

Compendium



*For travel to
be joyful, you
must know
where you
are, every
step of the
way.*



2021

DIVERSIFI
Annual Compendium
volume 2

Introducing Diversifi

Diversifi, as the name suggests, aims to bring together diverse perspectives and voices from the world of Behavioural Science. Instead of focusing on a “one size fits all” approach, Diversifi seeks to embrace the multiculturalism and messiness in studying human behaviour. If there is one thing we have learnt from this tumultuous year, it is that culture-specific and personalised interventions are the future of BeSci. True to its name, the Diversifi compendium is an eclectic collection of case studies, opinion pieces and work summaries from BeSci practitioners in the UK, USA, India, Africa, South Africa, Australia, New Zealand and the Netherlands.

More details about the team and Diversifi can be found at: diversifiglobal.com.

If you would like to connect with the team or be involved in any future endeavours, please contact us at:
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Letter from the editor



Jez Groom
*Diversifi Secretary
& Cowry Consulting
Founder, CEO*

Welcome to the second annual compendium from the global Diversifi Applied Behavioural Science Network!

During the last year, our cross cultural applied behavioural science teams from Mexico to Hungary, from the US to the UK, from Peru to New Zealand and more, have been working on a host of fascinating pieces of work we'd like to share.

Learn about risk taking and organisational change in response to the pandemic in the UK and US, sustainability in mainland Europe, eastern Europe and New Zealand, travel in India, improving Bayesian reasoning in Peru, selling cakes in Mexico, layering behavioural barriers from the Netherlands, dealing with organisational change in Australia and caring for vulnerable customers in the UK.

This compendium is truly diverse, in its content and the context from which it originates. Enjoy!

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BEHAVIOURAL BY DESIGN

CLEAN & CLEVER

ENERGY NUDGES
FOR
BUSINESSES

Vishal George & Eddie Jean
New Zealand

Business is a social process – a human activity that, like any other, revolves around situational awareness, norms, and behaviour. Inherent in any business is its people, who influence and are influenced by what they see, hear, say, want, do, think and feel. People are the driving force behind business processes from innovation to social responsibility, and a robust understanding of motivations is essential if we want to strive towards a more sustainable future. We set out to discover how behavioural science can leverage people’s dreams and aspirations towards positive climate action. Come take a look!

How behavioural science can be used to influence climate behaviour



With industry emissions among the top culprits of global greenhouse gas emissions, businesses have a huge role to fill in the shift towards a more sustainable future. However, there are deep-seated psychological barriers which make climate action for businesses challenging. Each company's actions, no matter how big or small, contribute to the world we live in. Harnessing their collective power for the benefit of the planet is one of the most exciting possibilities of our time.

Since there are no universal laws when it comes to behavioural science, one must keep an open mind while testing strategies and applying insights effectively for

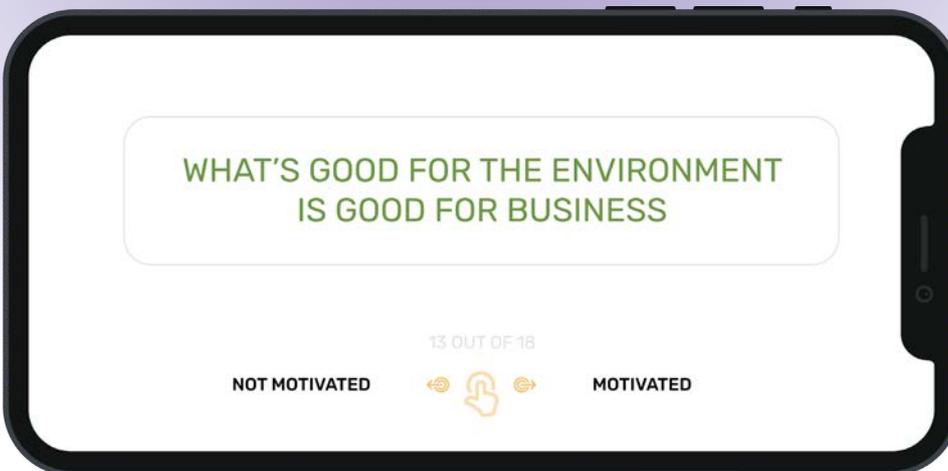
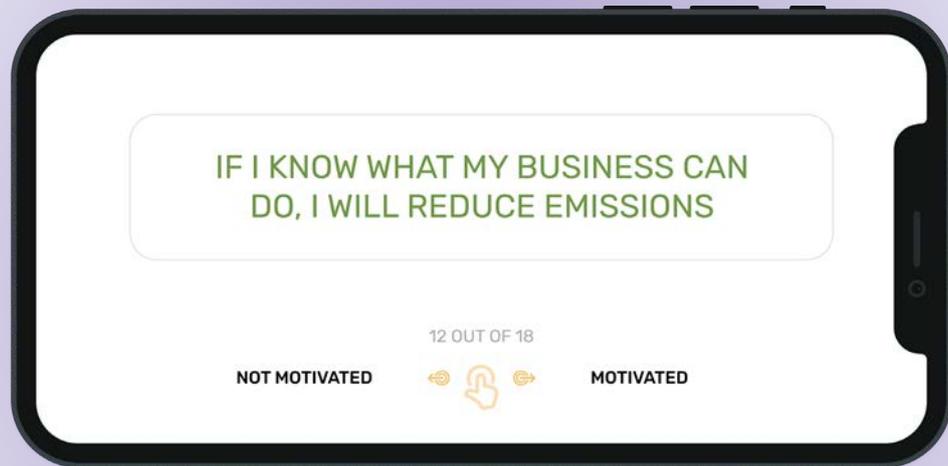
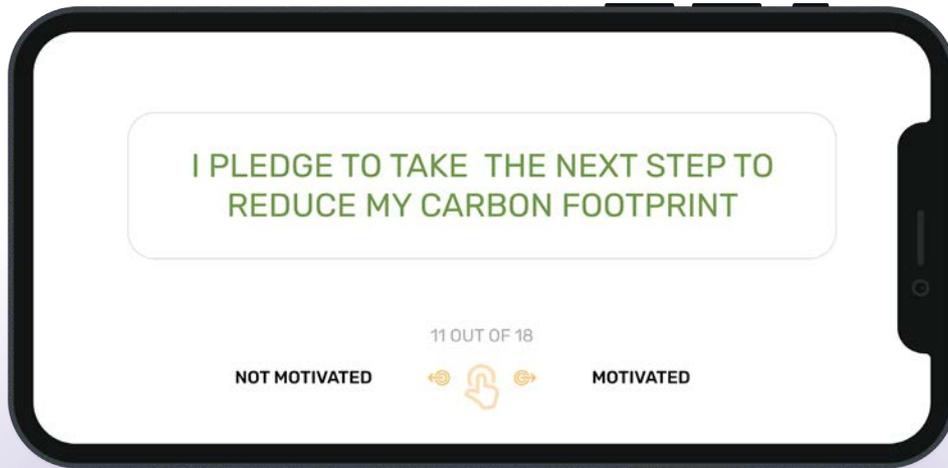
different individuals and contexts. Relying on previous research provides a good starting point from which to test evidence-based strategies. From this data, we can evolve industry-specific strategies which illuminate a more tailored communications plan. We kept this in mind to research and develop strategies from behavioural science to motivate climate action with New Zealand's small and medium enterprises (SMEs).

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PART 1

Purpose

We partnered with the Energy Efficiency and Conservation Authority (EECA) - New Zealand's government agency responsible for promoting energy efficiency and conservation - to test how we could best motivate SMEs to reduce their carbon emissions.



PART 2

Methodology

Working from Thaler and Sunstein's nudge theory, we designed a platform to test which nudges would work best for EECA. To guide our nudges, we applied MINDSPACE principles (Donal et. al.): a framework with nine robust influences on behaviour, where each letter represents a different principle for behaviour change. For example, M represents the Messenger principle, which describes a greater tendency for a message to be heeded when it comes from a respected messenger. This framework is supported by research in social psychology and behavioural economics.

We also diagnosed significant psychological drivers and barriers to SMEs for and against taking positive climate action based on synthesised market research. Using the COM-B model, we looked for ways in which SMEs were impacted by their Capabilities, Opportunities, and Motivations, and developed questions accordingly.

With the blockers and enablers gleaned from the COM-B model, we led a workshop with the EECA and the Sustainability Business Network to explore the use of nudges to influence behaviours and applied MINDSPACE principles to develop an initial 45 clean and clever 'nudges' as early thought starters. From there, we refined our research-backed ideas down to a short list of 18 nudges -- two for each of the nine MINDSPACE principles -- which we tested using our Nudge Testbed platform.

PART 3

Research Question

Using our Nudge Testbed platform, we asked three questions:

- Which nudges work best to motivate SMEs?
- What behavioural insights can explain this?
- How might we implement behaviour change strategies?

Our target audience was 388 decision makers from SMEs who were recruited by a panel provider to participate in our online experiment via their mobile phones or tablets. After completing demographic and personality questions, participants were asked to swipe right or left on their devices based on whether they were motivated by the 18 short-listed nudges. For our analysis to measure motivation, we adapted methods from the Implicit Association Test (IAT). This approach evaluates the participants' speed of response to surface the automatic (referred to as "System 1") associations with the nudges.

PART 4

Results

When the results of our experiment came back, we were left with four clear 'winners' among our original 18 nudges.

1. Messenger Nudge 1: "Our kids expect more kindness for the environment." 73% were motivated.
2. Commitment Nudge 2: "I pledge to take the next step to reduce my carbon footprint." 67% were motivated.
3. Affect Nudge 2: "What's good for the environment is good for business." 66% were motivated.
4. Ego Nudge 2: "Show them how innovative New Zealanders can be." 63% were motivated.

PART 5

Application

Each of the original nudges were chosen based on research, but our experiment found that these four were more impactful than the others. We took the time to analyze why that may be, given the behavioural insights underpinning each strategy.

THE MESSENGER EFFECT

We concluded that using kids as messengers has a strong influence on our behaviour. This far outperformed using the community as a messenger. Furthermore, this nudge demonstrated the power of a new norm of kindness. Especially in the context of dealing with Covid-19, kindness has come forth as a very salient approach for social cohesion. The combination of the powerful messenger of future generations and the increased salience of kindness made for a strong motivator.



COMMITMENT DEVICES

Public and/or private pledges have been shown to demonstrate greater follow-through when it comes to making a commitment. We concluded that people like to adopt “feel good” actions which allow them to stay consistent with their self-identity, and when coupled with the public nature of a pledge, it provides extra motivation to stay committed.

AFFECT HEURISTIC

Affect harnesses the power of emotions: how our actions can do good, which will then make us feel good. Businesses are run by people, and people are emotional creatures. We strive to feel good and avoid feeling bad. With this nudge, which showcased a win-win scenario (what’s good for the environment is good for business), people can feel confident and secure that their business needs will remain consistent with their social identity (i.e., they can be both successful and environmentally responsible).

