicate the conditions in which the other evaluators judged the surprising effect of the investigated products. In particular, while the function and characteristics of the lamps were explained in a short paragraph, the other products were simply displayed as an image, and therefore any surprising effect would emerge from the product's visuals only. The recalled *Levitating Lamp* was included only in the first set; hence, the global number of evaluated products was 21.

According to these prescriptions and the described scale, a questionnaire was formulated in the form of a two-sheet Excel file. Interested readers and anyone willing to repeat the experiment can freely access the file at the following link:

[https://drive.google.com/open?id=0B7kYu7ef8x\\_FR1FQd3hPQzJTQW8](https://drive.google.com/open?id=0B7kYu7ef8x_FR1FQd3hPQzJTQW8).

Invited testers were contacted by email and informed about their expected task.

### 4.3 Consistence of experts' evaluations

To help understand if the humour embodied in the products could be objectively rated, fifteen people leveraging humour in their professional or semi-professional lives answered the questionnaire, including stand-up comedians, sketch comedy writers and cartoonists. These experts live in the same country and can therefore be expected to possess a reasonably uniform culture.

The assessment of the consistency of their evaluations in terms of humour embodied in the presented products had to be performed by taking into account:

- A large number of raters;
- The presence of a variable for which an ordinal scale had been assigned;
- A variety of objects (the 21 potentially surprising products) for which evaluations have been provided.

Krippendorff's alpha coefficient was considered a suitable measure for this task, because of its flexibility in terms of rating conditions in experiments concerning human psychological responses (Hallgren, 2012) and its claimed capability to provide a statistical measure of agreement in any test circumstances (Hayes and Krippendorff, 2007). The computed Inter-Rater Reliability (IRR) measure resulted in an alpha value equal to approximately 0.29. The software Stata 13 and an ad-hoc add-in were used to perform the calculation; these tools allowed for the indication of the presence of an ordinal rating variable.

The resulting Krippendorff's alpha coefficient was evaluated in accordance with Landis and Koch (1977), which allows inference of the existence of a fair agreement between raters. This result demonstrates a moderate convergence in the evaluation task, but does not permit consideration of the humour content as a shared and objective measure — an alpha coefficient greater than 0.6 would be required. Thus, this outcome emerged despite the aforementioned common background of raters.

Lastly, the experiment with experts supported the need for leveraging humour content as a subjective parameter and considering it as a statistical variable instead of an unbiasedly agreeable measure.

### 4.4 Extension of the experiment

While the number of experts was considered appropriate for an IRR test, this quantity was deemed unsuitable for a statistical test. Consequently, the questionnaire was submitted to further participants, including colleagues, friends and students attending the classes of the authors. People participating in the surprise tests were not involved because of their supposed bias. The perception and sense of humour of the additional participants was considered irrelevant to the scope of the test.

The extension of the survey achieved an overall number of 47 respondents. Although their demographic data was not requested, personal knowledge of the participants provides some indications:

- The set is composed by 19 women and 28 men;
- Their age ranges between 20 and 55;
- They all live in European countries; and their mother tongues are English, German, Italian, Slovenian or Spanish.

## 5 ANALYSIS OF THE RESULTS

The objective of the analysis was to explore the mutual effect taking place between the perception of humour and the display of surprise. In particular, the influence of humour on the impact of surprising products.

Table 2 summarizes the outcomes of the administered questionnaires, by illustrating the share of respondents addressing the examined products as *not funny*, *somewhat funny* and *funny*. Data are affected by a few missing answers. Surprise scores emerging from the experiments outlined in 4.1 are also presented. Just in order to compare the two subsets of items (12 lamps and 9 other products), for which different procedures to extrapolate surprise assessments are employed, a common measure of surprise has been introduced (last column of the table). Surprise scores concerning each subset follow a normal distribution with the following parameters:

- Mean 0.449 and standard deviation 0.204 for lamps;
- Mean 0.3 and standard deviation 0.167 for the other products.

Transformed surprise scores represent the cumulative normal distribution values associated with the original index shown by each product in the relevant subgroup, hence in the corresponding Gaussian function characterized by the above means and standard deviations.

