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Grand challenges report

Ocean plastics and the circular economy

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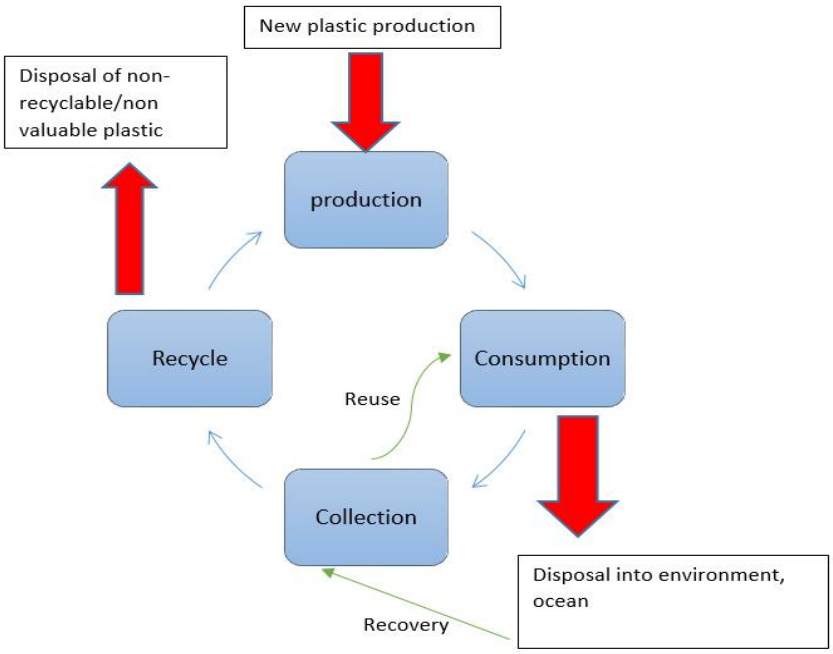
A pathway to a circular economy

a) Current issues preventing a circular economy:

In regards to the circular economy diagram, it incentivises the reuse and recycling of plastic products since the colour scheme promotes products that have these characteristics. Furthermore, businesses will be incentivised to change their packaging design policies since the framework will identify bad players in the industry, creating a push factor from consumption to production/design. The red arrows represent the characteristics that are ranked on the lowest scale and that should be eliminated, such as packaging with virgin plastic, non-recyclable or low quality/cheap plastic that is not financially viable for recycling and would end up disposed in the environment and ocean. Companies will have to either incur additional costs or find innovative solutions to have a positive ranking, which would incentivise industry to change to a more circular economy with sustainable product life cycles.



Positive and negative factors affecting the circular economy:
Red arrows represent the negative externalities (externalities occur when consumers or firms do not bear the full cost from the harm their actions do to others)
Green arrows represent positive actions contributing to the concept of a circular economy.

b)Enablers and favourable system conditions:

1. Collaboration
2. Rethinking incentives
3. Providing sustainable set of international environment rules
4. Access to financing

(extracted from Ellen Macarthur foundation)