HUMBLE EGO

We found that the power of framing (i.e., framing climate responsibility as an opportunity for business innovation) and in-group behaviours (riding the wave of the popular talking point around the world of how New Zealand came together as a team of five million during the Covid-19 crisis) had a powerful impact on harnessing businesses.



The wizardry of Nudge Testbed is that its malleability helps us determine exactly what type of messaging is most influential for a particular sector to influence a particular outcome. For SMEs looking to reduce their impact on climate change, our research indicates that appealing to the Messenger effect -- specifically using the future generation as messengers to convey the new norm of kindness -- is most effective. This not only has positive implications for the current social fabric, but provides a promising and hopeful framework from which to affect positive change.

For SMEs looking to reduce climate change, our research indicates that appealing to the Messenger effect -- specifically using the future generation as messengers to convey the new norm of kindness -- is most effective.

CONCLUSION

Climate change is a pressing issue facing our planet, and businesses are not exempt. As powerful players in society, SMEs have a unique opportunity to lead the way into a greener future. To omit human psychology from one of the most imminent issues of our time would be an unfortunate missed opportunity. Here, we have shown how behavioural science can find the best ways to influence the business world via our simple use of the Nudge Testbed.

To omit human psychology from one of the most imminent issues of our time would be an unfortunate missed opportunity.

Nudge Testbed allows an organisation to take advantage of the opportunity to apply research-backed principles to the specifics of their industry. By creating individualised “nudges” based on a behavioural science framework, they can be sure that the nudges they create will be both scientifically sound and relevant to their concerns. This provides a simple yet effective way to implement behavioural strategies into practical solutions with positive results. With this strategy, we hope to have contributed another step forward on the path to sustainability. Here’s to a greener future facilitated by behavioural science!

BEHIVE CONSULTING

INCENTIVISING RECYCLING WITH BEHAVIOURAL SCIENCE



Rachel Altmann
Hungary

Using Behavioural Science and habit creation to motivate employees to recycle their waste.

BeHive was approached by 3DHISTECH, one of the global market leaders in digital pathology devices, to develop a behavioural intervention package aimed at prompting employees to engage in proper methods of waste recycling. Their problem was two-fold:

1. Employees did not proactively engage in recycling behaviour, and
2. Employees did not separate the trash properly, even when there was an intention to use the recycling bins.

Furthermore, primary research suggested that while all relevant stakeholders agreed on the importance of recycling, employees' target behaviour could not be facilitated due to the lack of knowledge, motivation, and suitable infrastructure.

PART 1

Research Context

While at first glance it may appear straightforward, recycling behaviour is in fact composed of a rather complex set of ingrained individual habits and their corresponding behavioural cues. Thus, for proper recycling operations and successful behaviour change, developing strong habits is crucial, as even small individual inconsistencies can hinder collective efforts.

SECONDARY RESEARCH

BeHive conducted in-depth secondary research to explore the root cause of the client's problem. Four key contexts were identified in addition to the global context by which decision-making is driven:

INDIVIDUAL CONTEXT

Human decision-making is based on deliberate and automatic modes of information processing. By making information easier to consume, information asymmetry can be decreased between stakeholders, while their incentives can be aligned. Primary components involve: self-image, cognitive load, rewards and penalties, time distortion, fast and slow processing.

SOCIAL CONTEXT

Most people make efforts to conform to social norms and expectations. Therefore, by adjusting them to align with organisational change initiatives, the direction of individual effort can be influenced. Examples include: messenger effect, reciprocity, and social norms.

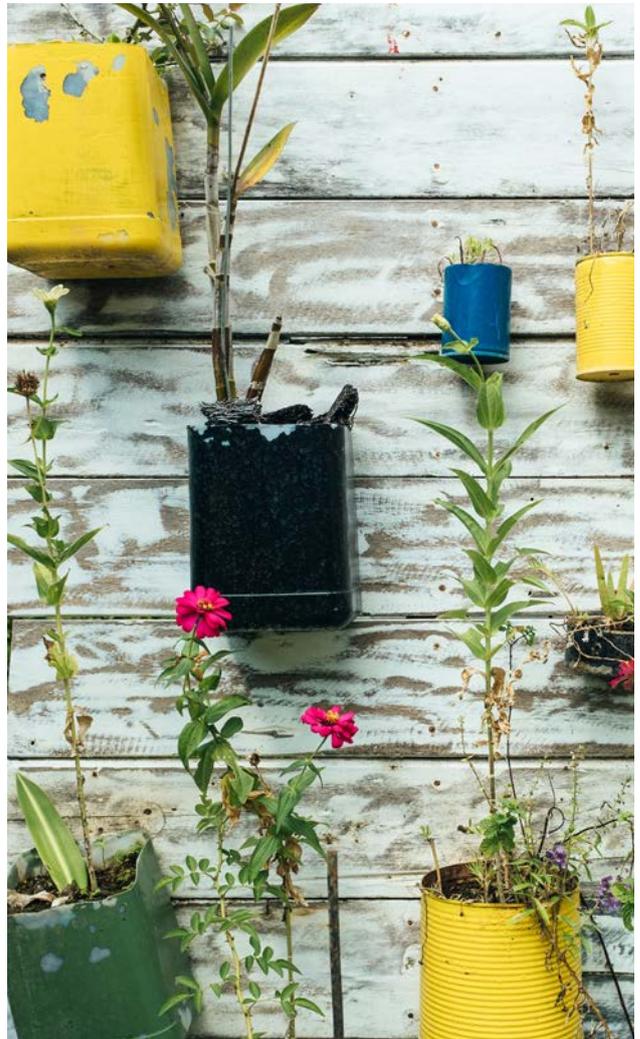
ENVIRONMENTAL CONTEXT

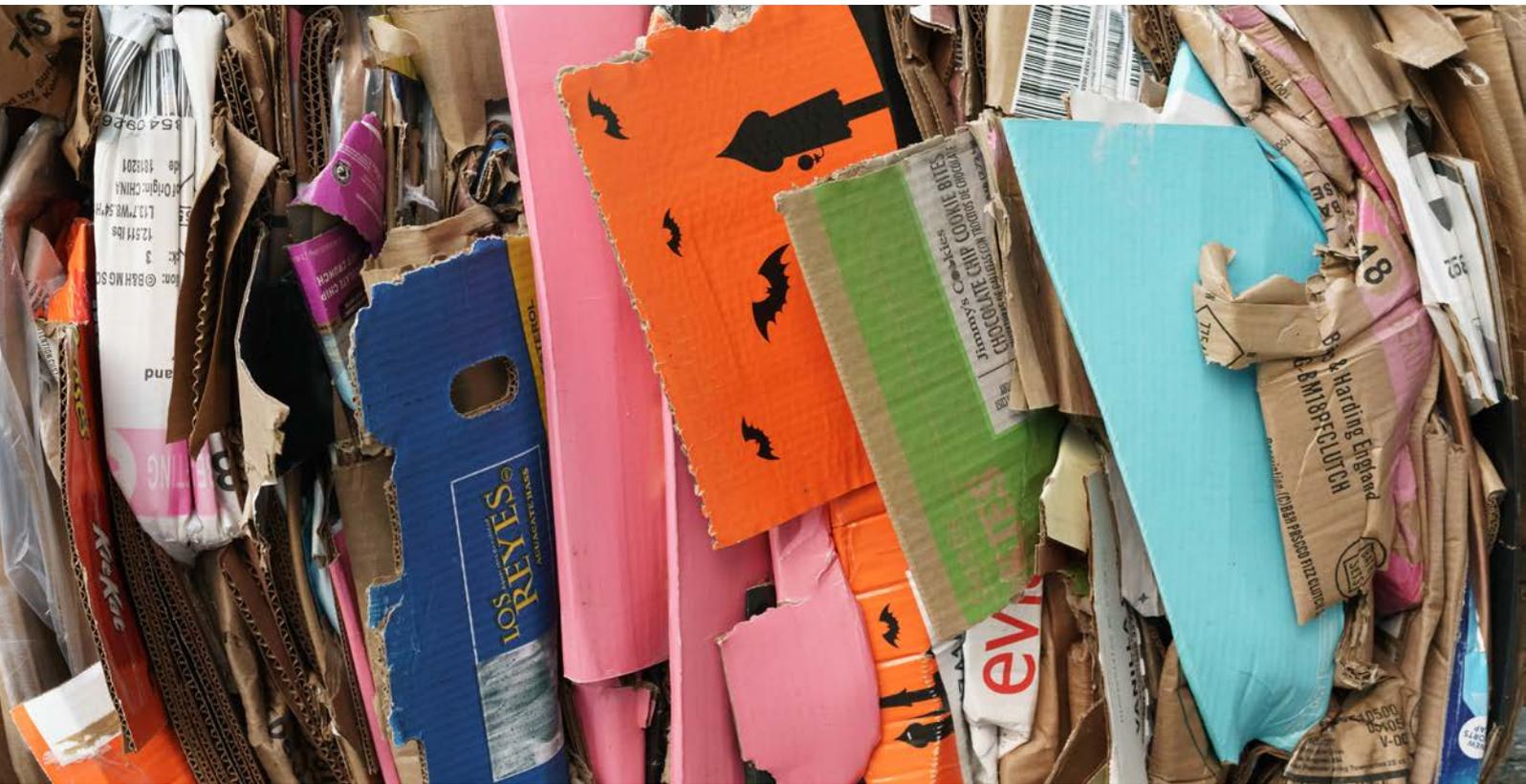
Automatic information processing is shaped by contextual factors and cues in our environment. Changing the relevant environmental factors around stakeholders can drive action towards the desired direction. Examples include: choice architecture, feedback and reminders, framing and priming, salience, simplification, and timing.

GLOBAL CONTEXT

To support the change process with clear, achievable, medium- and long-term goals, it is important to assess and communicate the global impact of individual and team efforts.

Since targeted behaviour change was required to alter old recycling habits and to instil the desired ones, BeHive incorporated Fogg's behaviour model (later referred to as BMAT) into its analysis and subsequent primary research. The BMAT demonstrates three elements which must simultaneously converge for a specific behaviour to occur: Motivation, Ability, and a Prompt. When a behaviour does not occur, at least one of those three elements is considered missing.





PRIMARY RESEARCH

BeHive conducted primary research in the mixed form of employee interviews and online questionnaires to gain a more accurate understanding of recycling behaviour taking place on the client's premises.

Results of the primary data collection revealed that **the majority of respondents cared about the environment and recycling**, perceiving

themselves as environmentally-conscious individuals. A strong collective agreement also emerged from the results regarding the importance of education on the subject, thus highlighting the need for more information on the whys and hows of recycling. Feeding into the BMAT model, the results organically revealed the existence of key motivators within the behavioural equation, while simultaneously uncovering the absence of imperative triggers as well as unsuitable levels of ability.

