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The Mind of Sustainability:
A Mind Genomics Cartography

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ABSTRACT

The authors introduce the science of Mind Genomics to explore what specific messages drive a person to say they will be interested in sustainability and motivated to do something. The messages are the nature of the message and the venue where the message is received. The experiment mixed messages/elements into small vignettes, presented the vignettes to respondents, and obtained ratings. These ratings were then deconstructed into the contribution of the individual elements to motivate respondents, as well as the degree to which the individual elements engage respondents. The results reveal specific messages that drive interest and motivation, respectively, and uncover two mind-sets, those swayed by feelings versus those swayed by facts. They introduce the personal viewpoint identifier (PVI) to identify these mind-sets and what to say to them.

KEYWORDS

Conjoint, Messages, Mind Genomics, Sustainability

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INTRODUCTION

As the 21st century proceeds, year by year, the social consciousness of the world is being prodded to take actions so that we can continue to live on this planet with more people, and with possibly limited resources. The concept of 'sustainability', the ability to live within our means as a world, is becoming increasingly heard in the press and in conversation.

Wikipedia offers the following explication of this notion of Sustainability, proceeding afterwards with a long, exceptionally detailed, well-documented article on the different aspects of sustainability.

Sustainability *is the ability to exist constantly. In the 21st century, refers generally to the ability to exist of the biosphere and human civilization. Defined also as the process of people maintaining change in a balanced environment, in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.[https://en.wikipedia.org/wiki/Sustainability from; "What is sustainability". www.globalfootprints.org. Retrieved 2 May 2018*

A Google® search of the word 'sustainability' through the years, starting with the early 1980's, reveals the dramatic increase in the number of hits in Google Scholar®. the pattern of hits on a year by year basis (Table 1).

ACADEMIC APPROACHES

The sheer breadth of the topic 'sustainability' can be sensed by the actual topics covered by the word. The range is from environment to people, from land to services, from agriculture to food, and beyond. Indeed, it may well be that the topic will evolve to encompass whatever is relevant. A sense of the evolving complexity is seen in the abstract to the paper in the journal Sustainability Science (Kajikawa, Saito, & Takeuchi, 2017)

Endeavor to build sustainability science as a discipline during the last decade promoted interdisciplinary integration. This paper analyses the development of sustainability science during the decades and contribution of Sustainability Science journal. Based on our analysis, the specific contribution of Sustainability Science is to integrate different theories, models, cases, and experiences as transdisciplinary expertise. We found that the journal could be characterized by the core research clusters of sustainability science, namely, "Environmental and Social Systems" and "Economy and Business Systems". Sustainability science now seems to be building distinguished interdisciplinary and transdisciplinary research field based on coupled socio-ecological systems and integrated social–economical systems.

Table 1. Number of 'hits' in Google Scholar® for the word 'sustainability'

	Number of citations Google Scholar®
Google® 2019 – 899 million	
2017	297,000
2015	523,000
2012	636,000
2009	435,00
2006	252,000
2003	145,000
2000	83,400
1997	34,800
1994	13,100
1991	5,790
1988	2,400
1985	1,200
1982	748

From The Topic to the Person – What Engages?

It is clear that the notion of sustainability as a general idea and rallying cry is increasing popular, as can be see both by the Google® numbers and by the Google Scholar® numbers. The topics in sustainability are many, the choice of issues almost staggering in their scope and increasingly complexity. Questions about consumer motivations are often overlooked in fast-growing fields, in favor of 'hard information' about the topic itself. We hear again and again about the need for sustainability in agriculture, in consumption, etc. But what about getting people interested What about the psychology of introducing this increasingly popular notion of sustainability. What method work, and what do not and in what areas do they work (Devine-Wright, 2007; Djordjevic, 2011; Kahle & Gurel-Atay, 2013; Kruse, 2011; Voinov, 2008)? If we were to ask a person to tell us about what is the 'grabbing force' to engage the mind to be involved in sustainability, what would that grabbing force which engages (Kasser, 2009; Louise, 2008; Shields, Šolar, & Martin, 2002)?