Traffic Light System

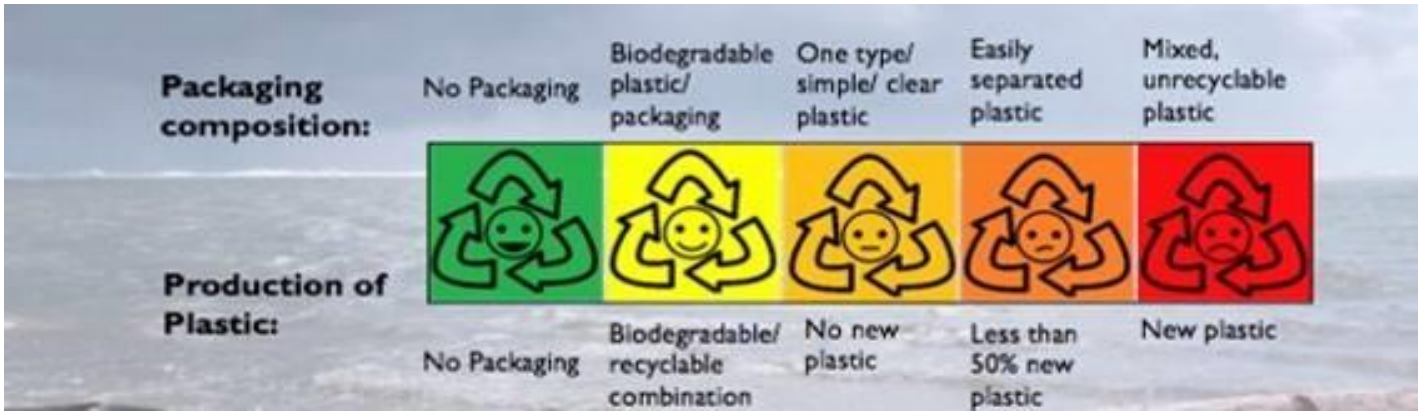
a)Design:

The traffic light style code that will be seen on the packaging and shop shelves is a development from two scales; one from production, measuring source of raw material, and another measuring packaging composition and its recyclability.

Through a scoring system combining the first two scales, packaging is then assigned one of 5 colours with green being the most plastic clever and red being the least. With more research and development the barriers of the scales will be able to be more clearly defined.

b)Desired effects

The aim of the colour system is to provide a simple and fast way for consumers to evaluate the plastic impact of their purchases, as it helps display the impact on the environment from plastic that the product will have. The system measures how easily recyclable the products packaging is and promotes the use of reusable and innovative alternatives in product package design. Furthermore, it promotes standardisation and a reduction in the different types of plastics used in packaging, both of which affect a sorting plants' ability to separate and recycle these plastics. The main benefit is informing consumers at the point of purchase, which enables them to recall the issue at large and how their everyday purchases can help solve the problem.



Traffic light system

Standard and information effects on industry

- Assuming that information on plastic impact and social cost will affect the value consumers place on different brands of similar products.
- Assuming recycling and reducing the plastic costs of packaging raises product price. Exceptions may apply for reusable and non-packaged goods.
- Assuming that comparative evidence about impact of single use plastic lowers the amount of single use plastic of the whole industry.

a)Effects of information:

As stated before, the system will provide a cost effective way to provide information to consumers at the point of purchase, we know "that information is socially valuable if it is worth more to consumers than its cost to provide it so therefore the system would have a significant social value." (*Carlton, Perloff)*

The system will tackle the problem of limited information by providing a reliable source, by subsidising the cost of collecting the information, reducing the amount of information the consumer has to recall through the rating system, reduce the effects of bounded rationality (the do not value processing all information) and provide a very simple way of evaluating the complexity off the issue so that less educated consumers may understand the problem. *(Chapter 13 Carlton , Perloff)*

A complementary case study can be done on the effects of similar labelling on nutritional value of foods for which there is more empirical evidence

An FTC experiment on markets where buyers have less information than sellers showed, where only truthful claims were permitted, the market almost behaved perfectly efficiently, high quality products were supplied regardless of brand value. *(Chapter 13 Carlton,perloff)*

It is important for there to be one standardised system so that the information provided is not asymmetrical or ambiguous. If the buyers know the social cost of the externalities caused by single use plastic the value they place on the products may change and push them to spend more for products that have a lower social/environmental cost. *(Chapter 13 Carlton,Perloff)*

b)Effects of standards:

"Definition: a metric of scale for evaluating the quality of a particular product."