PART 2

Interventions

Having empirically identified substantial voids within certain elements of the BMAT, three main areas of behavioural intervention were developed:

1. Provision of targeted information to enhance ability
2. Triggering and perpetuating target behaviour by implementing reminders and commitment devices
3. Utilising feedback and social norms to increase motivation and prompt target behaviour.

PROVISION OF TARGETED INFORMATION TO ENHANCE PERCEIVED ABILITY

In order to enhance employees' ability to execute the desired behaviour, our team developed targeted information posters built upon a triad of what, how and why questions which aimed to address the issue of information scarcity in recycling.

The intervention also incorporated time distortion, where recycling-related information is communicated in a way that helps to associate future consequences with the present (e.g. highlighting the sum of lifetime waste generation) and salience, where the significance and relevance of the recycling-related information is directly related to individual experience with the aim to create more personal associations.

How long does it take for a **plastic container** to decompose?



1 ≈ **450**
plastic container years

Give it another thought.
Wash it! Bin it!



Protect the environment. Recycle.

The original material is Hungarian



The original material is Hungarian

COMMITMENT DEVICES TO PROMPT BEHAVIOUR

Our team created a commitment device as well as introduced additional visual cues serving as reminders to reinforce recycling-related knowledge.

The commitment device was delivered

in the form of an online questionnaire which was created based on Hollenbeck, Williams and Klein's (1989) model for empirically measuring goal commitment.

Further visual cues in the form of stickers were introduced and placed at salient locations.



USING SOCIAL NORMS TO INCREASE MOTIVATION

The third main area of intervention was introduced with the aim to sustain and further increase the already desirable levels of employee motivation.

By tracking recycling progress on-site and taking targeted measurements at specified intervals, employees were regularly provided with feedback aimed at facilitating the formation of new habits. These weekly emails served to support the

desired mental associations with the right behaviour and reinforcement messages. Importantly, the emails provided the exact percentages of weekly changes in the recycling behaviour, whereby interpreting progress for employees became more tangible and concrete, assisting long-term habit formation.

We utilized the messenger effect by identifying key individuals within the organisational social networks and consequently delivering the desired behavioural prompts with the aid of these individuals.

PART 3

Testing & Results

To test the efficacy and track the progress of our interventions, a recycling diary was introduced in which the quality and quantity of recycling was documented on a daily basis according to the exact location of the corresponding bins. According to the baseline measurement and verbal reports, approximately 10% of the trash was recycled properly; which, following our intervention strategy, increased to 85% – the trend persisting throughout the three months of the measurement period.

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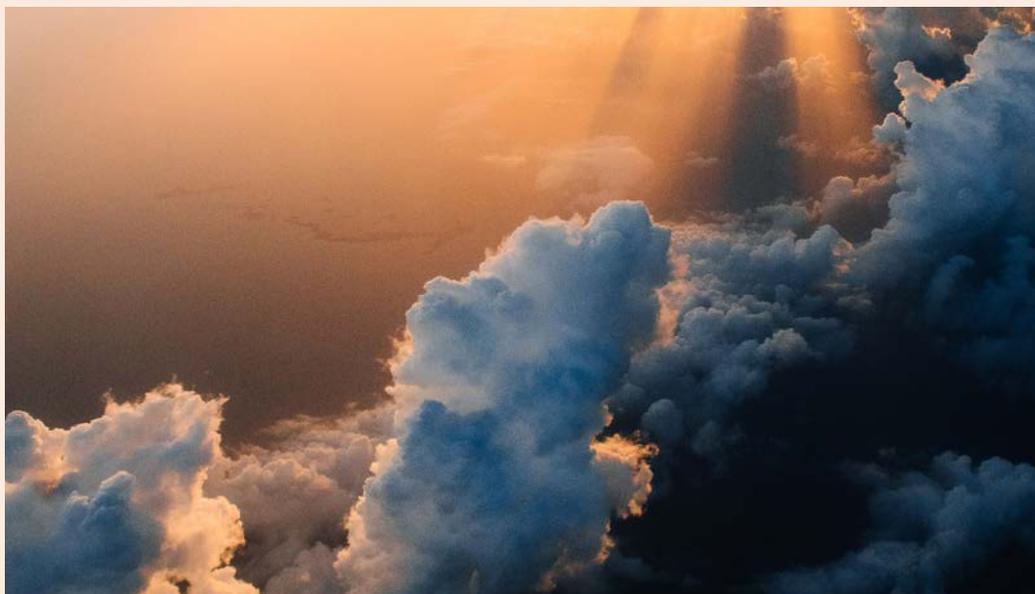
85%.



1001 STORIES

THE RITUALS OF TRAVEL

CASE OF THE INDIAN METRO



Written by: Priyanka Khatri
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India



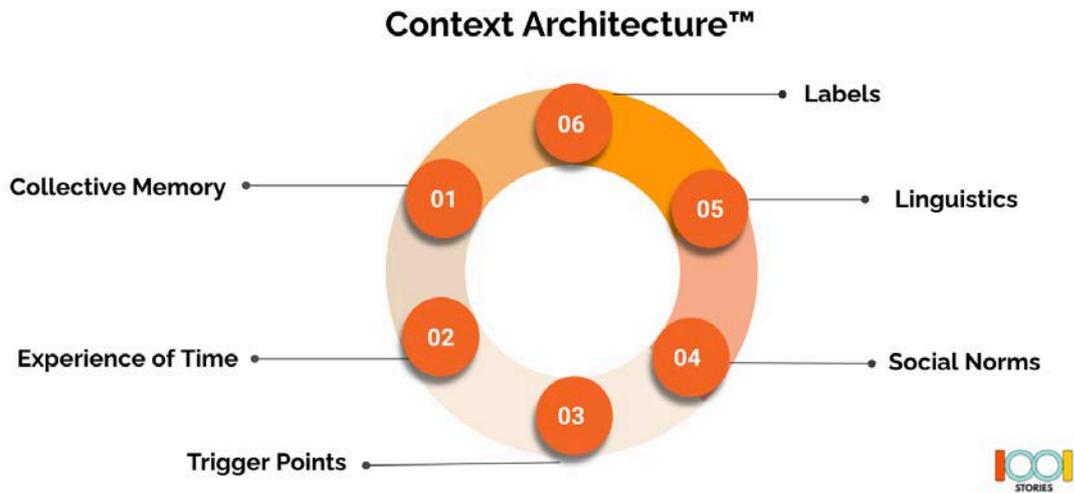


Over the last two decades the Metro Rail Projects have been the most touted and visible harbingers of change in the urban Indian landscape. Motivated to curb pollution and improve the standards of public transportation, the government of India developed overhead and underground metros across ten Indian cities, Delhi, Gurgaon, Mumbai, Bengaluru, Hyderabad, Kochi, Kolkata, Chennai, Jaipur and Lucknow, at break-neck speed.

The metro has even been particularly successful in the cities of Kolkata, Delhi and Chennai, with over 80% of travelers choosing the metro to travel over long distances (more than 10 kms; Goel & Tiwari 2014). Nevertheless, despite being much celebrated and acknowledged by citizens, the metro has not become an integral part of their daily travel routine as its acceptance in this context has been limited.

THE BRIEF

Prepping for life post-Covid, we were assigned the task of deciphering how to make metro travel a part of an urban Indian’s daily travel routine.



AN EXPLORATION OF CONTEXT

Step 1: Identify the key stakeholders

Metro Adopters, Metro Discarders & Metro Tourists

Step 2: Mapping the architecture of their context

THE NAVIGATION

We set out to study metro behaviour and commuter interaction across 4 cities using the following methods:

1. Academic and government research
2. Social listening on YouTube, Twitter and blog posts regarding urban Indian commute
3. Projective techniques and interviews with users and non-users

We then mapped our learnings onto metro acceptance, associations, triggers, system barriers and commuters' subjective well-being (will get to the reason soon).

Collective memory narrative:

a mapping of motivation

Collective labels and roles:

a mapping of identity

Collective experience of time:

a mapping of goals/incentive intervals

Collective linguistic boundaries:

a mapping of associations and interpretations

Collective trigger points:

a mapping of existing collective nudges

Collective social norms:

a mapping of behavioural patterns

A Behavioural Science Approach

THE CONTEXT OF TRAVEL

Social Norm | Collective Memory

Across interviews, the daily travel journey emerged to be a back-and-forth round trip between the home and the workplace. As expected, participants reported that they would like to travel quickly and cost-effectively. They further acknowledged that, contrary to popular perception, metro travel is not too expensive, and it most definitely is quick.

However, at this point, we encountered hesitation. When asked *“would you then choose the metro over your daily mode of transport (train, bus, car)?”*, participants replied, *“umm... sure I guess but in the local (train) I have friends I meet daily and I get to listen to music.”*

Rationally speaking, their rejection of the metro should be influenced by their reluctance to change their default mode of commute. However, the ask for social bonding and zoning out were their vocalized preferences.



To take this investigation a step further, we asked participants to document a day in their lives in as much detail as possible.

An analysis of the auto-ethnographies suggested that each one of us divided our day into moments of high involvement followed by moments of diffused living. The reconstructed episodic memories were most detailed for the high involvement moments, such as planning the next day before bed, when working and spending time with family.

In contrast, the moments of diffused living were marked by poor, generalized recall. These moments included shower time, breakfast and travel time. The moments of transit were being utilized by participants to cool-off and prepare for the next part of the day.

Observations from the interviews and

auto-ethnographies documented that commuters use their travel time as a break during which they can read a book, eat a snack, listen to music, socialize, pursue hobbies and even sleep. In this way, they allow their mind to wander and their bodies to physically achieve homeostasis balance. As far as daily-commuting is concerned, the moments of diffusion experienced during travel also help the commuter transition to their next identity role (supported by: Legal J-B et.al. 2016).

We humans live well enough and long enough, to generate all sorts of stressful events purely in our heads.

Sapolsky (2004)

The experience of daily commuting offers important moments of diffusion, thus dictating our mood and ability to transition to and meet the demands of our identity role successfully. Research also suggests that:

Travel affects well-being, positively and negatively, both through the activities accessed from travel (or not accessed, for some) and the actual travel itself. As mentioned above, people's "travel well-being" is

made up of affective (i.e. emotional) and cognitive (i.e. evaluative) components."

Smith (2016)





While examining the modes of transportation in urban India, three different ways to travel emerged, each for a specific audience. While the local train and bus are associated with the masses, the metro is strongly associated with white collar office professionals and the rickshaw is uniquely positioned to offer a private experience via a public mode of transport. In fact, the bus has become the preferred mode of transport by 90% of daily commuters (in all cities except Mumbai, where the local trains dominate).

While evaluating the experience of bus travel (and local train travel in Mumbai), we learned that the link between the metro and the social group associated with metro travel is deeply rooted in western individualistic habits. This appears in India perhaps due to an inheritance of colonial expectations of behavior in a western context or an exposure to travel scenes from the global north-west. In contrast, the

local bus and rickshaw are deeply rooted in community-spirited interaction, typical of the Indian collective consciousness.