The increasing number of 'hits' in Google Scholar® and Google® itself suggest that the topic of 'sustainability' has both scientific aspects as well as emotional aspects. When we hear that the world is in danger, for example, due to the over-use of plastics, some of the information is science-based, but other information is rhetoric, designed to stir up one's feelings and drive to action

The Mind Genomics Contribution to Understand the Inner Mind of Sustainability

Mind Genomics is an emerging science in experimental psychology, with roots in consumer research and statistics, and metaphorically in physics and science (Green & Rao, 1971; Green & Srinivasan, 1990; Luce & Tukey, 1964; Moskowitz, Gofman, Beckley, & Ashman, 2006). The key notion in Mind Genomics is that in the world of the 'everyday' where we must make judgments, there are many dimensions to which a person can attend, and that the judgments are often almost automatic. The most important notion is the nagging reality of variability among people. Quite simply, people differ from each other in systematic ways, leading to different judgments by people, when these different people are faced with the same issues and opportunities. In other words, people differ in what they find to be important when making a judgment, and these differences are worthy of study.

Metaphorically, these differences are mental genomes, with people displaying a range of variation for the same gene. Mind Genomics provides an operational way to define the range of these mental genomes for a topic, extract them through short experiments with people, and reveal the structure of this 'mental genome'. (Moskowitz et al., 2006, 2001). In short, the objective of Mind Genomics is to identify the mental genomes for what Kahneman and his associates call 'System 1,' the way of thinking that we use every day to make our decisions (Kahneman, 2013).

Mind Genomics studies are crafted to follow a path which focuses on specifics, on the granularity of life, namely specific ideas or answers to the questions. The objective becomes, quite simply, the degree to which the various answers to the questions perform with respect to a criterion, such as 'fitting a specific statement.'

The knowledge development process begins with the definition of the topic, here 'sustainability,' but in view of such a large topic, refined to read '*How do I communicate the notion of sustainability to make people understand its important and feel motivated to make a change in their behavior*?' When one reads this question, one might immediately think of the myriad approaches to address the question, these methods ranging from simple Socratic questioning, to methods such as brainstorming, or in-depth interviews, focus groups, and the like. Mind Genomics proceeds by creating an experiment as we see below.

THE MIND GENOMICS EXPERIMENT

Raw materials (questions, answers): The first step in the Mind Genomics process, really experiment, lays out the topic in terms of four questions, and provides four answers to each question. Table 2 shows these questions and answers. The question often arises whether one must be 'exactly right' when starting, as well as the standard query of underlying one's discomfort, namely the concern '*how we do we know we have the correct questions and the correct answers*.' The question Mind Genomics has been designed to be iterative, so the questions and the answers need not be 'on target.' Even when the questions and answers are off-target, the speed and simplicity

of Mind Genomics allows the researcher to identify any 'nuggets' of ideas which perform well, with these nuggets the center of a new set of questions and answers.

Vignettes - systematically created test combination of answers: The four questions in Table 2 are used to prime the researcher to provide answers or elements. It is the answers, or really systematically created combinations of answers, which constitute the test material to be evaluated by the respondents. Mind Genomics determines the degree to which the individual answers or elements 'drive the response.' The use of combinations of vignettes rather than single elements as test stimuli ensures that there is a context for the vignette, i.e., the vignette resembles something that might be encountered in real life. Single ideas are not encountered in everyday life, because single ideas have no real meaning. It is combinations which have meaning, because the combinations represent types of mixture that we encounter in everyday life.

Table 2. The 'raw material' for the Mind Genomics study. The raw material comprises four questions, each with four answers.

	Question A: How do I tell people that there is a need for sustainability?
A1	The economy is slowed down by the waste it can't deal with!
A2	Excessive growth of state economy now crashing the global economy.
A3	Sustainability is a way of expressing your humanity.
A4	Sustainability is a way of joining together for a better society.
	Question B: What is the nature of the information conveyed?
B1	Information reported with scientifically proven statistics
B2	Information reported by well know authorities
B3	Information reported by ordinary people
B4	Information reported by people who have been affected
	Question C: Where and when is the information presented (venue)?
C1	Information presented in special parts of news
C2	Information presented after economic problems reported
C3	Information presented at high school assemblies
C4	Information presented at public government forums
	Question D: What is the tonality of the information?
D1	Information presented in a straight factual manner
D2	Information presented as an engaging story
D3	Information presented as a five-minute special
D4	Information presented as a special feature during celebration of sustainability day

The answers to the questions are combined according to an experimental design (Box, Hunter, & Hunter, 1976) The test stimuli comprise 24 different combinations, vignettes, specified by an underlying experimental design. The design does not consider

the 'meaning' of the combination, but simply specifies the combinations to be created in a manner which makes the 16 answers or elements statistically 'independent of each other'. That statistical independence will be important for the subsequent regression modeling.