What will be developed in the following part is the importance of the reliability and accuracy of information so as to not degrade or mislead the consumer. Therefore the most effective way to implement standards is not to set an optimal standard (just green) but provide objective information on the plastic cost of each product and let them decide whether the added benefit on each level outweighs higher price (more research needs to be done to see if restrictions on the red classification would be more efficient, however we suggest it so that we do not see backward innovation strategies.). *(Chapter 13 Carlton,Perloff)*

The system is not anticompetitive since it allows differentiation between products in regards to their plastic impact. The green rated product therefore will have a higher value according to the system in regards to the lower ranked products. Since consumers have preferences over characteristics of commodities one could say that that it would help differentiate by helping evaluate different environmental product characteristics. *(Chapter 7 Carlton,Perloff)*

Government-led vs Third-party-led system:

a)Evaluating Different types of agency:

Government Agency	Private Third-party
Pros: • Only one system and website, making it easy for consumers to understand • More potential to form agreements with other countries on internationally recognised standards	Pros: • More opportunity for specialisation and innovation • More competition would lead to a higher quality system, services, and more modern standards
Cons: • Might be slower than private agencies to keep up with public opinion and consumer's views on plastics • Would have to be funded by the tax-payer	Cons: • Could be confusing for consumers if there are too many different agencies and systems to understand • Needs to be profit-driven, so business would have to pay out-of-pocket for their plastics to be rated

Table 1: comparison of private and government agencies.

b)An ideal middle-ground system:

An ideal system would be implemented by a Non-ministerial Government Department (NMGD), similar to the Food Standards Agency. This would be an independent body, free of political oversight that would serve the public interest. Its actions wouldn't need ministerial approval and could be advised by different committees. It would have its own .gov website and only one rating system, making it easier to understand than multiple private rating systems. Some of the work could be subcontracted out to individuals or private businesses in order to carry out auditing/rating of plastic producers. This system would be cost-effective as there would be no need for advertising after initially starting up, and the tax-payer would only fund the research, while plastic producers would pay for the labelling.

Survey results:

a) Sample size and demographics.

N=91

British and international students

Majority were female-55; Male-29; and 7 did not fill in their Gender;

52 were British; 9 did not fill their nationality 30 international

8 students did not fill their age

b) Qualitative results:

We had 91 respondents to our survey. We asked an open-ended question on how respondents reuse their plastics. Of our 91 respondents, 75 replied to the aforementioned enquiry. 40% of our respondents reused plastics as bottles (*refillable/single-use) while 30.7% reused plastics as food containers. Fascinatingly, only 3 respondents used plastics to make art crafts.

We also asked an open-ended question on whether respondents were willing to pay more for environmentally-friendly products and the reasons they chose yes or no. Only 54 respondents replied to this enquiry: (see graph 1)

Graph 1: Pie chart of question 10 responses

The primary reason why people chose to buy eco products was environmental. Other reasons include concerns about the world the future generation would inherit and a belief that eco-products such as refillable bottles posed a better financial investment. For respondents who answered no or not sure, the primary reasons were economic. Some respondents even mentioned that student-budget constraints prevented them from buying eco-friendly products that they saw as too expensive. Others thought it was a money-consuming process to develop and produce an environmental-friendly product.