The metro context, simply put, is '*Unfamiliar!*' Increased ambiguity associated with this mode of transportation reduces sense of control and comfort - a situation to be avoided unless necessary.

One could say that the analysis of the metro context was a metaphorical application of the phenomenon of the Uncanny Valley (Mori, MacDorman & Kageki, 2012), only in this case with respect to contextual infrastructural upgradation. Infrastructural upgradation is appreciated until it becomes discomfoting and stress-inducing. Perhaps at that point, the commuter seeks to travel swimmingly in order to maintain travel as an experience of diffused moments, thus feeling in control, in safety and within their familiar zone.

THE CONTEXT OF METRO

Experience of Time | Labels | Linguistics

To further investigate the above hypothesis, we carried out a series of quasi-experiments to understand what makes the context of the metro unfamiliar. We generated three key insights:

The Speed: We asked participants to tell us when the metro's speed was appreciated and when it was not. They reported that metro travel becomes a pleasurable experience when it reduces travel time for long journeys and when traveling takes place in a non-crowded, air-conditioned bogie allowing one to view their city from an elevated position.

However, in some cases, speed hinders one's ability to engage in travel rituals, such as listening to music, sleeping, engaging in conversation during daily and shorter-distance commutes. The multi-

modal nature of travel to reach and depart from the metro station further reduces the perceived duration of the metro ride and thus of the delightful experience of being in the bogie.

“Metro is super-fast. Eastern-to-western side of the highway, otherwise takes a lot of time. From up high, I only see the city as beautiful. But to take the metro is too much effort for 2 minute AC”

58, male, Mumbai



SOLUTION DIRECTION

Create a sense of seamlessness across the multiple modes of transportation to make it feel like a single journey and reduce effortful friction points, pre and post metro-experience.

This will enable the commuter to think of their journey as one experience, giving them more time to experience moments of diffusion without feeling that 'additional attention is required'.

THE MAP OF THE METRO

When choosing how to travel on a daily basis, commuters display strong ambiguity aversion. People are most comfortable when they find themselves in familiar environments, where routine scenes play out before them. They make decisions about commuting that will reduce their 'Travel Anxiety'.

For example: Taking an Uber instead of driving to an unfamiliar part of town or taking the same train/bus everyday as a routine, falling asleep and knowing exactly when to wake up to get off at the right station.

These spatial familiarities are built over time, and rely heavily on the myriad of natural variations of a city, which changes every few kilometres. Being able to see the city and familiar landmarks gives the commuter a much-desired sense of control

and visibility. The Google Maps habit and an Uber driver's constant visual display of the map allow a degree of control over the journey, even on unfamiliar ground.

For travel to be joyful, you must know where you are, every step of the way.

With respect to the metro map, people are unable to decipher the map in relation to their understanding of the city.

*For travel to
be joyful, you
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the way.*

Commuters have a mental map of their city that is experiential, with its level of detail being determined by the extent of their travel experience. The map of the metro, however, is removed from the city map making it harder to be processed and memorized. 73% of the metro maps drawn by respondents were depicted with minimal detailing and only included stations the commuters were aware of.

"Metro map I know only airport road and Ghatkopar station. Airport road near office and Ghatkopar skywalk to switch to local."

34, male, Mumbai

The metro allows for a limited view of the city, from a disorienting and unfamiliar vantage point above the streets, or under the ground. It is thus difficult to identify landmarks and have proper awareness of one's spatial coordinates throughout the journey.

As expressed by an occasional travel
"From metro see a different city, from a top looks beautiful very different from when on ground"

58, Male, Mumbai



SOLUTION DIRECTION

Encourage a sense of awareness by signalling control and reducing decision fatigue. For example, convey route clarity by superimposing the metro map on the city map. Build a no pressure atmosphere for the commuter to relax.

The Context Architecture translated to Action

These findings imply that, for the urban commuter, travel beyond utility is an essential activity of the daily routine - an activity on which urban Indians spend a considerable amount of their time and money. The more seamlessly it integrates with and adds joy to the daily rituals of life, the more it enables the urban commuter to meet the demands of their daily life.

Along with a focus on speed, security, cleanliness and convenience, the metro environment needs to be redesigned in a way that it can offer an opportunity to serendipitously experience wonder, achievement, and relaxation. Additionally, each station should be integrated with its surroundings and its design could be inspired by the characteristics of its location. For example, Dadar metro station could be integrated with the flower market in Dadar, both visually and aromatically. Currently, localization of train stations is being adopted and experimented with in Delhi and Kolkata:

Similarly, introducing a mechanism that allows urban Indians to outsmart the system will introduce moments of joy and the feeling that it is 'their own place' - "I have traveled in local without ticket so many times it is ok. Metro barriers cannot do!" -34, male, Mumbai. The feeling of endowment associated with being able to travel back and forth without being charged twice or watched creates a kinder interaction between the metro environment and commuters.

The ultimate goal of these interventions is to allow the urban citizen to feel both accomplished and at home in their cities, rather than aliens in an unfamiliar, rigid environment characterized by cameras, security systems and uncanny social influence exerted by the behavior of fellow commuters who are watching their every move.



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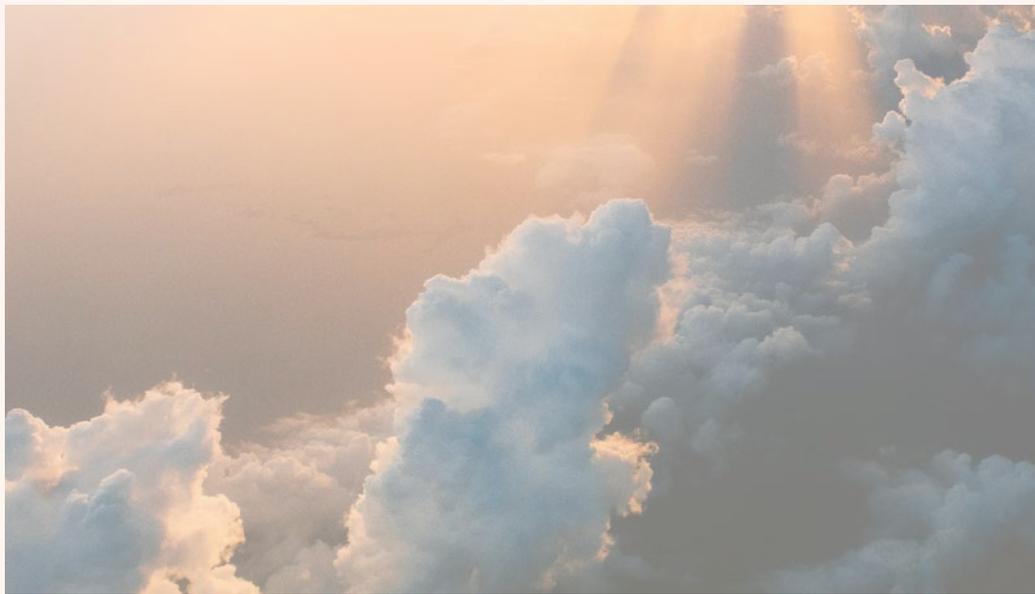
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BEHAVEN

Towards a Sustainable Society



One Behaviour at a Time

Julia Terlet & Fred Dorsimont
France

Not everyone agrees on the importance of individual behaviour change as a way towards a more sustainable society. Generally, two types of arguments run against it. The first is that small acts don't have any impact. The second is that governments and businesses should be responsible for making important changes, and shouldn't push their responsibility onto individuals.

The truth is, technological progress and political decisions aren't sufficient to affect change to the scale that we need. These initiatives need to be complemented by individual behaviour change to have enough of an impact.



PART 1

The contribution of individual behaviour change

The French consultancy Carbone 4 estimates that actions such as cycling, not eating meat and flying less could help reduce our carbon footprint by 25%. Adding to that, investments such as switching to an electric car or a new boiler, or opting for thermal renovation, could lead to further reductions. Altogether, our collective carbon footprint could be cut by up to 45% through individual action. And even a moderate, more realistic level of engagement could reduce emissions by 20% if it was adopted by all. This is all the more important for inhabitants of the Global North, who live in countries responsible for 92% of excess emissions.

"I think one of the challenges of the transport decarbonisation plan is that there's a soft implication that everything can be achieved through technology. But I think we all know that there needs to be some behavioural change as well", recently said Martin Dean, Managing Director at the Go-Ahead Group, at COP26 as he was highlighting the importance of considering individual behaviour change.

The impact of behaviour change goes beyond reducing CO2 emissions and addressing climate change. Our behaviours also have an impact on other environmental issues, such as pollution, the depletion of natural resources, and biodiversity loss. The ecological transition is a mix of complex interdependent mechanisms that all include an individual element.





In addition, individual behaviour change can be a catalyst for bigger, societal changes. Stuart Capstick, Deputy Director of the Centre for Climate Change and Social Transformations at Cardiff University, said: “Take the example of plant-based diets. There’s not actually been many, if any, policies that have encouraged people to make the shift towards plant-based diets, aside from a little bit of health messaging. But there’s

been a big shift over the last decade towards plant-based diets. Because people have chosen to eat differently and, by making that choice, helped shift the cultural and social norms around plant-based diets.” Buying vegetarian products has indeed encouraged manufacturers to create more of it and supermarkets to put it on their shelves, subsequently driving further adoption and preference.

PART 2

Where Change Matters Most

Behavioural hotspots in terms of environmental impact include housing, water and energy consumption, transport, food, waste and the consumption of goods. Among these, nutrition, housing, and mobility are thought to amount to 75% of our total lifestyle carbon footprints. Let's zoom in on some of these categories:

FOOD

Consuming a plant-based diet is considered as one of the most impactful behaviours towards sustainability. It is estimated that we could save between 29% and 70% of CO₂ emissions globally if we were to reduce our consumption of animal products. Fresh (excuse the pun) insights come on an ongoing basis, related to both reducing meat consumption and increasing the adoption of plant-based diets. For instance, a recent intervention by the Flemish Government focused on reducing meat consumption. More specifically, they used the decoy effect to reduce the quantity of meat bought

in supermarkets. Simply by offering an additional medium-size option for sausages, 18% less meat was bought in supermarkets over the course of one month, although the number of sausages sold remained stable.

WASTE

Reducing plastic waste is also of prime importance, with some interesting interventions proving its effectiveness. For instance, the Refill campaign aims to tackle plastic pollution at the source by encouraging people to use reusable water bottles. Prior to the launch of the campaign, it appeared that one of the barriers preventing people from using reusable bottles was the fact that asking for tap water refills in restaurants and cafes was not perceived as being socially acceptable. Through the Refill app, and stickers on front windows, the campaign showed people

that refills were accepted by many places around them, including cafes and chains selling plastic bottles, such as Starbucks or Costa. An estimated one million plastic bottles have been saved since the start of the campaign.