An important feature for the Mind Genomics approach is that each respondent tests different combinations of elements or answers in their set of 24 vignettes. That is, each respondent evaluates combinations from a legitimate experimental design. The basic design is maintained; only the specific combinations vary. This strategy of 'permutation' allows the research to cover a 'wide space' of different combinations and obviates the need of the researcher to select the 'proper combinations' at the start of the experiment. The experiment truly explores the range of alternative combinations, rather than focuses on the performance of a limited, pre-selected set (Gofman & Moskowitz, 2010). It is this property of 'coverage' which turns Mind Genomics from the conventional hypothetico-deductive system of conventional science to a cartography of the mind.

Panelists recruited for on-line studies: The respondents for this study comprise individuals who have volunteered to become part of an online panel, who participate in studies. The respondents are anonymous, totally unknown to the researcher, except for the country, year of birth, and gender. Any other information relevant to this study is connected at the start of the study by a short classification questionnaire. For this study, the respondents were also asked a third classification question beyond age and gender.

The respondents were recruited from the test panel aggregated by Luc.id Inc., the strategic panel provider associated with Mind Genomics, a company which has tens of millions of respondents available to participate world-wide. The respondents began the interview by clicking on an embedded link in the invitation.

The entire interview for a respondent required 4-5 minutes. Unlike today's short surveys, the Mind Genomics study is not really a survey in the true sense, but rather an experiment, in which the respondent is presented with systematically varied test stimuli (vignettes), which test stimuli they read and evaluate on the 5-point scale shown below. The Mind Genomics program, BimiLeap®, recorded the composition of the vignette, the rating assigned to the vignette, and the number of seconds (to the nearest tenth of second) elapsing between the presentation of the vignette on the screen, and the response. This is known as response time, considered by experimental psychologists to reflect ongoing internal process (Boring, 1950). In the academic literature the response time is known as the 'reaction time.'

The five-point rating scale and the transformation to allow regression analysis: Mind Genomics permits the respondent to rate each vignette on a scale. The nature of the scale is left to the discretion of the researcher. Table 3 shows the scale used. The scale combines two different dimensions, interest & motivation to do something. The respondents are able to select the appropriate feeling from the five points. Each of the five original points was transformed to a binary scale, so the analysis first created five new binary scales, R1, R2, R3, R4, and R5, respectively. When the respondent selected

Table 3. The five-point rating scale and the two 'net' scales

Read the vignette below and select your feeling ..
1=tuned out.....
2=not interested & do nothing to help
3=interested & do nothing to help
4=not interested & do something to help....
5=interested & do something to help
Net Do Something = sum of binary transformations for R4 & R5
Net Interested = sum of binary transformations for R3 & R5

a specific rating (e.g., R4), that binary scale value become 100, and the four remaining binary scale values became 0. In this way the original 5-point scale gave rise to five new scales. Afterwards, two 'net' scales were created by summing the appropriate binary scales. The 'net scales' will become important when we look at the elements or answers which drive 'interest' versus those elements which drive 'motivation'.

Linking the Presence/Absence of the 16 Answers/ Elements to the Binary Ratings and the Net Ratings

The data for the 62 X respondents generates a large data set of 1488 rows, each respondent generating 24 rows of data corresponding to the 24 vignettes. Although the respondents were instructed to rate the vignette as a totality, and most respondents did so easily, the underlying experimental design makes it straightforward to deconstruct the ratings into the part-worth contribution of each message. The statistical technique is OLS, ordinary least-regression, chosen because the results of the regression allow the researcher to understand the contributions of the individual answers virtually immediately.

Applying OLS regression to the data, using four different response variables, generates the coefficients shown in Table 4.