Conclusion

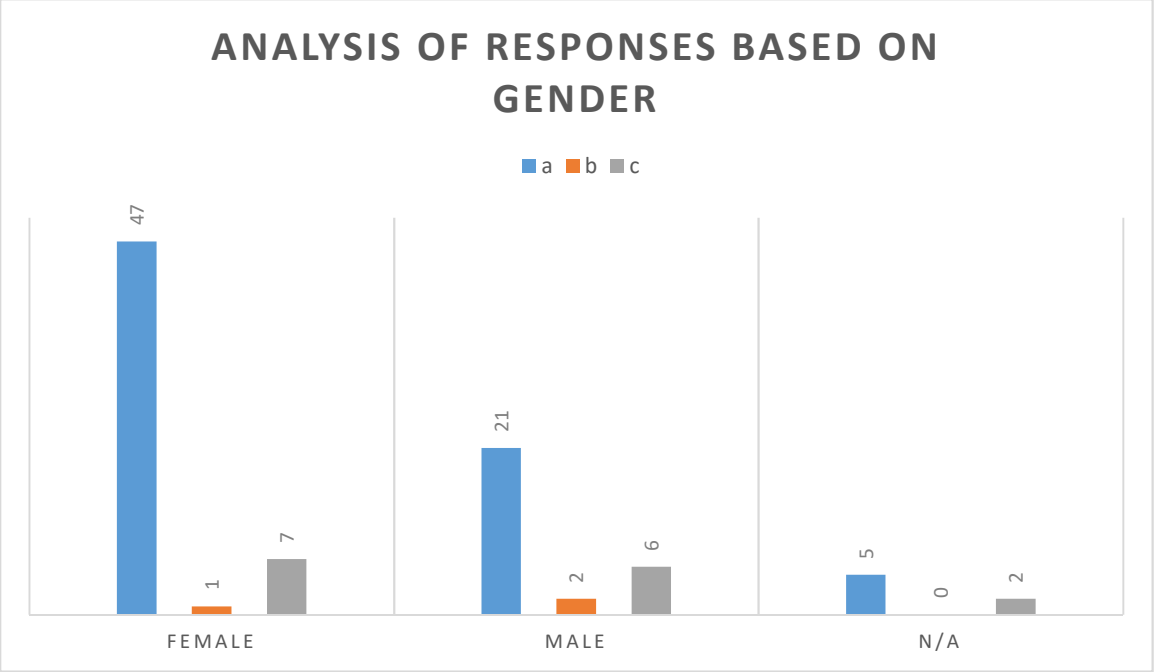
We believe our suggestion for a colour coding system is the next step in turning the tide against plastics littering our oceans. This is because it fosters a UK economy inclined towards phasing out less eco-friendly products by supporting innovation towards eco-friendly packaging and ensuring present recyclable material are used in future packaging. Nonetheless, we concede that there are certain limitations to our output. The primary limitation is that our suggested system is highly dependent on effective implementation and enforcement of the suggested reforms by the future NMDG/private agency. Another limitation is that our system assumes that innovative/more eco-friendly products will eventually be widely affordable for the general public in such a way that it phases out less eco-friendly packaging or products (see para 1, page 4). Certainly, these immediate obvious concerns are not insurmountable and could be explored in the future.

They are various means to aid the implementation of our project. One way is to provide for eco-friendly certificates to be given to products with the best packaging composition but also durable plastic goods that are made from recovered beach plastic. In the long run a look into the secondary plastic waste that is not related to consumers directly needs to be tackled. Another means could be to create a publicity campaign for the colour coding system in other to nudge consumers towards consuming more eco-friendly products. This publicity campaign could also help give visibility to innovative products such as Splosh in other to encourage consumers to participate in the circular economy.

Appendix:

<u>Exhibit 1: Survey question 14</u>

Q14 Whether or not people agreed with colour-coding of plastics recyclability being from green to red
a-Yes
b-No
c-Not sure