*Table 2: indexes concerning humour content and surprise rates emerging from the described test. The bold line separates lamps from other products*

| Product                        | <i>Not funny</i><br>percentage | <i>Somewhat funny</i><br>percentage | <i>Funny</i><br>percentage | Surprise score | Normalized<br>surprise score |
|--------------------------------|--------------------------------|-------------------------------------|----------------------------|----------------|------------------------------|
| On Edge Lamp                   | 0.149                          | 0.468                               | 0.383                      | 0.739          | 0.922                        |
| Lamp on/off                    | 0.362                          | 0.447                               | 0.191                      | 0.348          | 0.310                        |
| Fisherman's<br>tears           | 0.659                          | 0.182                               | 0.159                      | 0.609          | 0.782                        |
| Euro-Condom                    | 0.362                          | 0.277                               | 0.362                      | 0.304          | 0.239                        |
| Fly lamp                       | 0.447                          | 0.340                               | 0.213                      | 0.261          | 0.178                        |
| Titania Lamp                   | 0.511                          | 0.267                               | 0.222                      | 0.348          | 0.310                        |
| Levitating lamp                | 0.170                          | 0.234                               | 0.596                      | 0.913          | 0.988                        |
| Leaf lamp                      | 0.553                          | 0.255                               | 0.191                      | 0.348          | 0.310                        |
| Workstation<br>Lamp            | 0.543                          | 0.326                               | 0.130                      | 0.348          | 0.310                        |
| Blooming Heck!                 | 0.255                          | 0.277                               | 0.468                      | 0.478          | 0.556                        |
| FlexLamp                       | 0.489                          | 0.319                               | 0.191                      | 0.435          | 0.472                        |
| Konko                          | 0.511                          | 0.319                               | 0.170                      | 0.261          | 0.178                        |
| Toilet paper Hat               | 0.244                          | 0.289                               | 0.467                      | 0.650          | 0.982                        |
| Rubik Cube for<br>blind people | 0.422                          | 0.356                               | 0.222                      | 0.240          | 0.360                        |
| Baby-mop                       | 0.333                          | 0.333                               | 0.333                      | 0.130          | 0.155                        |
| VW sidecar                     | 0.267                          | 0.444                               | 0.289                      | 0.260          | 0.405                        |
| Masochists'<br>coffeepot       | 0.273                          | 0.295                               | 0.432                      | 0.330          | 0.571                        |
| Transparent<br>toaster         | 0.489                          | 0.289                               | 0.222                      | 0.260          | 0.405                        |
| Sideways<br>rocking chair      | 0.222                          | 0.467                               | 0.311                      | 0.320          | 0.548                        |
| Magic bottle<br>holder         | 0.467                          | 0.244                               | 0.289                      | 0.190          | 0.255                        |
| Fork and cutter<br>for pizza   | 0.378                          | 0.356                               | 0.267                      | 0.510          | 0.895                        |

Linear regression functions have been generated, also through Stata software, to determine the impact of the humour percentages on surprise scores. The values associated with *somewhat funny* and *funny* were deployed as regressors (the residual score is clearly a linear combination of the other two variables). Surprise scores therefore represented the dependent variable of the regressions. The normalized versions were used when lamps and other products were taken into account simultaneously.

Table 3 summarizes the results of the regressions, highlighting the magnitude of the influence of the regressors (by means of the corresponding regression coefficients) and their statistical relevance (by

means of the corresponding p-values). P-values lower than 0.05 (marked with a star in the table), as a common rule of thumb, indicate that the relationship between the pertaining regressor and the supposedly dependent variable is statistically significant. Table 3 also includes the statistics squared-R (R<sup>2</sup> in the last column), representing the capability of the employed regressors to explain the studied phenomenon.

*Table 3: summary of the outcomes obtained with the linear regressions, distinguished according to the employed product samples*

| Observed items | <i>Somewhat funny</i>  |         | <i>Funny</i>           |         | R <sup>2</sup> |
|----------------|------------------------|---------|------------------------|---------|----------------|
|                | Regression coefficient | p-value | Regression coefficient | p-value |                |
| Lamps          | -0.099                 | 0.873   | 0.958                  | 0.020*  | 47.3%          |
| Other products | 0.149                  | 0.856   | 1.006                  | 0.192   | 26.6%          |
| Both subsets   | 0.069                  | 0.921   | 1.268                  | 0.010*  | 31.5%          |

According to the presented results, the following conclusions can be drawn.