1. The additive constant is the estimated percent of the time the respondent will assign the answer in the absence of elements or answers in the vignette. By design, all vignettes comprised 2-4 elements, so that the additive constant is an estimated parameter. Even so, the additive constant provides information and insight. For example, when we look at scale point R5, 'U*nderstand the facts and motivated to do something*,' we find that only 17% of the responses are expected to be R5, in the absence of elements. We are not dealing here with a highly motivated group of people, at least on an intrinsic basis. It will have to be the specific messages which propel the strong response. When we turn to R1, *Tuned out*, we find a lower additive constant, 11. Finally, when we look at the responses to the newly created 'net variables,' we found 45-48, slightly below 50%, for both motivated to do, and for understand the facts.
2. We see very few elements are answers which exceed 8. In these Mind Genomics studies, the standard error of estimate for the coefficients are often around 4. When the coefficients exceed 7-8,, we often see covariation with external behaviors, when

Table 4. Performance of the 16 answers/elements on four binary scales. Data from the total panel

	Total panel	R5 Interested & do something	R1 Tuned out	NET Do Some-thing	NET Interested
	Additive constant	17	11	45	48
A3	Sustainability is a way of expressing your humanity.	**8**	2	**10**	-4
B4	Information reported by people who have been affected	5	-4	6	**9**
D4	Information presented as a special feature during celebration of sustainability day	5	-2	0	3
B1	Information reported with scientifically proven statistics	5	-4	5	7
D2	Information presented as an engaging story	5	-1	1	6
A4	Sustainability is a way of joining together for a better society.	5	1	3	-4
D1	Information presented in a straight factual manner	4	-1	1	5
C2	Information presented after economic problems reported	4	0	-3	5
B2	Information reported by well know authorities	2	-5	2	7
D3	Information presented as a five-minute special	2	0	-1	1
A1	The economy is slowed down by the waste it can't deal with!	2	3	0	-5
C4	Information presented at public government forums	1	-3	-4	3
B3	Information reported by ordinary people	1	-3	-1	**9**
A2	Excessive growth of state economy now crashing the global economy.	-1	4	-7	1
C1	Information presented in special parts of news	-2	-3	-5	5
C3	Information presented at high school assemblies	-2	-1	-4	1

such information is available. Inspecting Table 4 shows us only three strongly performing variables:

Sustainability is a way of expressing your humanity.
Information reported by people who have been affected
Information reported by ordinary people

3. It may be that the answers or elements for sustainability chosen in this study are simply the 'wrong' ones. More likely, however, is the general pattern that there are different groups in the population with different response patterns to the same messages. A message may be very motivating to one group, and not at all motivating to another group, or even demotivating.

SCENARIOS – HOW 'VENUE OF PRESENTATION' AFFECTS THE RESPONSE TO THE OTHER INFORMATION

The Mind Genomics structure ensures that each answer or element from one question appears with each answer or element from another question. Since the combinations differ for each respondent, one can rapidly and easily discover interactions between answers from different questions, and then quantify their magnitude. This type of analysis is impossible with regular experimental designs which present one set of combinations, but to many respondents.

The strategy, called scenario analysis, proceeds in a simple manner, beginning by stratifying the vignettes based upon the messages within the vignette. The stratification that we use here is by venue where the information is presented, question C. Question C has four answers, as well the condition No Venue mentioned in the vignette. We create five strata, comprising all vignettes with no answer from question C, and four additional strata, one stratum for each answer. Thus, all vignettes with C1 (special part of news) fall into one stratum. All vignettes with C4 (public government forums) fall into another stratum, and so forth. Within each stratum, the venue is the same.

The next step in the analysis works with each stratum separately, estimating the coefficients for the net rating (e.g., NET DO, R4 & R5 combined). This time the OLS regression uses only 12 predictors, not the 16. The predictors are the four elements or answers from questions A, B and D, respectively.

The coefficients from this analysis appear in Table 5. Each column corresponds to one venue. The same answer, i.e., the same verbiage (row) can perform quite differently, depending upon the venue in which it is placed (column.) Table 5 shows only the combinations where there is a dramatic synergy (the venue substantially increases the coefficient of the element) or dramatic suppression (the venue substantially decreases the coefficient of the element.)

The additive constant can be construed as the value of the venue. The four locations of the venues are approximately equal. The interesting aspect now follows, namely the interaction of venue and element. As an example, let us look at the element A3 (Sustainability is a way of expressing your humanity). Depending upon the venue, the element can be a strong driver of the response (e.g., coefficient of A3 is +29 when paired with '*high school assemblies*,'), as well as be is a modest performer when not paired with any venue (coefficient of A3 is +5 when the venue is absent), and even negative when paired with with a different venues (e.g., coefficient is -5 when paired with the venue of '*public government forums'*.)