TRANSPORT

Our personal transport behaviours are responsible for a large part of our carbon emissions annually. In high-income countries, the most impactful ones are without a doubt our car usage and air travels. In the UK for instance, the personal carbon footprint of individuals is almost equally shared between those two behaviours. Shifting from car usage to public transport or active modes such as cycling or walking is therefore key to reducing our impact. Pricing and regulation are obvious means of encouraging that change, but behavioural science can

also help. A recent study conducted in London found that gamification can efficiently encourage people to drive less. Participants were offered points and prizes for walking a certain distance everyday - which they proved by tapping a card on physical boxes placed throughout the borough. With this system in place, car usage was reduced by over 50%.

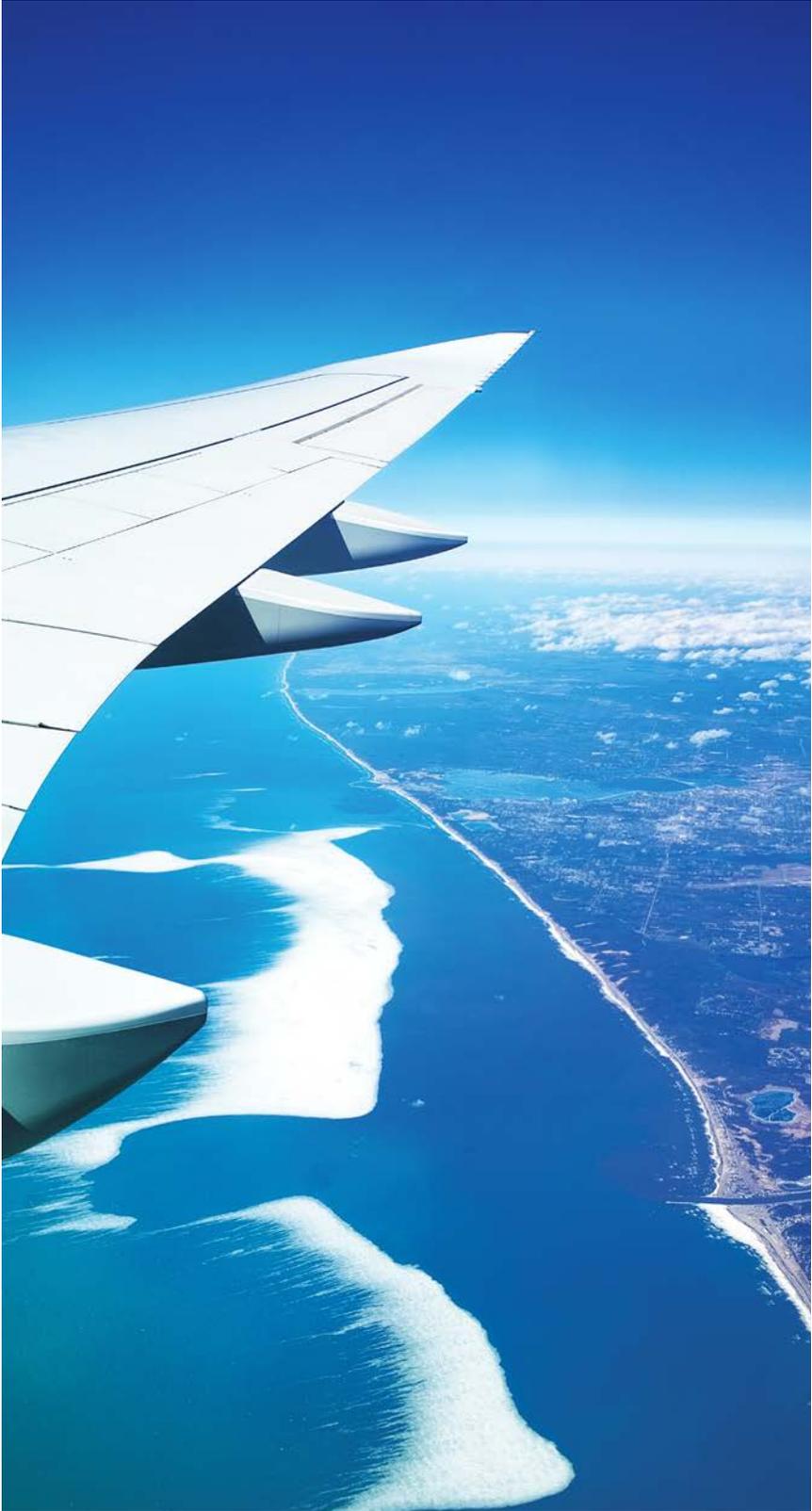
ENERGY

Although many of our energy-related behaviours happen in the private sphere, protected from the influence of social pressure, some others can be influenced by social norms. Take solar panels for instance. These are not geographically distributed in a random way but appear as clusters. Installing solar panels on your roof is likely to encourage your neighbours to do the same - and social influence doesn't stop there. Another study by Opower

showed that simply informing people about the energy consumption of their neighbours has helped save about 11 billion kilowatts of energy since 2007. Since then, the use of social comparisons has been replicated by many energy utilities around the world.

BANKING

Our banking behaviours are also particularly important. The impact of our everyday deposit accounts matters, as many banks currently use this money to loan to companies, including fossil fuel companies. While we can rarely decide who our deposits will be lent to, our personal banking choice will play a role in global carbon emissions. Amongst the many pro-environmental behaviours we can engage in, shifting to a sustainable bank can massively increase our contribution to a better planet, as it tackles the climate crisis at the root.





PART 3

Targeting the Right Groups

The good news is, moving towards a sustainable society does not necessarily require everyone to do everything. Collectively adopting a small number of impactful environmental behaviours could already bring about significant change. This said, it is extremely important that interventions designed using behavioural science particularly target high-impact behaviours and the right socio-economic groups. According to the World Inequality Database, in regions like the US or Europe, the richest 10% emit six to seven times more CO₂ emissions than the poorest 50%.

In relation to designing the right behavioural interventions, Polaris Koi from the University of Turku takes the example of nudging and states: *“It is of paramount importance that a nudge includes an accurate and comprehensive analysis of the climate impacts; that we target the most effective behaviours, rather than tinkering with something insignificant”,* and adding *“since harms from climate change are*

unevenly distributed, disproportionately affecting the global poor, inefficiency would make us complicit in those injustices and we need any intervention to be designed with that in mind.”

CONCLUSION

New laws and technologies need to be coupled with individual behaviour change and acceptance in order to accelerate change. Governments and organisations have a role to play in facilitating the adoption of sustainable behaviours, and that’s where behavioural science comes into play. And citizens and consumers have the power to create ripple effects, ultimately driving forward large-scale systemic changes towards a more climate-friendly and sustainable society.

It is of paramount importance that a nudge includes an accurate and comprehensive analysis of the climate impacts; that we target the most effective behaviours.

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CHAPTER
Two

organisational change.

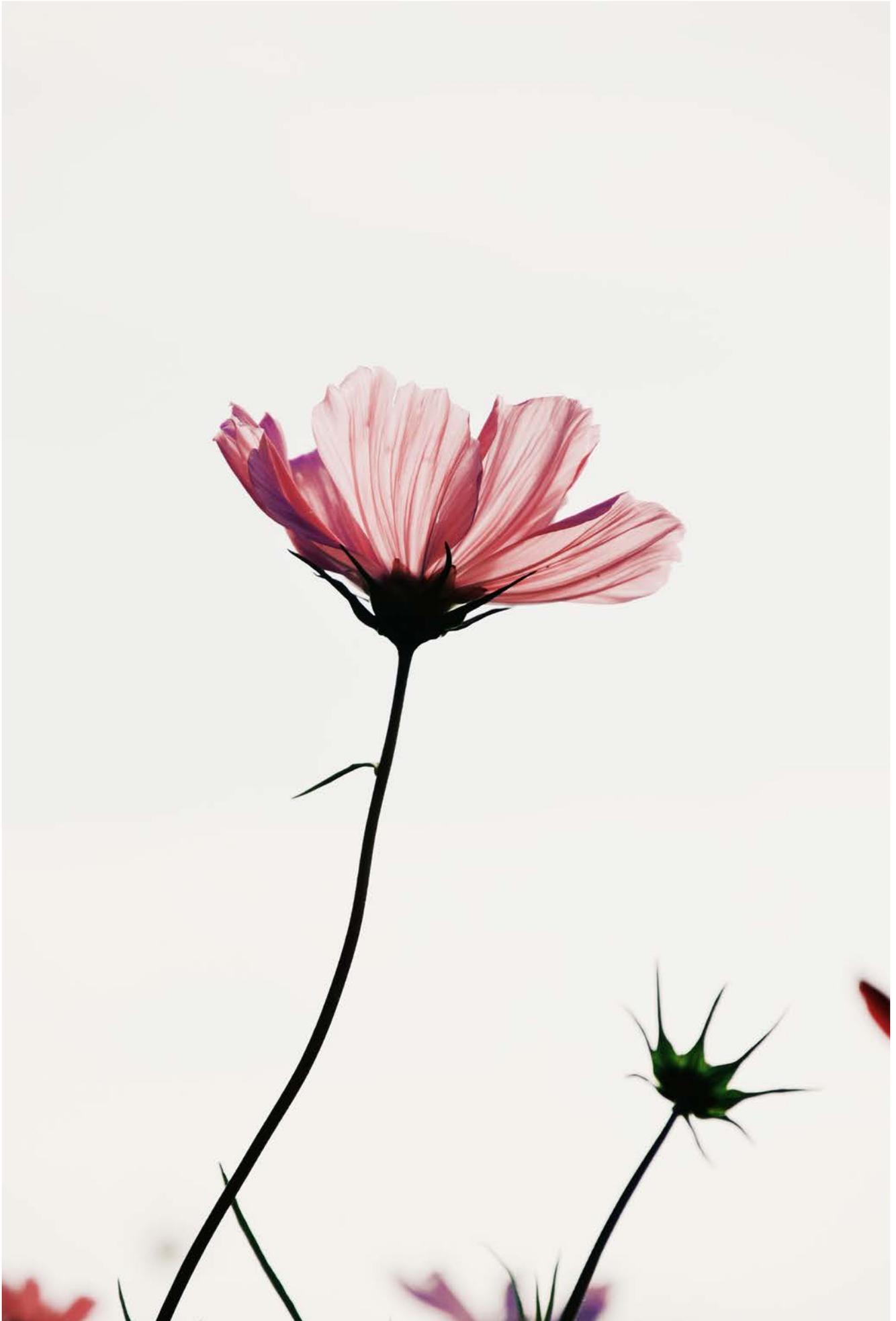
COWRY CONSULTING

A HELPING HAND

for vulnerable customers



Ziba Goddard
United Kingdom



Customer vulnerability is a growing problem faced by 53% of the adult population in the UK. According to the FCA, “a vulnerable customer is someone who, due to their personal circumstances, is especially susceptible to harm - particularly when a firm is not acting with appropriate levels of care.”

