INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
8-9 SEPTEMBER 2022, LONDON SOUTH BANK UNIVERSITY, LONDON, UNITED KINGDOM

HOW GRAPHIC DESIGN CAN INFLUENCE THE PERCEPTION OF SUSTAINABLE FOOD PACKAGING

Henrik Kongsli GJERDE
OsloMet University, Norway

ABSTRACT
This master's study is a pilot research project that investigates the effects packaging and graphic design has on consumers' perception regarding renewability and waste, in conjunction with the 2021 Norwegian research project *Sustainable Eaters.* The project has the aim of reducing plastic and food waste through placing the consumer in the centre of the research and studying their behaviour. Response to packaging and awareness of waste are both issues that focus on human emotions and behaviour. This study dwells into how the use of different packaging and graphic design may affect the users' perception of a products' renewability. Using concepts such as cue utilisation, research design and previous peer reviewed articles to aid it, this study aims to investigate how user awareness can contribute to the Norwegian issue of food and plastic waste. This research was limited to Norwegian's attitude towards packaging in order to remain relevant as pilot research for the *Sustainable Eaters* project, as well as to limit the otherwise vast scope of such a project. A similar study conducted in the United States was used as a basis for this research project, and this paper acts as a supplement to the study.

Keywords: Green design, graphic design, packaging, consumer attitudes, cue utilisation

1 INTRODUCTION: SUSTAINBALE PACKAGING AND CONSUMERS
On an everyday basis we encounter situations in which we are slowly killing and harming our planet. Not so in a despicable and cruel way, but rather through material usage and the vast waste production. Going by the *cradle-to-cradle* principle [1], much of packaging materials consumers use today is not sustainable due to mixed materials and ability to recycle products. Therefore, the need for an alternative is imminent for our planet. This alternative should be a disruptive and innovative solution, rather than relying on previous environmentally hazardous ways of production. As Nigel Steenis et al. mention in their research about the role of packaging materials, modern packaging is made in a way where it often outlasts the content itself [2]. Many consumers also have a limited knowledge about packaging and its sustainability factors. The result is that many consumers rely on personal perceptions and assumptions rather than researching themselves. This also misleads those with green and sustainable motivations. Other studies by Carolien T. Hoogland, Joop de Boer and Jan J. Boersema found that something as simple as the colouring of the packaging was a determining factor in users' perception about a products' ecological friendliness and sustainability [3]. Relating this to the Norwegian consumer and food market, *The Sustainable Eaters – Consumers in sustainable Norwegian food system research* project have the goal of reducing food waste in Norway by enlightening users about the products they are using. This can be done through increasing the awareness and knowledge people have about the products they consume. Especially important tasks for the project include the educating of Norwegian high schoolers and the redistribution of leftover food, as well as designing environmentally friendly food packaging. Relating this to the field of graphic design, the issue of packaging and visual representation of a product can contribute to aiding customers determine the quality of the different products they buy. From an educational viewpoint, this new insight about consumers response to the physical appearance of a product, can aid researchers and designers in making better products with traits that encourage clear and concise recycling for the consumer. In that regard this paper acts as a pilot study for the *Sustainable Eaters* project for understanding consumer behaviour regarding food choices. A pilot study can be defined as a small, preceding study with the goal of dissecting certain components of a larger study. This is to determine whether the parts of the larger study are feasible [4].