Table 5. Scenario analysis – the coefficient of each answer/element when VENUE is held constant at each of the five options it takes in the vignettes. The dependent variable is NET DO SOMETHING

	NET – Do something (R4 & R5)	No Venue in vignette	special parts of news	after economic problems reported	high school assemblies	public government forums
	Additive constant	75	46	35	40	38
A3	Sustainability is a way of expressing your humanity.	5	**9**	**9**	**29**	-5
D2	Information presented as an engaging story	-11	-5	**18**	-8	5
D1	Information presented in a straight factual manner	-11	-6	**18**	-8	4
D3	Information presented as a five-minute special	-16	-6	**13**	-7	5
A1	The economy is slowed down by the waste it can't deal with!	-12	-3	**9**	2	-1
B1	Information reported with scientifically proven statistics	-9	6	-3	**8**	**12**
B4	Information reported by people who have been affected	-2	5	-2	5	**10**
A4	Sustainability is a way of joining together for a better society.	-3	2	1	1	**8**
D4	Information presented as a special feature during celebration of sustainability day	-6	-3	7	-8	**8**

Table 6 shows the scenario analysis, this time with the other variable 'NET INTERESTED"

Gender Differences in Net Variables

When we divide the respondents by gender and then look at the separately estimated coefficients for both Net Interested and Net Do Something, we see dramatic differences by gender and by scale (see Table 7)

Net Interested (R3 and R5)

1. Women are more likely than men to say that that they are interested facts (additive constant =29 for men, 51 for women).
2. One element strongly stands out, A3, *Sustainability is a way of expressing your humanity'*. This phrase strongly resonates with men and is a differentiating element. The same phrase resonates with women, but not as strongly differentiated.
3. Women are more motivate to do something when the message appeals to emotions, e.g., *Information reported by people who have been affected*
4. Men are more motivated to do something when the message talks about the venue whe3re the information is communicated (e.g., Information presented at high school assemblies)
5. The differences in genders are clear in terms of what they are, but they do not 'tell a story.'

Table 6. Scenario analysis – the coefficient of each answer/element when VENUE is held constant at each of the five options it takes in the vignettes. The dependent variable is NET INTERESTED.

	Net Interested (R3 & R5)	No Venue	special parts of news	after economic problems reported	high school assemblies	public government forums
	CONSTANT	90	65	57	46	37
B4	Information reported by people who have been affected	-29	**8**	3	5	**21**
D2	Information presented as an engaging story	**11**	-2	**14**	1	**9**
B3	Information reported by ordinary people	-25	6	-7	**18**	**13**
A3	Sustainability is a way of expressing your humanity.	-18	-5	-9	**14**	0
B1	Information reported with scientifically proven statistics	-35	6	4	**11**	**11**
A2	Excessive growth of state economy now crashing the global economy.	-18	-9	6	**10**	**10**
B2	Information reported by well know authorities	-40	7	6	**9**	**15**
D3	Information presented as a five-minute special	2	-12	-1	7	**12**
D1	Information presented in a straight factual manner	**18**	7	0	-14	**8**
D4	Information presented as a special feature during celebration of sustainability day	**21**	-3	2	-10	4

UNCOVERING MIND-SETS

A key tenet of Mind Genomics is that in every area of human endeavor where judgments are made or decisions taken, people may differ from each other, with these differences based upon the criteria used to make the decision. Folk wisdom recognizes this in aphorisms, such as '*one man's meat is another man's poison,'* or 'of *taste one does not dispute*.'

Individual differences have long been recognized in the world of opinion and judgment. The contribution of science is not the discovery of the variability, but rather the systematization of the variability, the discovery of underlying homogeneous groups, emerging from that variability. The project of Mind Genomics research is to

Table 7. Comparing males and females on the two Net variables, understand and motivate. Only strong performing elements are shown (coefficients > 7)

		Net Interested		Net Motivated (Do Something)	
		Male	Fem	Male	Fem
	Additive constant	29	51	47	50
A3	Sustainability is a way of expressing your humanity.	**17**	**8**		
B1	Information reported with scientifically proven statistics	**13**	2	**8**	**7**
B2	Information reported by well-known authorities	**10**	-1	**7**	**7**
D4	Information presented as a special feature during celebration of sustainability day	**9**	-3		
A1	The economy is slowed down by the waste it can't deal with!	**8**	-3		
D2	Information presented as an engaging story	**8**	-1	**8**	5
D1	Information presented in a straight factual manner	**7**	-2		
B4	Information reported by people who have been affected	4	**7**	1	**12**
C3	Information presented at high school assemblies			**7**	-2
B3	Information reported by ordinary people			**15**	5

recognize the variability, and then put a meaningful rationale behind that variability, on a topic by topic basis