Phoenix, a life and pensions company within the financial sector, found that at least 50% of their customers have characteristics of vulnerability. Recognising that making financial decisions can be harder for those who are vulnerable, they decided they would like to give their colleagues a newfound appreciation of what vulnerable customers experience so they can relate to them and act with compassion when supporting them.

It is in this context that this year Phoenix hired us and CanStudios, an agency specialising in creating accessible, tech-focused, and unique e-learning platforms, to design an engaging and immersive e-learning around vulnerability for Phoenix’s colleagues.

The goal of the project was to enable Phoenix colleagues to understand the nuances of vulnerability, support their own well-being, and eventually better support their customers.

It was important for Phoenix to adopt an innovative and creative design approach for this course because, while they already had a number of e-learning courses, feedback highlighted a lack of interactive elements, relying on individual initiative to engage with the content.

Marrying behavioural science with tech was at the heart of our innovative approach: At Cowry, we used our C-factor

toolkit and our behavioural design capabilities along with extensive literature review into the mindset of vulnerable customers to create a first-hand vulnerable customer experience; CanStudios made it possible to use gamification and 3D videos making this experience all the more immersive.



*Marrying
Behavioural
Science with tech
was at the heart
of our innovative
approach*

Using perceptual psychology and interaction design, we considered creative ways of mimicking the experience of being vulnerable in a way that Phoenix hadn't done before. This includes demonstrating life with a severe visual impairment using an interactive 3D video, while another example recreates the overwhelming feeling when given too much information to process at once, and the impact this can have on decision making.

This approach allowed us to respond to the way our brains process information, using biases to bring vulnerability to life. We also made sure to create an optimal learning experience that continues after

the e-learning, providing colleagues with tools to improve their wellbeing - because it's only when we're feeling our best that we can give our best possible service to customers.



RESULTS

Phoenix has never seen so many colleagues complete an e-learning course, with over 90% completion within the first 4 weeks.

The results from the follow-up survey that we designed to measure the impact of the e-learning were overwhelmingly positive. Nearly all employees (96.3%) stated that

they felt more comfortable understanding the types of vulnerability and how this may impact their customers. Almost 9/10 felt more equipped to support vulnerable customers with the Helping Hand Framework the e-learning provided (89.3%). Overall, employees thought the e-learning was intuitive, interactive, and immensely engaging.

Feedback highlights that they have already begun thinking about how this applies to their role and wider network, with one employee stating:

“It made me think of a wide spread of different people that need different help or support. Brought real the fact that people can have various vulnerabilities and situations or can even just be confused by the words. Financial

decisions are very important and it’s our responsibility to make sure our customers understand that”.

This indicates that Phoenix colleagues have been actively listening and truly engaging with the programme.

The success of our e-learning module has also received public recognition, winning “Best Customer and Employee Engagement Programme” in the 2021 Engage Award!



After such amazing results, this style of e-learning has now become the new benchmark for future programmes. Moving forward with vulnerability, Phoenix will be continually improving the e-learning annually with the latest insights into vulnerable customers and wider socio-economic developments and make sure that all colleagues, both customer and non-customer facing are aware of how they can support vulnerable customers.



SONIA FRIEDRICH CONSULTING

BESCI FOR STARTUPS & SCALEUPS



It's simple. Give them proof of concept, with measured outcomes, and your clients keep coming back.

From Fortune 500 Companies to Start-Ups, Independent Consultant, Sonia Friedrich applies Behavioural Science (BeSci) interventions with clients, with the aim to empower employees, and to make or save the business money.

For her, it's not about keeping the BeSci toolkit a mystery. It's about upskilling the team and helping clients reach their goals faster. She sees three clear signs BeSci is taking hold within a client company:

1. EMPOWERING EMPLOYEES

Watching employees and teams shift from fear and uncertainty, to confident, empowered and successful with evidence-based decision making is a huge reward.

2. REVENUE IMPACT

Seeing the bottom-line impact confirms the process and interventions, again and again.

3. CULTURE AND CONVERSATIONS

Hearing new lexicon within the business shows the change is cemented within culture and process.

When I hear clients in meetings and conversations saying: I think that's a Friction Point! Let's look at the data? The data shows something different? We're using reciprocity here...and so many other BeSci one-liners, then I know it's taking hold. The BeSci baton has shifted from me to employees and I know we're winning and it is gathering momentum.

The Start-Up, now Scale-Up, School Stream is a success in point, demonstrating the BeSci journey and how it has built and worked over three years. The longevity of results speak for themselves. School Stream is an APP voted #1 for Service and support for school-to-parent communication in Australia. The BeSci journey began when CEO and founder Melissa Bridson attended a speaking event of Sonia's on Irrational Pricing Wins!

Average new sale value

+515%

This alone is a staggering result demonstrating how B.E plays a critical role in any business strategy.

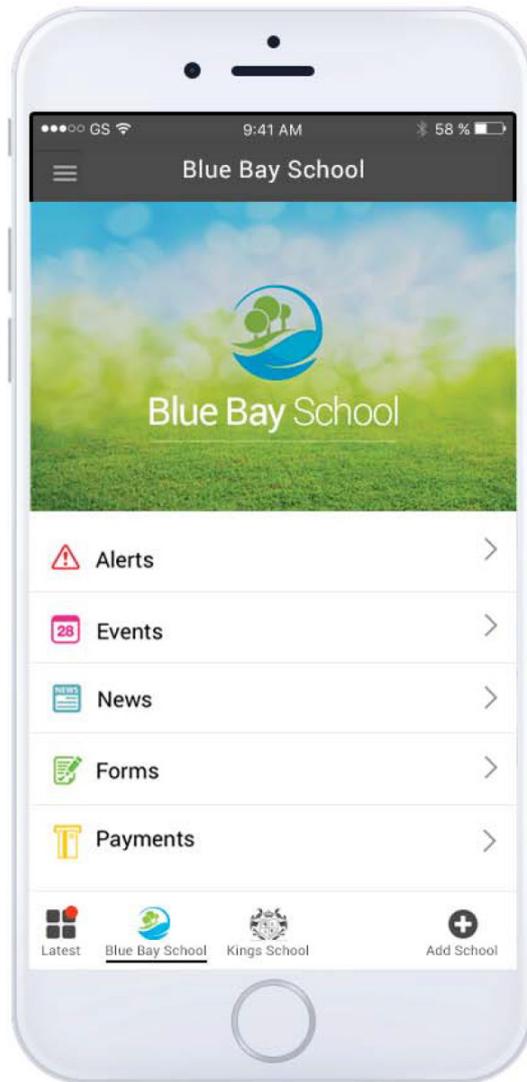
Melissa, CEO & Founder

UPSKILL THE TEAM

Next, the sales team was upskilled. With big shifts in pricing there is always fear. Sonia's role now is to hand-hold and help shift the fear to excitement, which in essence is a mind shift. The key is to share all the draft thinking, have everyone experience the pricing, and see their own behaviour change. To have the sales team and management observe what they would buy and understand the pricing heuristics and biases involved is always powerful to watch. Nearly everyone has the same response. It's a way to change beliefs quickly with interaction and self-experience. You take everyone on a journey rather than presenting it as a fait accompli. There is a different level of engagement when you share in draft, and what goes live is still considered 'final

draft' until it's proven effective. There's always room for change based on live experimentation. Everyone gets to share their fears and their experiences. Staff buy-in is completely different this way.

Adding BeSci to the sales team selling script was next. While Melissa holds the bigger sales targets she wants her team to achieve, Sonia's goal is never a big sales target. Her goal is to get individuals to say the new pricing once. "You chunk it down to one easy and present goal. This is the behaviour you want to change," says Sonia. Her aim is to have the sales team say it once, aim to sign up one customer, and then individuals will be confident to say it again. Fear disappears instantly. Excitement and confidence take hold. It's the first win that instantly changes beliefs.





KEEP A CLOSE EYE ON ROLL-OUT

Everyone keeps a close eye with the roll-out with low-risk customers first and watches for any unintended consequence. "I mean, we are watching the first calls very closely. You aren't waiting for statistical proof when you start. You are keeping a close eye on every sale for the first 24 to 48 hours. If something goes pear-shaped you need to intercept this quickly. This is real money the business has on the line," shares Sonia. Sonia works with her clients to come up with a goal of how many customers Melissa and the team would be prepared to lose before they changed tactics. The client is taking the risk, so it is critical these conversations happen before the pilot begins. In effect, it's part of a pre-mortem, bringing failure into the conversation. Then you can plan for it in

advance. Doing that live is not where you want to make these decisions.

Sonia is called in to consult when key challenges for the business arise that have an opportunity to apply BeSci interventions. There seems to be a logical sequence of projects that occurred independently, yet build upon each other. With School Stream it followed the following journey:

The following pricing flow has been repeated during the 3 years.

1

**DATA & PRICING
AUDIT**

Internal & Market
Review for Revenue
Forecast Accuracy +
Baseline

2

**NEW PRICING
OPTIONS**

3

**UPSKILL SALES
TEAM ON
IRRATIONAL
PRICING WINS!**

4

**UPSKILL SALES
TEAM BЕСI &
SELLING SKILLS**

Include Revised
Selling Scripts

5

**TEST / LEARN /
MEASURE / PIVOT**

6

FULL ROLL OUT

7

**REVISE SALES COMMISSION REMUNERATION
ONCE NEW PRICING SUCCESSFULLY ROLLS OUT**

Increase in retention over 12 months

+8%

Customer Success Team - Reducing Churn & Pricing Renewals

In any SaaS business, customer retention highlights how well your product and services are performing. B.E. insights helped us identify strengths and weaknesses which became pivotal in improving the customer journey - delivering an impressive 8% increase in retention over a 12-month period.

Melissa, CEO & Founder

ELIMINATE FRICTION

Key to success is unwavering commitment from the CEO, and then getting the buy-in from the team. Sonia used a Friction to Fluency and Flow Audit that allowed employees to share the Friction Points in the Customer Success journey. This was a critical success factor. Normally you want your employees to be positive about business processes. The conversations with this process allow for dissent, and for employees to be heard. There was a defining moment where all the Customer Success Team had the same first major friction point. It was a design factor that would take 3 months to fix. Fixing it meant that most of the domino effect and long tail of other friction points would disappear. To Melissa's credit she made the important decision for this fix.

With **Friction Sprints** Sonia looks for both quick wins and big wins. In Sonia's experience,

“You can spend a lot of time fixing small things, yet often you fix the one big win, the rest disappear. It is critical though to get a quick win on the board so the momentum and confidence of the team builds. Something as small as removing all jargon can be both a quick and big win.”