- There are non-negligible dissimilarities in results when the two different product sets are employed.
- Products evaluated as 'funny' by a high percentage of respondents are more likely to also be rated highly for surprise; and constantly positive regression coefficients, low p-values can be observed.
- Intermediate scores of humour perception do not greatly affect the manifestation of surprise, their effect is not always positive, and statistical significance is absent.
- Evaluations concerning humour, at least with reference to the used scale, have a moderate explaining power in the emergence of surprise.

The authors have replicated the same statistical analyses by considering the two groups of respondents (experts and non-experts) separately. Results regarding both groups are largely similar to outcomes depicted in Table 3.

## **6 DISCUSSIONS AND CONCLUSIONS**

The paper has described a study with the aim of verifying the supposed relationship between surprise and humour embedded in products. Whereas the surprise dimension of physical objects has been investigated in literature, research about the presence of humorous nuances in artefacts is still in its infancy. According to theoretical insights, the processes and drivers underpinning the manifestation of surprising and humorous reactions largely overlap. However, the triggers that cause unexpectedness include factors that cannot be assigned to the humour domain. Furthermore, other authors have proposed that the simultaneous manifestation of humour and surprise can support creative design through the development of products capable of delivering lasting positive emotions.

The performed experiment involved the evaluation of two different samples of products, whose capability to generate surprise had been assessed in previous tests. The participants in this experiment consisted of two different sets of individuals, one of which included people with considerable experience in the fields of comedy and comics. With reference to the results, the main findings are reported at the end of previous section. It has to be highlighted that the products evaluated as funny by many respondents have greater probability of also being rated as surprising, while products with moderate humour ratings did not display a similar probability of being rated as surprising. At the same time, whereas humour embedded in products is meaningfully correlated with surprise, it is clear that other non-negligible factors are present which require further investigation. These outcomes support the authors' initial thoughts, however they require further verification due to inherent limitations of the present study. Future work is discussed below, with reference to said limitations.

Firstly, the authors assumed that the simultaneous judgement of humour and surprise would have resulted in biased evaluations, as the two dimensions could have been indistinguishable by some participants. This assumption requires verification, and the authors plan to conduct a further experiment to assess the extent of this potential phenomenon. However, convergence between humour and surprise ratings in any future test would support the validity of the presented findings. Second, although the results point to a clear contribution of humour in terms of boosting surprising reactions, the extent of the correlation between the two studied dimensions differs for the two product samples substantially.



This could be due to the original selection of these sets of artefacts, which was designed to study drivers and cognitive processes behind unexpectedness, and not directly the magnitude of neither surprise, nor humour reactions. As a result, more appropriate samples of products should be used in future studies. Nevertheless, available data are worth analysing further. Table 2 displays many cases in which surprise and humour rates are both low or both high, and the corresponding products contribute to determining a significant correlation between the two variables. Also, some surprising products were rated as funny to a much lower extent — this may be explained by unexpectedness triggers that do not correspond with humour characteristics, as inferable from Table 1. Such misalignments should be better verified in order to check whether other circumstances could cause unexpectedness without humorous reactions. In addition, a few products with high humour rates presented low surprise scores. This outcome does not comply with the discussed fundamental theory, and requires further research.

As anticipated in previous sections, the effects and relationship of surprise and humour should also be investigated with regard to other aspects of the design process. In particular, whereas humorous thinking has been leveraged in design activities described in the literature, the authors are not aware of similar experiments in which surprise represented the fundamental driver.

Finally, the real benefits of designing humorous and surprising products deserves future attention. Whereas some typologies of incongruities can supposedly lead to pleasurable experiences for users, it can be hypothesized that certain mismatches leading to extraordinary designs, highly ranked in terms of both surprise and humour, can be effective in the creation of enduring positive emotions.