Mind Genomics uses k-means clustering to place the respondents into different groups, based upon the similarity of patterns for their 16 coefficients. For segmentation the additive constant is ignored (Dube & Jain, 1980.). Each pair of respondents generates a distance measure, defined as (1-Pearson Correlation), with the correlation computed across the 16 comparable coefficients of the pair of respondents. The Pearson correlation varies from a high of +1 with two sets of coefficients perfectly correlated and thus the distance is 0; to a low of -1 with two sets of coefficients perfectly inversely correlated and thus the distance is 2 (1 – 1 = 2).

The final step beyond the mechanics of clustering, a purely mathematical operation, ensures that the clusters or 'mind-sets' make sense. The clusters are a mathematical construct. We are looking for a psychological construct, mind-set, defined as a coherent way to describe the nature of the differences between people, the underlying 'story.' There must be a limited number of clusters or emergent mind-sets (parsimony, and the clusters must tell a story (interpretability).

The ideal is, of course, one mind-set, the total panel, but as our data suggest in Table 3, the strongest performing elements are not very powerful (no very high coefficients), and do not suggest an underlying story. When we apply the clustering program to the data, using as the NET variable 'Do' as the criterion on which we create the new clusters, we find two radically different groups. Table 7 shows the output of the clustering, presenting the coefficients from both the Net variable 'Motivated' (the basis for the clustering), and the Net variable 'Understand' (not used in the clustering.)

Mind-Set 1 can be labelled 'Feelings' because they respond to statements designed to appeal to the emotions.

Sustainability is a way of expressing your humanity.
The economy is slowed down by the waste it can't deal with!

Mind-Set 2 can be labelled 'Facts' because they respond to statements designed to present the case in a factual way.

Information reported with scientifically proven statistics
Information reported by people who have been affected
Information reported by well know authorities
Information reported by ordinary people

The remaining answers or elements do not motivate either group.

It is also clear from Table 8 that dynamics of the two mind-sets differ. For Mind-Set 1 (Feelings), the elements or answers which drive Do Something' are not those which drive 'Understand,' For Mind-Set 2 (Facts), the elements or answers which drive 'Motivate' ARE among those which drive 'Understand.'

FINDING THESE MIND-SETS IN THE POPULATIONS

Despite the clarity of the differences between the two mind-sets, finding them in the population will be much harder than identifying them. A simple experiment uncovers the nature of the mind-set, but it will be hard to assign a new person to a mind-set based simply on WHO the person is, and what the person THINKS. Table 9 shows the similar patterns of gender and age for the two mind-sets, as well as the similarity in the way they answer the third classification question about their point of view regarding sustainability. There might other 'magic questions' of a general nature, but it's more likely that we will need a specific procedure, designed on the basis of this study to assign new people to one of these two these mind-sets.

Recent developments in Mind Genomics have focused on creating a PVI, a personal viewpoint identifier, comprising a set of questions, the pattern of answers to which define a person as a member of one of the mind-sets. The six questions of the PVI are presented in Figure 1. The questions are derived from the most differentiating elements, converted into questions, each question having two answers to make the process quick and not painful for the respondent. The responses to the questions generate 64 possible patterns. Each pattern is more likely to fall into Mind-Set 1 (Feelings) or into Mind-Set 2 (Facts). The PVI is not perfect, of course, but within 30 seconds it is able to assign a respondent to one of the two mind-sets, either for ongoing research about attitudes, or for promotion of educational events, or even products.

Once the respondent has completed the PVI, the classification is made immediately, the information stored (but without necessarily knowing WHO THE RESPONDENT

Table 8. Comparison of the coefficients for the two emergent mind-sets, Feelings and Facts, respectively