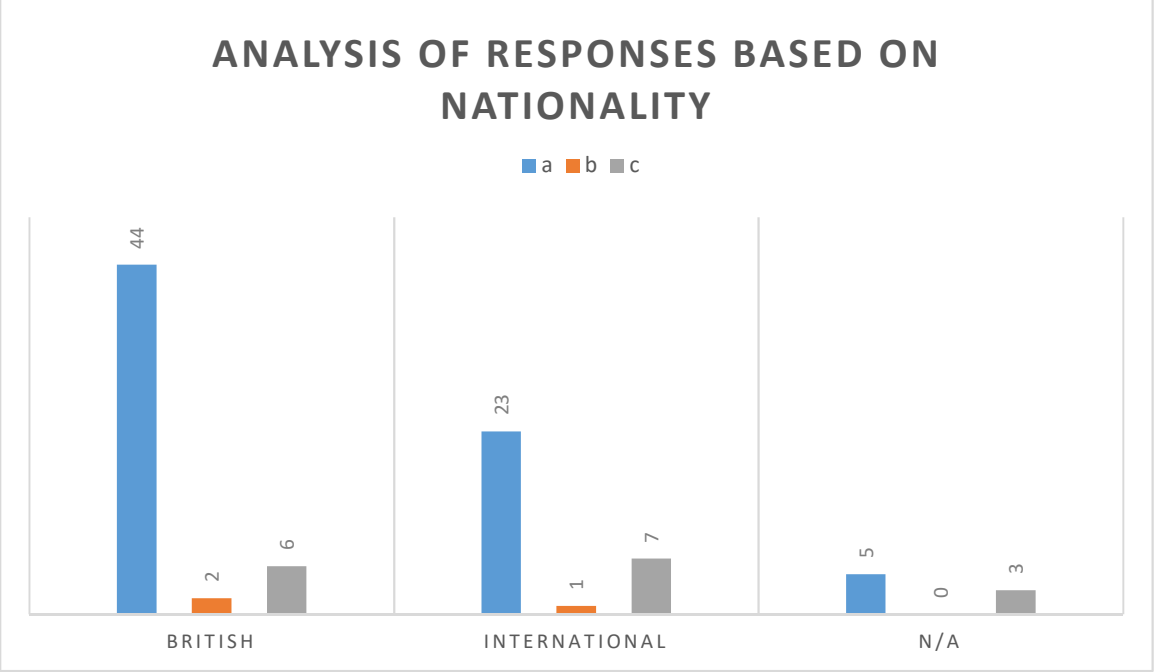
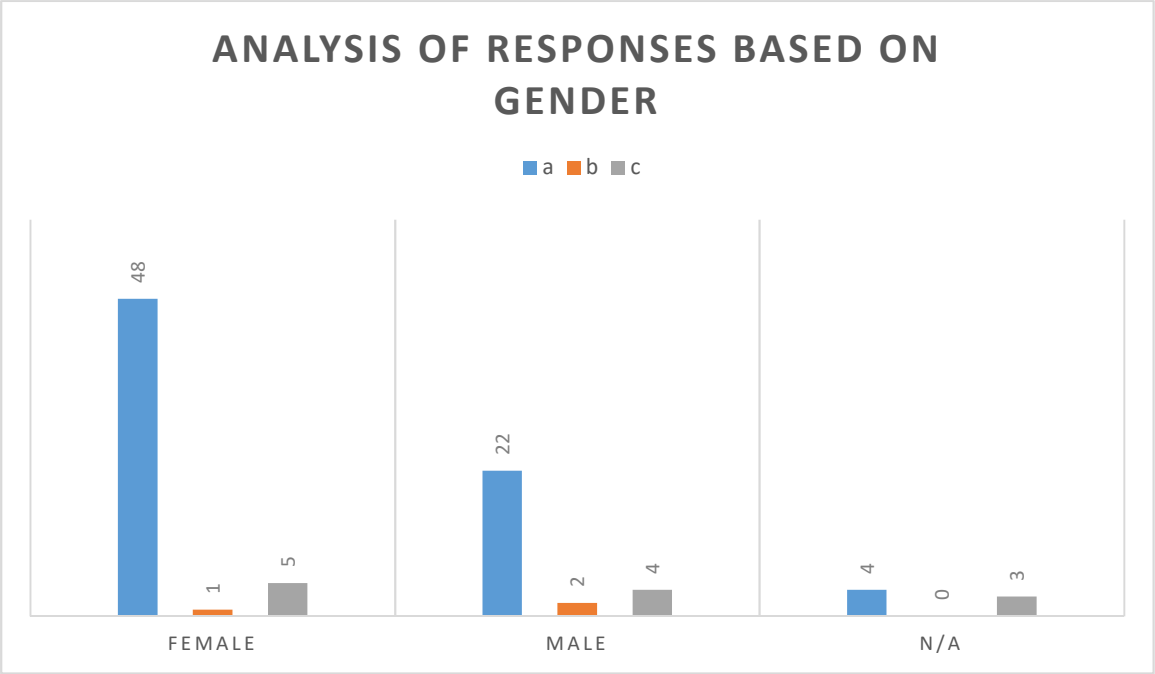