## REFERENCES

- Alden, D. L., Mukherjee, A. and Hoyer, W. D. (2000) “The effects of incongruity, surprise and positive moderators on perceived humor in television advertising”, *Journal of Advertising*, 29(2), 1-15. <https://doi.org/10.1080/00913367.2000.10673605>
- Attardo, S. (2014) *Encyclopedia of humor studies*, Thousand Oaks: SAGE Publications.
- Becattini, N., Borgianni, Y., Cascini, G. and Rotini, F. (2015) “Surprise as a situated phenomenon”, *20th International Conference on Engineering Design*, Milan, Italy
- Becattini, N., Borgianni, Y., Cascini, G. and Rotini, F. (2016) “Surprise as the inconsistency of FBS variables in evaluators' interpretation?”, *Fourth International Conference on Design Creativity*, Atlanta.
- Becattini, N., Borgianni, Y., Cascini, G. and Rotini, F. (2017) “Surprise and design creativity: investigating the drivers of unexpectedness”, *International Journal of Design Creativity and Innovation*, 5, 29-47. <http://dx.doi.org/10.1080/21650349.2015.1090913>
- Bergson, H. (1911) *Laughter: An Essay on the Meaning of the Comic*, translated by Brereton, C. and Rothwell, F., New York: The Macmillan Company.
- Berlyne, D. E. (1972) “Humor and its kin”, *The psychology of humor: Theoretical perspectives and empirical issues*, 43-60.
- Dean, D. L., Hender, J. M., Rodgers, T. L. and Santanen, E. (2006) “Identifying good ideas: constructs and scales for idea evaluation”, *Journal of Association for Information Systems*, 7(10), 646-699.
- Filipowicz, A. (2006) “From positive affect to creativity: The surprising role of surprise”, *Creativity Research Journal*, 18(2), 141-152. [https://doi.org/10.1207/s15326934crj1802\\_2](https://doi.org/10.1207/s15326934crj1802_2)
- Freud, S. (1960) *Jokes and their Relation to the Unconscious*, translated by Strachey, J., London: Routledge & Kegan Paul Ltd.
- Gavanski, I. (1986) “Differential sensitivity of humor ratings and mirth responses to cognitive and affective components of the humor response”, *Journal of personality and social psychology*, 51(1), 209. <https://doi.org/10.1037//0022-3514.51.1.209>
- Gero, J. S. (1996) “Creativity, emergence and evolution in design”, *Knowledge-Based Systems*, 9(7), 435-448. [https://doi.org/10.1016/s0950-7051\(96\)01054-4](https://doi.org/10.1016/s0950-7051(96)01054-4)
- Giora, R., Fein, O., Kronrod, A., Elnatan, I., Shuval, N. and Zur, A. (2004) “Weapons of mass distraction: Optimal innovation and pleasure ratings”, *Metaphor and Symbol*, 19(2), 115-141. [https://doi.org/10.1207/s15327868ms1902\\_2](https://doi.org/10.1207/s15327868ms1902_2)
- Goldenberg, J. and Mazursky, D. (2008) “When deep structures surface: Design structures that can repeatedly surprise”, *Journal of Advertising*, 37(4), 21-34. <https://doi.org/10.2753/joa0091-3367370402>
- Hallgren, K. A. (2012) “Computing inter-rater reliability for observational data: an overview and tutorial”, *Tutorials in quantitative methods for psychology*, 8(1), 23. <https://doi.org/10.20982/tqmp.08.1.p023>
- Hatcher, G., Ion, W., Wodehouse, A., Maclachlan, R., Simpson, B. and Sheridan, M. (2016) “Humour Processes for Creative Engineering Design”, *Proceedings of the DESIGN 2016 14th International Design Conference*, Dubrovnik. <http://dx.doi.org/10.15129/7a8c5e1e-988b-4f32-ba9a-0ad8c01c0dc6>
- Hayes, A. F. and Krippendorff, K. (2007) “Answering the call for a standard reliability measure for coding data”, *Communication methods and measures*, 1(1), 77-89. <https://doi.org/10.1080/19312450709336664>