BeSci opportunities with Starts Ups and Scale Ups

1. Pricing and Data Audit for revenue forecasting and modelling
2. New Pricing for potential customers
3. Renewal Pricing for existing customers
4. Upskill of Sales Team in Call Centre Scripts and conversations (to sell in the new pricing)
5. Friction, Fluency and Flow in the Sales Call Centres, demonstrations and communications
6. Reduce Churn Data Audit – Customer Success Team to review and understand Churn
7. Friction, Fluency and Flow Audit with the Customer Success Team
8. Friction Sprints – Quick wins and big wins.
9. Review of Pricing again (a few years on)
10. Refinement and ad hoc upskill or support

USE DATA FOR MYTH BUSTING

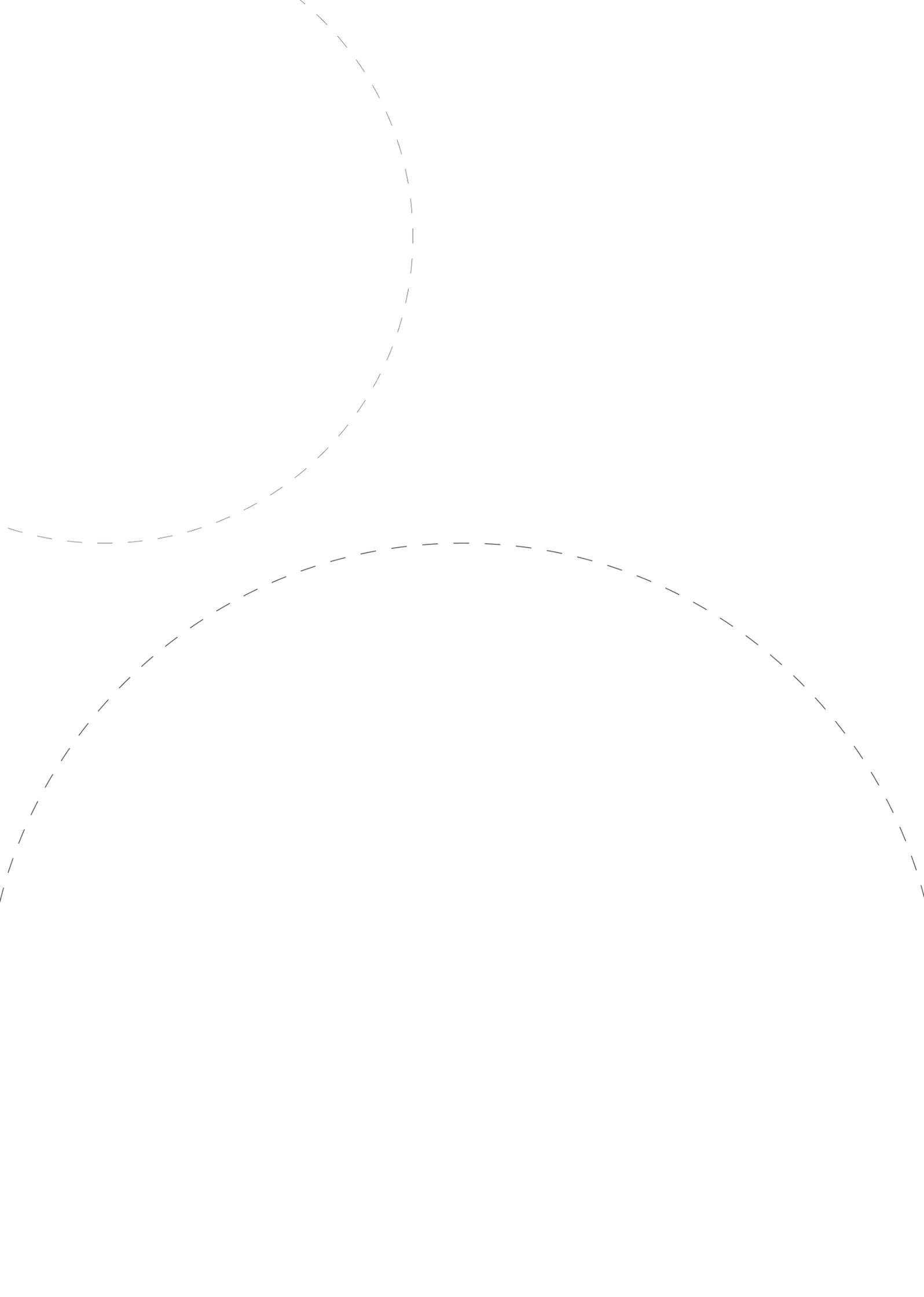
Seeing the Sales team gather their own data and shatter their own assumptions on conversion times to close deals and other challenges was eye opening for everyone. You could see an instant shift in entrenched beliefs that were, in fact, convenient assumptions rather than causal relationships. We had a situation where the sales team thought larger schools and bigger value deals took a lot longer to convert. When looking into the conversion data, they saw the opposite and instantly broke their own myths.

According to Melissa,

“Placing greater value on data driven processes (myth busters) has created a feedback system that has

elevated our people and culture. We collaborate differently, make decisions collectively and confidently. Importantly, the data insights have helped us accelerate growth intelligently.”

According to Sonia, Start-Ups can change the game quickly when adding BeSci into their daily business. CEOs and Founders have a different mindset – they are innovators, nimble, want to act quickly and take a risk. There are so many opportunities for Start-Ups to apply B.E and BeSci in their business. These represent a few thought starters to show the results you can expect. The earlier you introduce it the better, in her mind. Sonia brings clarity of thinking to start finding solutions for your business in a manner you didn't expect. She helped another start-up save \$2 Million they were looking for from investors for manufacturing bridging finance, simply by nudging the sales team in one area. It was a game changer for this business too. You too can start your BeSci journey today.



BEHAVIORAL GROOVES

OBSERVATIONS

FROM THE

United States



Tim Houlihan & Kurt Nelson
United States

Businesses are not finding their way back to normal. As the months stretch on from the onset of the pandemic, the corporate world continues to adapt to an ever-changing and chaotic world besieged by COVID. To make it all more challenging: there is no template, no go-to guide, no tried-and-true advice from the elders.

That means that virtually every company is adapting differently. Fortunately, some are doing so with a behavioral science lens.

PART 1

What's Happening

Most modifications to what we considered normal are physical in nature: return-to-office guidelines, protocols for in-person meetings, travel rules and restrictions, mask requirements, and vaccination standards. To complicate matters, the Great Resignation continues and the mass exodus of employees leaving for greener pastures continues with no end in sight. The consequences are that leaders are not only struggling with the latest innovations to keep their competitive edge, but they're also challenged to keep their best and brightest employees engaged.

HR departments are fatigued by constant changes to policies and the never-ending search for job candidates for an unprecedented number of vacancies. CEOs are frustrated by workspace issues and are hobbled by their customer, technology, innovation, and supplier strategies being foiled.

While the underlying chaos continues, some leaders are turning to behavioral science to lead them through those changes.

In this paper, we examine two firms that are leveraging a behavioral science lens to identify new ways to change and to build value for the next chapter in their organization.



PART 2: CASE

Using Behavioral Science to Innovate

Process improvement was once the domain of organizational engineers. They improved through streamlining, creating checklists, improving efficiencies, and making cuts wherever possible. They solved organizational problems through an operational lens by asking, “What are we doing?” and “What should we be doing?”

Today, organizational change is accomplished through a behavioral science lens. The emphasis is on, “Why should we do that?” and “Why shouldn’t we do that?” The new ministers of organizational change focus on friction points, communication, relationships with coworkers and customers and stakeholders. All of these contribute to delivering better results.

Our client is a corporate training department in an international firm that builds highly technical products (machines) that get installed in their

customer's labs. The training department plays a critical role in educating both the customer-facing coworkers as well as their customers.

The department's leaders were challenged by an increase in demand for the company's products, and hence greater demand for training the customers who will operate them. At the same time, they were challenged with acquiring talent, onboarding, maintaining and developing their teams, and of course, delivering their training. Early in the pandemic, the department was forced to migrate an all-in-person training methodology to a virtual-only training system nearly overnight.

It was under this array of complexities that the leaders of the training group decided that now was the time to improve their organization.

They sought to effect lasting change by asking (and answering) some deeply rooted questions: What could they do to streamline their pre-during-and-post project communication? How might they nudge the sales organization to afford them more time and more flexibility when scheduling customers for training? How could they assist their stakeholders with better decision-making tools?

Although moving to online and virtual training had been discussed as an interesting idea, the pandemic necessitated an abrupt change which laid bare some festering issues within the department: Why are we doing things the way we are? What should we be doing to help move the organization forward? What are the impediments that are keeping us from doing better?



SOLUTIONS

The Behavioral Grooves team was invited to help the training department build a new process and create the guidebook on how training projects would be assessed, designed, developed, deployed, and sustained.

Using a behavioral science lens, the Behavioral Grooves team began with a behavioral audit. We interviewed senior

members of the training department to understand their perspectives on roadblocks and strategic goals for the organization. We identified pain points in working with other departments, as well as within the department itself.

Next, we designed and delivered a 3-day workshop to engage 30 or so select members of the training department with the goal of unpacking each of the key

pillars of any training project (assessment, design, development, deployment, and sustainability). Included were representatives from leadership, project management, instructional design, and technology.

The workshop leveraged behavioral-science-backed techniques for engaging a diverse group of experts to maximize the output from the sessions.

We used aspects of behavioral science to accomplish a few specific things. First, we wanted to avoid groupthink, second was to ensure we integrated the diverse rationale of the experts involved, and lastly, we wanted to focus the group so the output would be actionable to produce relevant and credible summaries.

The group's detailed considerations combined with our behavioral

observations were built into what we called a playbook - a guidebook of considerations, checklists, and resources for each pillar in the life of a training project.

The playbook is now a comprehensive guide to managing new and existing projects within the department and is considered a best-in-class resource within the division.

*Why are
we doing
things the
way we
are?*



OBSERVATIONS FROM THE UNITED STATES



PART 3: CASE

Using Behavioral Science to Add Value

Some US-based firms have used the pandemic to double down on investing in their employees, particularly salespeople, and this was true for our pharmaceutical client. Salespeople are typically more mobile than the rest of the workforce and this particular group of salespeople are highly tenured, expert in product knowledge, and skilled in building relationships.

In order to keep talented, tenured salespeople engaged, this global pharmaceutical firm envisioned a two-pronged approach: First, the leaders needed to increase engagement by empowering the salespeople to share their expertise at a new level within the organization and with their customers. Second, the leaders saw an opportunity to challenge the reps with new skills on persuasion, and, in so doing, enhance their bond with the corporation.

SOLUTIONS

Leadership engaged the Behavioral Grooves team to develop and deliver a workshop for their 70-person sales team. The purpose was to engage and challenge them with behavioral science principles of persuasion. Armed with new knowledge of persuasion, and techniques to deploy it, the sales reps could increase their value inside their organization and with their external partners.

The half-day session focused on only 4 of Robert Cialdini's pillars of persuasion, and the content was tailored to the context the sales reps were dealing with.

The irony of teaching the behavioral science fundamentals of persuasion to salespeople was not lost on us. Naturally, many of the reps already applied some of the concepts intuitively but welcomed

our more detailed discussion. Overall, the workshop helped the reps refine their persuasion techniques for both their internal partners and external customers.