2 BACKGROUND AND LITERATURE REVIEW

Peter Glavic and Rebeka Lukman defines sustainable packaging as packaging which has a low environmental impact compared to its' alternatives based on different life-cycle assessment models [5]. The aforementioned article written by Nigel D. Steenis et al. [2] talks about the issue of consumer response to packaging design. What is interesting about this article in conjunction with the *Sustainable Eaters* project is the focus on the individual. According to Steenis's research, most users does not determine the renewability of a product by researching, but rather through one's own lay beliefs. This is supported by Helén Williams' study about recycling in Swedish households [6]. Williams' research showed that something as simple as a yoghurt cup was treated different than milk cartons, despite their material composition being similar. This was due to the mixture and feel of the material presented to the consumer. Williams further explains the confusion a lot of consumers feel when encountered by products made of different materials. Mixture of materials, as well as the stickiness of food products, caused several participants to disregard recycling plastic or hybrid plastic products. 0 out of the 10 participants never recycled milk cartons, while 6 out of 10 never recycled yoghurt products, partly due to material mixture and the effort required to clean the leftover packaging. Williams' study inspired the concept of presenting vaguely determinable materials to the test subjects, as well as asking participants how they recycle the material. The primary purpose of this study is to investigate the effect and impact awareness about packaging can have on the Norwegian population, and what perceptions Norwegians have about said packaging. In conjunction with this, the research question for the article is as following: "*How can graphical appearance and user awareness reduce food waste in Norway?"*. The research question itself is more inductive and in line with qualitative research, however, these qualitative findings were used to explain the quantitative data collected. This paper thus takes advantage of mixed methods research to conduct the study. Other studies and peer reviewed articles act supplementary, however, Steenis article is what this study bases itself on in conjunction with the *Sustainable Eaters*.

3 METHODS: MIXED METHODS RESEARCH AND CUE UTILISATION

3.1 Quantitative and qualitative research

This article uses mixed methods research (MMR), a mixture of qualitative and quantitative research [5]. The quantitative research consists of a survey research method, specifically a cross-sectional design form. A qualitative, semi structured interview is used to extract meaning from participants and correlation between the quantitative and qualitative data. Integration is the practice of relating qualitative and quantitative research data, and this study will be focusing on the integration method of *explaining the data* [7]. Using quantitative survey research method, this study gathers users' opinion regarding a selection of made-up packaging designs. The idea was to create six different packaging designs, using Adobe Illustrator and different principles to create a "sustainable" look, and then ask the participants to rank them based on which they believed to be more sustainable. These graphic shells might not be real packaging found in store but are made to replicate several of the traits one might find on the outside of products in an average daily grocery store. A qualitative interview was then conducted with some of the participants to get a better understanding of their reasoning. Did the colour affect their decisions making? The perceived feel of paper? Any symbols associated with ecological sustainability and renewability?

3.2 Use of cue utilisation

The relationship between consumers and their products relies on communication. Visual graphics are meant to help us understand, judge and rework information. The human being has developed to understand colours, shapes, placements, and size, as this remains relevant for our evolution even to this day [8]. Packaging both signalise a sense of quality for a product, while also serving more beneficial factors such as portability. However, taste and renewability are hard to determine factors for a consumer through packaging alone. Despite this, a first-time purchaser will use the packaging and their beliefs to determine the content's renewability and its' taste, since these are the determining factors, the user have available to them [2]. We are then presented with the phenomenon of cue utilisation. According to Olsen and Jacoby [9], cue utilisation is when a user lacks knowledge of a product, and so they ascertain multiple cues about the given product to determine its' predictive and confidence values. Predictive value is to what degree a cue is associated with positive or negative benefits, while confidence value is the users' confidence in their decision making based on the given cues. Cardboard-like packaging is a cue that might resonates with healthy environmental benefits, while it is up to the user's confidence to determine to what degree this product provides any real, actual environmental benefits. The graphical

appearance affects user opinions and are vital cues for many in determining products' renewability [2].