- Isen, A. M., Daubman, K. A. and Nowicki, G. P. (1987) "Positive affect facilitates creative problem solving", *Journal of personality and social psychology*, 52(6), 1122. <https://doi.org/10.1037//0022-3514.52.6.1122>
- Jordan, P. W. (2002) *Designing pleasurable products: An introduction to the new human factors*, CRC press. <https://doi.org/10.4324/9780203305683>
- Kudrowitz, B. and Wallace, D. (2010) "Improvisational Comedy and Product Design Ideation: Making Non-Obvious Connections between Seemingly Unrelated Things", *Proceedings of the International Conference on Design and Emotion*. Chicago.
- Landis, J. R. and Koch, G. G. (1977). "The measurement of observer agreement for categorical data", *Biometrics*, 33(1), 159-174.
- Ludden, G. D., Kudrowitz, B. M., Schifferstein, H. N. and Hekkert, P. (2012) "Surprise and humor in product design", *Humor*, 25(3), 285-309. <https://doi.org/10.1515/humor-2012-0015>
- Ludden, G. D., Schifferstein, H. N. and Hekkert, P. (2008) "Surprise as a design strategy", *Design Issues*, 24(2), 28-38. <https://doi.org/10.1162/desi.2008.24.2.28>
- Ludovice, P., Lefton, L. and Catrambone, R. (2013) "Humorous Improvisation Tailored for Technical Innovation", *ASEE Southeast Section Conference*.
- McGraw, A. P. and Warren, C. (2010) "Benign violations making immoral behavior funny", *Psychological Science*, 21(8), 1141-1149. <https://doi.org/10.1177/0956797610376073>
- Ming-Huang, L., and Shih-Hung, C. (2014) "Examining the "Later Wow" through Operating a Metaphorical Product", *International Journal of Design*, 8(3), 61-78.
- Mireault, G. C. and Reddy, V. (2016) "An Overview of Humor", In: *Humor*, InfantsSpringer, 1-9. [https://doi.org/10.1007/978-3-319-38963-9\\_1](https://doi.org/10.1007/978-3-319-38963-9_1)
- Norman, D. A. (2005) *Emotional design: Why we love (or hate) everyday things*, Basic books.
- Peters, M. (1998) "Towards artificial forms of intelligence, creativity, and surprise", *Proceedings of the twentieth annual conference of the cognitive science society*, Citeseer, 836-841.
- Pralhad, C. K. and Ramaswamy, V. (2004) *The future of competition: Co-creating unique value with customers*, Harvard Business Press.
- Rhodes, M. (1961) "An analysis of creativity", *Phi Beta Kappan*, 42, 305-310.
- Rodríguez Ramírez, E. R. (2012) "The role of surprise on persuasion in industrial design", *International Journal of Product Development*, 16(3-4), 263-283. <https://doi.org/10.1504/ijpd.2012.049837>
- Rodríguez Ramírez, E. R. (2014) "Industrial design strategies for eliciting surprise", *Design Studies*, 35, 273-297. <https://doi.org/10.1016/j.destud.2013.12.001>
- Schwarz, J. (2010) *Linguistic aspects of verbal humor in stand-up comedy*, unpublished thesis.
- Suls, J. M. (1972) "A two-stage model for the appreciation of jokes and cartoons: An information-processing analysis", *The psychology of humor: Theoretical perspectives and empirical issues*, 1, 81-100. <https://doi.org/10.1016/b978-0-12-288950-9.50010-9>
- Wiggins, G. A. (2006) "A preliminary framework for description, analysis and comparison of creative systems", *Knowledge-Based Systems*, 19, 449-458. <https://doi.org/10.1016/j.knosys.2006.04.009>
- Wodehouse, A., Maclachlan, R. and Gray, J. (2014) "The best form of medicine? Using humour to enhance design creativity", *International Journal of Design Creativity and Innovation*, 2(3), 125-141. <https://doi.org/10.1080/21650349.2013.815597>
- Yi, H., Nguyen, T. A. and Zeng, Y. (2013) "Humour and Creative Design: Twins or Partners?", *Journal of Integrated Design and Process Science*, 17(4), 81-92.
- Yu, Y. and Nam, T.-J. (2014) "Let's giggle!: design principles for humorous products", *Proceedings of the 2014 conference on Designing interactive systems*, ACM, 275-284. <https://doi.org/10.1145/2598510.2598557>
- Ziv, A. (1976) "Facilitating effects of humor on creativity", *Journal of Educational Psychology*, 68(3), 318-322. <https://doi.org/10.1037//0022-0663.68.3.318>

## ACKNOWLEDGMENTS

The research is partially supported by the project STARTLED "STimulating And oRganizing The deveLopment of crEative iDeas", funded by the 2016 RTD call at the Free University of Bozen-Bolzano, Italy.