Exhibit 2: survey question 13

Q13 About whether people supported or not the idea of colour-coding on plastics regarding their recyclability

a-yes
b-no
c-Not sure



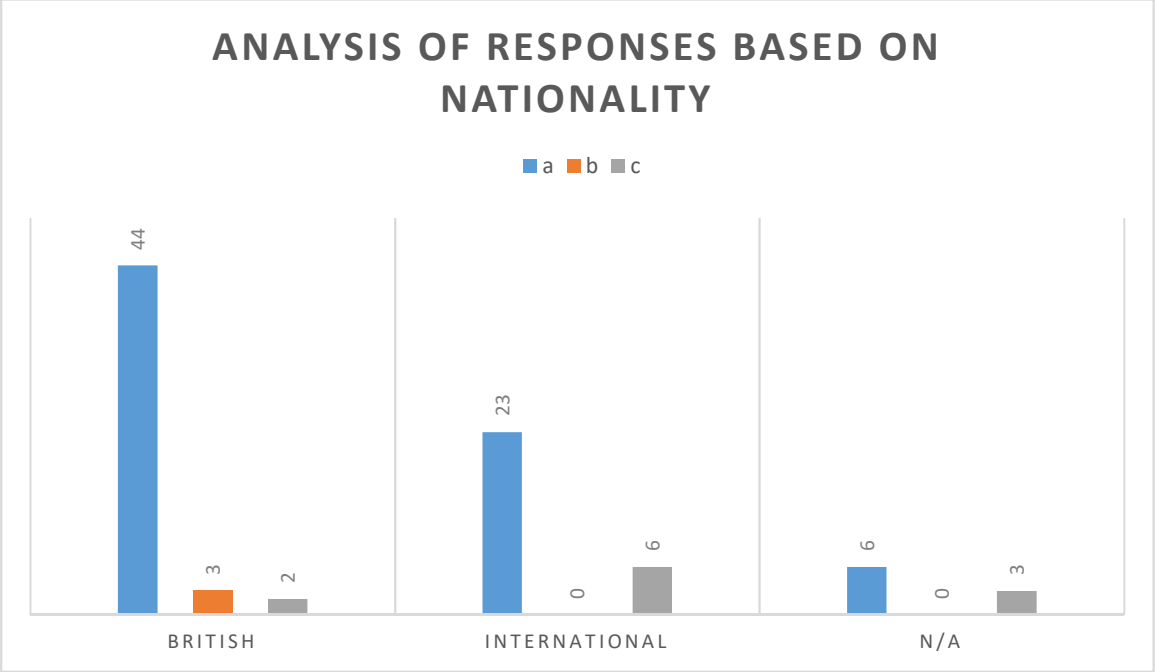


Exhibit 3: Complete list of survey questions.

Questionnaire

Nationality: **Age:** **Gender:**

The first 2 questions are about how much you know about the ocean plastic issues.

1. What happens to plastic globally after it is disposed?
   a) Most of it goes to landfills
   b) Some of it is dumped in the oceans where it poses a threat to marine ecosystems
   c) Most of it is recycled
   d) Some of it is recycled and some goes in landfills or is dumped in the ocean
   e) Not sure
   f) None of the above
2. Why is plastic dangerous for marine life?
   a) They mistake it for food and cannot digest it.
   b) They can get tangled in it which hinders their ability to swim
   c) It's dangerous because they use plastic waste for habitats
   d) All of the above
   e) Not sure

The questions from 3 to the end are about how you are feeling about recycling, reusing and labeling of plastic items and packaging.

3. Are you concerned with how your plastic waste is recycled?
   a) Yes
   b) No
   c) Not sure
4. Are you aware of the different codes for recycling plastic?
   a) Yes
   b) No
   c) Not sure

5. How good is your understanding of the different codes of plastic?
   a) Very good
   b) Somewhat good
   c) Not sure
   d) Somewhat bad
   e) Very bad
6. Do you notice recyclable sign on plastic items such as bottles?
   a) Yes
   b) No
   c) Not sure
7. Do you recycle plastic items and packaging?
   a) Yes
   b) No
   c) Sometimes
8. Do you own a reusable plastic item i.e. a refillable plastic bottle?
   a) Yes
   b) No

If the next question does not apply to you, go to question 11.