3.3 Graphic design and data collecting

The experiment conducted by Steenis et al. focused mainly on the physical packaging design, however, rather little on the graphical [2]. Initially it would be interesting to see how the users would react with a wider range of "eco-looking" packaging and more graphical cues to utilise. As such, this pilot research project is mainly focusing on the graphical appearance and perceived textures of a product. Using a standardised Norwegian liquid carton, the graphic design is the only variable that differs between the products. Environmental logos were utilised to make a product appear more environmentally friendly, sustainable, and "green" to the users [10]. The appearance of cardboard and metallic background was another cue. High use of ink and colours vs low use of ink and colours was another contrasting cue. Some of the text also altered between designs, either being cut out or emphasised to different degrees. Finally, some of the designs were made to be more appealing either through images, simplified designs, or playful and colourful appearance. Figure 1 below consists of all the different designs, design **1** being to the very left, and design **6** being to the very right. All design were inspired by some existing products, with the Norwegian orange brand *Sunniva® Original Appelsinjuice 1 liter* being the template for the redesigns. Participants viewed Figure 1 on an Apple iPad when conducting the research. The participants ranged from the ages of 23 to 26, with a total of 10 participants. Each participant performed a quantitative ranking of each design, before then moving on to a qualitative interview about their reasoning behind. Additionally, the participants were tasked to choose one product which appeared more appealing and more likely for them to buy during grocery shopping. All participants names and further information are kept secret to respect their privacy. Participants were assured that all feedback was subjective and valid.

Figure 1. Cartons were designed by author and researcher Henrik Kongsli Gjerde.

4 RESULTS

4.1 Users' response and reasoning

All participants but one agreed that design **1** appeared most environmentally friendly out of the different designs. The use of cardboard-like-colour was the main contributing cue, with the eco-logos being another contributor. The lack of ink usage made many feel as the manufacturer had taken the absolute stand to be as resourceful as possible. Meanwhile, 7 out of 10 participants, 70%, agreed that design **3** appeared to be the least environmental. The predictive value of design **5**'s nature-imagery cue varied quite between participants. Two subjects said they thought the design was least environmental, mainly due to the excessive use of colours to create the background image. However, other participants ranked

this design as one of the more sustainable. The use of clear blue skies and mountains gave the packaging a feeling of nature, thereby associating the juice with natural ingredients. Design **6** ranked high among the participants, which was reasoned for as a due to the minimal use of colours, saving ink and thereby the environment. Some felt this made the product look cheap, while others felt the minimalism made it look expensive and of high quality. In the middle place was design **2** attracting no strong opinions. Some expressed the saturated sky and cheap design made it appear as the company behind it would not care much for renewability either. The use of an orange and "Grønt punkt" logo made it more appealing to some. However, "Grønt punkt" is not a sign of the renewability of a product, but rather that the company has aided financial in making sure the product is brought into the recycling process, not that the material can be fully recycled [10]. Design **4** did not provoke any strong opinions regarding eco-friendliness, though it ranked lower than the previous design due to excessive use of ink. None of the participants mentioned the notice of whether the juice was from a concentrate or not.

4.2 Participants' personal preferences

While this study focused mainly on what is perceived as sustainable, it is also important to take notice of whether the customer would take this into consideration when conducting their shopping routine. When given the choice to buy whatever of the products desired, regardless of price, several participants chose different from what they believed to be the most sustainable. Many participants felt design **6** had an appealing design that felt simple and almost exclusive to a degree. Another group of participants preferred design **4** due to the more playful and sweet design. This was affirmed by other participants referring to the design as sugary and childish. Two participants chose design **5** as their favourite, the reasoning being the packaging gave the product a more sincere and fresh feel. On the contrary, design **2** and **5** was considered cheap looking by a few participants, often associated with the Norwegian brand "*First Price*". One person expressed appreciation for the effectiveness of design **1** in conveying its green message. Design **3** had several participants sceptical of the industrial-like appearance. All participants believed the cartons to be recycled as paper, except for one person who believed for design **3** to be recycled as residual waste. It should be noted that the participants were asked a leading question regarding the recyclability of design **3** due to beliefs and insecurities regarding glossy, shiny, and metallic looking packaging.