	The two mind-sets, created from clustering 'Net Do Something'	Net Do Something			Net Interested	
		MS 1 Feelings	MS 2 Facts		MS 1 Feelings	MS 2 Facts
	Additive constant	54	35		57	38
	Motivates Mind-Set 1 (Feelings) to do something					
A3	Sustainability is a way of expressing your humanity.	**19**	0		-5	-4
A1	The economy is slowed down by the waste it can't deal with!	**11**	-11		-11	1
	Motivates Mind-Set 2 (Facts) to do something					
B1	Information reported with scientifically proven statistics	-7	**18**		**8**	6
B4	Information reported by people who have been affected	-5	**18**		6	**13**
B2	Information reported by well know authorities	-6	**11**		6	**8**
B3	Information reported by ordinary people	-12	**11**		4	**12**
	Do not motivate either mind-set to do something					
A4	Sustainability is a way of joining together for a better society.	5	1		-4	-3
D1	Information presented in a straight factual manner	3	-2		6	5
A2	Excessive growth of state economy now crashing the global economy.	3	-17		-8	**10**
D2	Information presented as an engaging story	2	1		5	7
D4	Information presented as a special feature during celebration of sustainability day	-1	3		7	-1
C4	Information presented at public government forums	-2	-3		-2	**9**
D3	Information presented as a five-minute special	-4	1		3	0
C2	Information presented after economic problems reported	-5	-1		**8**	0
C1	Information presented in special parts of news	-7	-2		3	7
C3	Information presented at high school assemblies	-8	0		-4	6

IS), and the proper next steps are followed, e.g. recording the data, or sending out appropriately worded follow-up materials.

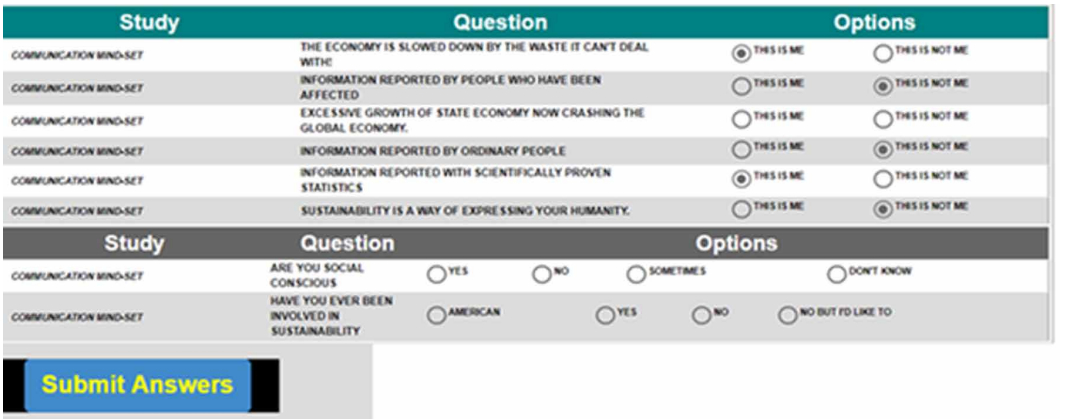
Response Time To Messages

The history of experimental psychology began with studies of reaction time or response time, in the laboratory of the noted pioneer, Wilhelm Wundt (Boring, 1950). Long response times were assumed to represent the intervention of processes in perception and decision- making, most of which might escape articulation, but would make their presence known by the time needed to react. It should come as no surprise that a great deal of attention in experimental psychology has focused on the measurement of response time, an easy measure, and one that can be correlated with the test stimulus and with the test condition to which the subject or responded is exposed.

Table 9. Distribution of respondents in the two mind-sets, total, gender age, and stated belief about sustainability

	MS1 Feelings	MS2 Facts	Total
Total	32	30	62
Male	10	8	18
Female	22	22	44
Age 18-24	5	4	9
Age 25-37	27	26	53
Believe when shown	16	16	32
Don't care	8	9	17
Feelings are for hippies	1	1	2
Move to woods	2	2	4
Not applicable	5	2	7

Figure 1. The six-question PVI for sustainability



The Mind Genomics paradigm enables the introduction of the non-verbal measure, response time, and the connection to the underlying test stimulus. Just as regression was used to link elements to ratings, so can regression link elements to the time needed to make a judgment. The modeling follows the now-standard approach, which makes the 16 answers or elements into so-called dummy variables ('1' when present in a vignette, '0' when absent from the vignette), and the response now being the number of seconds, to the nearest tenth of a second The model does not incorporate an additive constant, however. The rationale for omitting the additive constant is that in the absence of elements or answers in the vignette, there is no reaction at all. We write the equation as: Response Time = k1(A1) + k2(A2) ... k16(D4)

Table 10 shows us the set of estimated response times by answer/element (row) and by key subgroup (column.) Those response times of 1.0 seconds or longer are shown in shaded cells, with bolded numbers. These are the elements which, operationally defined here, can be said to 'engage' or at least appear to take longer to process. These elements are not necessarily positive, but rather they hold the respondent's attention, at least as estimated from the regression analysis. There is no clear pattern of elements which engage everyone, although there are two elements which tend engage, or at least take the longest to be processed:

Information presented as a special feature during celebration of sustainability day
The economy is slowed down by the waste it can't deal with!