9. How do you reuse plastic?

10. Are you willing to pay more for environmentally-friendly plastic products? Why?
    a) Yes
    b) No
    c) Not sure

11. What reasons do you consider when choosing products?
    a) Price
    b) Quality
    c) Environmental cost
    d) Brand
    e) None
    f) Other
12. When you are shopping, do you consider the impact of your purchases on the environment?
    a) Yes
    b) No
    c) Sometimes
13. Would you like a standardized labeling showing how recyclable the plastic items you buy are?
    a) Yes
    b) No
    c) Not sure

If you answered "No" to the last question, please proceed to the optional question at the end.

14. Would you like all plastic packaging to be color-coded for recyclability?
    a) Yes
    b) No
    c) Not sure
15. Would you like the scale of recyclability to be from green for highly recyclable plastics to red for low/non recyclable plastics?
    a) Yes
    b) No
    c) Not sure

    Do you have any additional comments/suggestions?

Thank you for taking the time to complete the survey!

Exhibit 4: Answers to survey questions:

Book1 [Mode protégé] - Excel

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Gender	Age	Nation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
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3	1	19	1	d	d	a	b	d	a	a	a	a	a & c	a	a	a	a
4	1	19	1	a	d	a	c	c	a	a	a	a	a,b,c & d	a	a	a	a
5	1	20	1	d	d	a	b	b	a	a	a	a	a & b	a	a	a	a
6	1	18	1	d	d	c	b	d	a	a	a	c	a,b & c	c	c	a	c
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9	1	20	1	d	d	a	a	b	a	a	a	a	a,b & c	c	a	a	a
10	1	22	1	d	d	a	b	d	a	a	a	a	a,b & c	a	a	a	a
11	1	19	1	a & b	d	a	c	c	a	a	a	a	a, b & c	c	a	a	a
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13	1	39	1	d	d	a	b	d	a	a	a	a	a,b,c & d	a	a	b	b
14	1	19	1	d	d	a	b	e	a	a	a	a	a & b	c	a	a	a
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Sheet1

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Sheet1

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Sheet1

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Exhibit 5: Tests of Between-Subjects Effects Q13 and 14

Dependent Variable: Q13

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3,519[a]	6	,587	1,166	,332	,077
Intercept	77,698	1	77,698	154,516	,000	,648
Gender	1,225	2	,612	1,218	,301	,028
Nationality	,294	2	,147	,292	,747	,007
Gender * Nationality	,077	2	,038	,076	,926	,002
Error	42,239	84	,503			
Total	204,000	91				
Corrected Total	45,758	90				

a. R Squared = ,077 (Adjusted R Squared = ,011)

This analysis shows that gender, nationality and the interaction between gender and nationality as independent variables does not affect the responses to Q13.

Tests of Between-Subjects Effects

Dependent Variable: Q14

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5,101[a]	6	,850	1,555	,171	,100
Intercept	90,190	1	90,190	164,940	,000	,663
Gender	2,404	2	1,202	2,199	,117	,050
Nationality	,978	2	,489	,894	,413	,021
Gender * Nationality	2,538	2	1,269	2,321	,104	,052
Error	45,932	84	,547			
Total	220,000	91				
Corrected Total	51,033	90				

a. R Squared = ,100 (Adjusted R Squared = ,036)

This analysis shows that gender, nationality and the interaction between gender and nationality as independent variables does not affect the responses to Q14.

Furthermore, the analysis included participants with mean age=21.67 years and St. Deviation of 3.8years which might indicate that results from a population with a higher average age may differ from the ones obtained by this analysis.

Key references:

Cover page image link: https://cosmos-images2.imgix.net/file/spina/photo/14034/180215-ocean-full.jpg?ixlib=rails-2.1.4&auto=format&ch=Width%2CDPR&fit=max&w=1800

Ellen mcarthur foundation: https://www.ellenmacarthurfoundation.org/

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