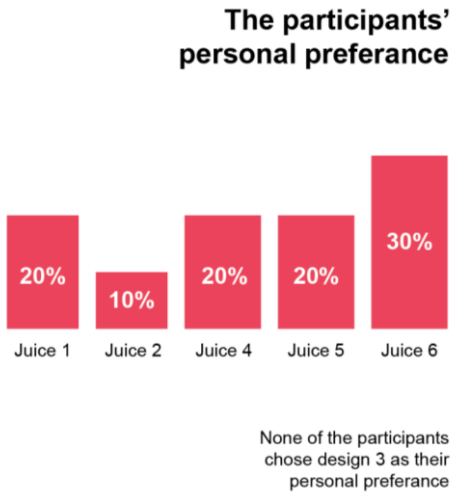

Table 1. The participants personal preference

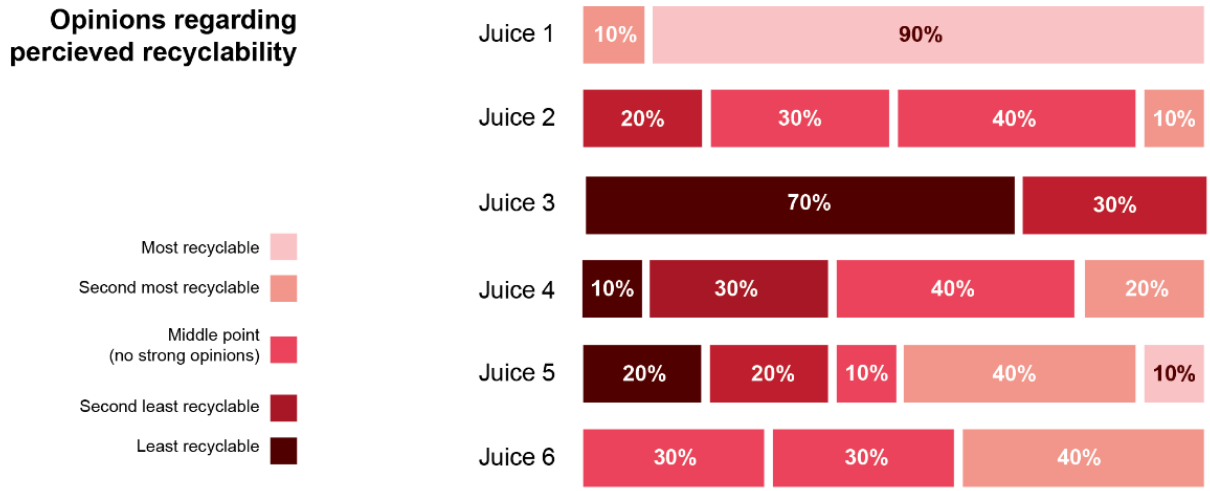

Table 2. The quantitative findings from the research expressed through percentage

5 DISCUSSIONS: ASUMPTIONS, AFFIRMATIONS AND SUPRISES

The minimal use of ink had an overall positive effect on the participants' perception of eco-friendliness. However, a product being sustainable did not seem to be among the top priorities for most participants when buying the actual product. Even so, the packaging design still aided the user in knowing how to recycle a product. The overall most important cue seemed to be the material, or rather the perceived material. Every packaging was meant to be made from paper, only the coating on the outside would in theory differ from each other. The simpler designs, especially the cardboard-like design, made it clear it was to be recycled in the paper bin. Predictive values and users' confidence value was high for the cardboard utilisation cue. Contrary, the metallic and glossy-looking packaging made the test subjects uncertain on how to deal with the waste, resulting in lower user confidence value. Design **1** lead almost all subjects to believe it was the most sustainable, and none had any doubt on how to recycle it. Even though almost all participants would recycle design **3** as paper, the several participants were uncertain by the glossy metal packaging. Cues such as the eco-labels had a minimal effect on the test subjects. Only a few dictated their buying decision by them, though only to a slight degree. One subject mentioned the lack of the "Nyt Norge" label, though this label only highlights a Norwegian product from other foreign products [11]. However, this can be seen as a sign that Norwegians care about quality and animal treatment, and products from Norwegian farms are believed to be within their desired quality. The overall effect of eco-labels as a cue might have changed with more participants. Another notable cue was the lack of colour or printed ink. As mentioned in the book *Cradle to Cradle* the ink used might in itself be poisonous for the environment, so the lack of print would in that regard be beneficial [1]. Some felt this might make the product look cheap and of low quality. This would however depend on the overall graphic design, and some of the participants who felt this way about the lack of ink would later note that the lack of print on other designs made them look more efficient. It would be interesting to see the strong points from the different designs combined into one product for future research experiments. The paper-like feel of design **1**, somehow combined with the nature-like feeling of design **5**, as well as the simple but exclusive feeling some felt from design **6**. Similar to Steenis et al. study, the sustainable packaging appeared more likely to be accepted when it enhanced perception of the product itself and what was contained inside [2].