Total panel: No element holds attention. The longest response time is 0.9 seconds

The economy is slowed down by the waste it can't deal with!

1. Males: Respond to venue
2. Females: Engaged by an emotional message or by a person with who they can identify
3. Age 13-24: Engaged by many elements, and appear to be sensitized to the issues
4. Age 25-37: Are not easily engaged
5. Believe it if see it: Engaged by emotional presentation
6. Don't care: Engaged by the sense of facts
7. Mind-Set 1: Feelings – Engaged by generalities
8. Mind-Set 2: Fact – Engaged by a factual presentation dealing with reasons

DISCUSSION AND CONCLUSION

Our short excursion into the world of sustainability focuses on the listener, the recipient of the messages as a person who is to be influenced. The Mind Genomics 'project' changes the focus from that which is communicated in and of itself to that which is communicated and 'received' by the audience. In our exploration we see a very deep world of differences in the messages about sustainability. The topic is large, and the nature of the reaction of the listener will vary.

The literature of sustainability recognizes the importance of proper communication, based upon the titles and the content of the papers. At the most general level, such as that presented here, Mind Genomics reveals the types of information to which a listener will respond. The exploration with Mind Genomics can go further, focusing on a topic area (e.g., environment), and modifying the language and tonality of the specific messages, but keeping the messages similar. That deeper focus, one or two levels below the general level, provides a further contribution to the science and

Table 10. Response time estimated for the 16 answers/elements. The table shows only those elements with response times > 1.0 for at least one subgroup.

			Gender		Age		Self-Profiling Question				Mind Set	
		Total	**Male**	**Female**	**A 13-24**	**A 25-37**	**Believe if see**	**Do not care**	**Move to woods**	**Feelings for hippies**	**MS1 Feelings**	**MS2 Facts**
D4	Information presented as a special feature during celebration of sustainability day	**1.1**	**1.2**	**1.1**	0.8	**1.1**	**1.3**	0.8	0.8	**1.4**	**1.3**	0.9
A1	The economy is slowed down by the waste it can't deal with!	0.9	0.2	**1.2**	0.8	0.9	**1.1**	0.7	0.8	0.4	0.8	**1.0**
B3	Information reported by ordinary people	0.9	0.6	**1.0**	**1.0**	0.8	**1.0**	0.9	0.7	**1.2**	**1.1**	0.6
D3	Information presented as a five-minute special	0.9	0.7	0.9	0.9	0.9	1.0	**1.2**	0.8	0.0	**1.0**	0.8
B4	Information reported by people who have been affected	0.8	0.9	0.8	**1.0**	0.7	0.6	0.8	0.8	**1.1**	0.8	0.7
C2	Information presented after economic problems reported	0.8	0.9	0.8	**1.1**	0.8	0.8	**1.1**	0.8	-0.3	0.5	**1.0**
A2	Excessive growth of state economy now crashing the global economy.	0.7	0.3	0.9	0.8	0.7	0.8	0.8	0.8	**1.2**	0.5	0.9
A4	Sustainability is a way of joining together for a better society.	0.7	0.6	0.8	0.2	0.8	0.7	0.5	0.7	0.5	0.6	0.8
B1	Information reported with scientifically proven statistics	0.7	0.7	0.7	**1.0**	0.6	0.6	0.7	0.7	0.6	**1.0**	0.3
C4	Information presented at public government forums	0.7	**1.1**	0.6	**1.0**	0.7	0.9	0.5	0.8	-0.1	0.8	0.7
B2	Information reported by well know authorities	0.6	0.5	0.6	0.5	0.6	0.6	0.7	0.8	**2.4**	0.9	0.3

sociology of sustainability, not only from the point of what motivates action, but also what types of messages, what language, what tonality, engage attention, and then produce the desired response. The need for this has been well recognized in the published academic literature (Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014; Corral Verdugo, 2012; Godemann & Michelsen, 2011; Huijts, Molin, & Steg, 2012).

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