6 CONCLUSIONS

The results and research design from this study can aid the *Sustainable Eaters* project in making products more easily to recycle and determine for consumers. The main purpose of the results was to see how graphic cues influence perceptions within the food industry, however it could also be seen as a lesson in brand perception as well as educate about green washing. With companies trying to change their image in more recent years to be perceived as more sustainable despite their business practices, being aware of cues and how they affect us is important. Insight from the study shows that packaging can matter in how we perceive the quality of a product. One can conclude that a simpler, more paper-like packaging design would be efficient at aiding users on how to recycle, while glossy, over the top design may confuse the

user. The current study can also contribute to graphic designer in general on how to research to design for more sustainability and with more awareness of users and interaction design. It should be noted that participants perception of renewability was highly diversified, but with a few aforementioned, repeated common traits. Many participants relied on utilised cues such as colour, amount of print and nature imagery, with some taking note of the eco-symbols. As this is pilot research master's project, the study would need an increased and varied number of participants to provide beneficial for future research, as low variation within age groups and the number of participants is one of the shortcomings of this research. The current study still provides some valuable insight into what cues young grocery shoppers view as most important. It also provides educational value for both product- and graphic designers, and in addition proves how graphic design can contribute within the field of research design.

REFERENCES

[1] Braungart M. and McDonough W. *Cradle to Cradle – Remaking the way we make things*, 2008 (Vintage Books). pp. 59 – 60.

[2] Steenis N. D., van Herpen E., van der Lans I. A., Ligthart T. N. & van Trijp H. C. M. Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *Journal of Cleaner Production*, 2017, pp.164, 286 – 298.

[3] Hoogland C. T., de Boer J. and Boersema J. J. Food and sustainability: do consumers recognise, understand and value on-package information on production standards? *Appetite*, 2007, 49(1), pp.47 – 57.

[4] Cadete L. *What is a pilot study?* Available: https://s4be.cochrane.org/blog/2017/07/31/pilot-studies/ (Accessed on 2021, 10 October), (2017) 31. July.

[5] Glavic P. and Lukman R. Review of sustainability terms and their definitions. *Journal of Cleaner Production*, 2007, 15(18), pp.1875 – 1885.

[6] Williams H. *Kan emballasjedesign og atferdsvitenskap forbedre kildesorteringen?* Available: https://www.youtube.com/watch?v=kqKbc_fw17I&ab_channel=Gr%C3%B8ntPunktNorge (Accessed on 2021, 26 September), (2021) 21. September.

[7] Leavy P. *Research Design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*, 2017 (Guilford Press). pp.101, 139, 164, 172 – 179.

[8] Cairo A. *The Functional Art*, 2013 (New Riders). pp.112 – 113.

[9] Olson J. C. and Jacoby J. *Cue utilisation in the quality perception process*: In: Paper presented at the third Annual Conference of the Association for Consumer research in Chicago, IL., 1972.

[10] Renas.no. *Dette betyr miljømerkene.* Available: https://renas.no/dette-betyr-miljomerkene/ (Accessed on 2021, 4 October), (2017) 14. November.

[11] Norskmat.no. *Merkeordningen Nyt Norge*. Available: https://norskmat.no/no/nyt-norge?gclid=CjwKCAjwtfqKBhBoEiwAZuesiAFzQ1eKHrIFdklj_X9dMW3YsQtHt7P74XGxz52dBrPo6Sh2jeyHYBoCh9QQAvD_BwE (Accessed on 2021, 7 October).