The workshop included a variety of behaviorally informed methods for greater adoption of the material - including leveraging idiosyncratic fit, group norms, framing, commitment bias, spacing effect, and the peak-end rule. Interspersing the learning with short brainstorming for applications and brief role-playing exercises, the workshop delivered high-value content for the reps. It gave them a sense of power, that they had been lacking, to improve interactions with both their internal partners and their customers.

A FINAL TWIST

Before the conclusion of the workshop, the reps were split into small groups of accountability cohorts that transcended the sales force's hierarchy and geographic territories. These cohorts mixed reps with varying experience levels and a variety of selling situations, with a directive to meet monthly. The monthly meetings of the cohorts fostered bonding and knowledge sharing never before experienced in the organization.

The accountability cohorts improved the delivery of sales messages (both internally and externally) and increased individual commitment to the organization in a highly competitive environment. The bonding resulting from these cohorts has increased engagement and bonding to the organization.



CONCLUSION

Behavioral sciences can be applied broadly - across many parts of an organizational structure - and achieve meaningful results on every frontier. And it need not be the focal point of the project.

For-profit organizations are driven by quarterly results and speed-to-solution is an unabashed priority. While this leaves little room for experimentation and the scientific method, it engages leaders' focus in a powerful way. It's not easy for leaders to walk away from solutions in which they are so heavily invested.

Observations from these two client situations reinforced the following:

1. Behavioral science principles can be put to use across nearly every discipline within a corporation
2. Whether applied directly or indirectly, behavioral science is a powerful tool for improving a corporation's odds of success in a chaotic world
3. Behavioral science need not be the "point" of the engagement - the principles can be woven into nearly any solution

Whether an organization needs to make a major shift in processes, communication, and technology, or leadership needs to improve their team's persuasive abilities with their coworkers and customers, the behavioral science lens provides a meaningful path that can deliver great results.



IMEC

Behavioural Research

in a **Commercial
Context**

Emiliano Diaz Del Valle
Mexico



PROJECT TYPE

An investigation of processes, customers and employees across several branches and franchises which sell cakes and desserts.

CHALLENGE

Mexican company specialized in the production, distribution and commercialization of cakes and desserts; with more than 130 branches distributed in the Mexican Republic. In spite of the great growth of the company, the directors realized that their collaborators were having difficulties when it came to sales and customer service, which had a direct impact on the monthly sales of each branch.

PART 1

Context of the Problem

The employees working in the branches have to provide attention to each customer, this attention should be directed to promote the customer to buy a cake or dessert for consumption. Unfortunately, not all employees were performing their customer service tasks in an optimal and consistent manner.

Although the employees had established procedures to carry out the actions involved in sales and training, these procedures were not being followed.

Considering this, a contextual investigation was structured to delve into the factors behind these behavioral failures.

As a result of the research, we identified the need to structure a standardized customer service protocol, which would integrate contextual tools to reform the practices and actions of current employees and to support the development of new practices and actions of employees in the future.

Considering this, a contextual investigation was structured to delve into the factors behind these behavioral failures.







PART 2

Research Process

Our research process was divided into 4 phases to obtain a clear picture of the behavior and its context:

DOCUMENTARY RESEARCH

This first phase of the research was based on a review of the company's internal processes with respect to sales work, in order to determine the existence of incentives, KPI's, established products and sales processes, results of previous market research, among others. This allowed us to generate exploratory interviews with the company's managers in order to have a better approach to the behavioral problem detected.

In this phase, version 1 of our Touch Point Map was created, which was a graphic analysis mechanism that evolved and accompanied us throughout the project.



RESEARCH WITH COLLABORATORS

Once the results of the documentary research and the interviews with the company's managers had been processed, we determined the topics to be investigated with the branch collaborators. The objective of these topics was to identify the main behavioral barriers they faced at the time of executing an optimal sales task (target behavior). These interviews with key actors of the behavior we are analyzing began to shed light on the behavioral factors behind the identified behavioral deviations.

ON SITE RESEARCH

In addition to the application of the interviews, we conducted observation in 32 stores in order to visualize the contextual composition of the branches and identify the main Touchpoints involved in the interaction of the employee with the customer, which in turn allowed us to structure our Behavioral Touchpoint Map, which allows us to clearly and strategically identify key processes and actions to be performed in the deployment of the Target Behavior.

CUSTOMER RESEARCH

Finally we structured a third interview guide, in order to investigate the behavioral barriers faced by customers and to be able to collate the information captured in the previous research.

In general, the four research sources allowed us to answer the following questions:

1. What behavioral barriers are hindering the sales work of the collaborators from being optimal and generating good interaction with customers?
2. What tools and solutions fed with findings from Behavioral Sciences can facilitate this sales work?

PART 3

Diagnosis

From the interviews with the 3 profiles (managers, employees and customers) we developed a Behavioral Touchpoint Map and added Behavioral dimensions to determine the location of the physical and interactive elements that were causing the Behavioral Problem.

With this mapping we were able to generate specific areas of opportunity for behavioral change and others with a more general focus, but equally important. All this in order to propose lines of solution design.



PART 4

Design Lines

Based on the diagnosis, we developed lines of design to create a new customer service protocol that contemplated behavioral principles and that would make the sales work of our collaborators more efficient.

These lines included:

- Creation of solutions/nudges to guide potential customers,
- Integration of heuristics and cognitive biases to facilitate customer decisions,
- Creation of finger rules to facilitate the homogenization of certain customer service practices,
- Creation of support tools strengthened with some cognitive heuristics; and
- Strengthening of the sales protocol with behavioral principles.

SOLUTION SKETCHING

Potential customers were experiencing problems in deciding which size of cake to take because they failed to understand the sequence of sizes. (Single, Mini, Small, Large). This confusion affected the purchase of large cakes, i.e., those that generate the highest profit. For this, it was proposed to include behavioral tools, in this case the benchmarks to facilitate the decision process.

To this end, it was recommended to make visible the number of slices that the customer can get per size and restructure the order of the display case accordingly. It was also suggested to include stickers that will help the potential customer not only to identify the number of slices but also the type of cake. By generating a sort of "columns and rows" structure, customers can

have simple reference points to decide.

Customers who had already decided to buy a cake avoided adding a complementary product because of two factors: 1) Not knowing the options due to irregular sales management and 2) Not being able to decide among the existing options.

For this reason, the integration of elements of prominence and predetermined options was proposed to help the person to engage, maintain their inertia and avoid the mental effort required to make the decision by analyzing all available information. For this purpose, it was recommended to place a sticker on the counter, in order to influence the purchase decision at the last moment and to include in it predetermined options of complementary products and facilitate the decision to choose one of them.



FINAL VERSIONS

The project resulted in 9 final interventions, 3 that were tested experimentally with pilot 1 and 6 that were also tested in pilot 2.

1. Footprints from the store entrance to the showcase, the same that favored attention at the most important point for the sale

2. Mat behind the display case on the employee's side + pleca signaling the starting point of the sales task

3. Sticker to give prominence to the products in the display case

4. Stickers on display case to indicate types of cakes and number of slices per size

5. Product catalog

6. Product cards

7. Photos showing the process of elaboration of the cakes

8. Size sticker on display case to encourage customers to take a larger size cake

9. Suggested sale sticker with per-set packages.

PART 5

Results

Two measurements were carried out. The first one was an approximation, which was tested with pilot 1. It was found that before the intervention, half of the customers started the interaction in the display case and the other half in another point of the store. With the intervention, the percentage of people who started the interaction in the showcase (the desired behavior) increased by 14%.

The second measurement focused on ATV (average ticket value) and found that the total amount of sales in the experimental stores increased by 14.65% compared to the previous year's data, and by 7.41% compared to the stores that did not have the interventions.

In addition, it was identified that outlets with higher adherence to the interventions have grown by up to 5.94% more than those with low adherence.

*With the intervention, the percentage of people who started the interaction in the showcase (the desired behavior) increased by **14%**.*

CONCLUSION

Through the implementation of these design guidelines, we were able to develop a sales protocol and a training format with behavioral tools that instructed employees on the operation of sales labor support materials and resources. This fostered an increase in ATV (average ticket value) and monthly sales within the company's branches.

In addition, the success of these tools and resources can be attributed to leveraging existing elements, making interventions non-disruptive to established behavioral processes and reducing investment costs.

The implementation of global behavioral research that considers the actors involved in the problem or behavioral challenge posed is of great importance to achieve far-reaching results.

CHAPTER
Three

thought pieces.

HUMAN RISK

From **Human Risk**

to **Human
Reward**

Christian Hunt
United Kingdom

When I originally came up with the concept of human risk – both as the name of the company I founded in 2019 and as a category of risk that I would help my clients mitigate – I was following tried and tested advice to ‘do one thing really well’.

I would, I reasoned, focus on the complex but easily comprehensible challenge of managing ‘the risk of people doing things they shouldn’t, or not doing things they should.’ After all, there were plenty of examples out there of human decision-making leading to bad outcomes and of organisations spending lots of money on trying to prevent it.

As I highlighted in last year’s compendium, 2020 provided the perfect illustration of the impact of human risk thanks to that pesky virus. After all, it’s people that spread it, incubate new variants and recruit others to work as COVID sleeper cells.

So, as we entered 2021 and what we all hoped would be a return to some form of normality, I felt confident that we would better understand the importance of properly managing human risk than ever before. After all, we didn't just leave 2020 with an increased understanding of virology. We also all had a crash course in running — or in many cases how not to run — a compliance program, as governments attempted to influence our behaviour to stop the spread of COVID.

On the one hand, that confidence turned out to be well placed. My mission of

'Bringing Behavioural Science to Ethics and Compliance' didn't just appeal to fans of the Rhyme-as-Reason Effect. It appealed to some very unexpected audiences. My background is in Financial Services, so I fully expected to continue to work with banks, insurers and asset managers. I didn't expect to be helping chemical weapons inspectors, regulators, publishers, tech companies, trade associations, construction engineers, pharmaceutical manufacturers, utility providers, and many more to solve their human risk challenges.



FROM HUMAN RISK TO HUMAN REWARD



On the face of it, that might seem surprising. After all, each organisation and sector has unique characteristics, so what value can I add as an outsider? The answer comes from an important lesson from Behavioural Science — one that's incidentally inherent in the reason for the existence of the Diversifi network. There's real power in bringing different perspectives to solving problems. Behavioural insights from one industry or context can help manage human risk in another. Sometimes you just need to look at the world through a different lens.

2021 has taught me that the same logic also applies to my business. As I helped my clients think about mitigating their human risk in an evolving environment — where a simple term like 'work' could now mean

any or all of 'home,' 'hybrid' or 'head office' — I realised that just looking at human risk in isolation wasn't always the right frame.

As we've seen with COVID, people aren't just drivers of human risk. While they can and do act as agents of the virus, helping to spread it far and wide, they're also the key to stopping it. From the brilliant vaccine-developing scientists to the extraordinary healthcare professionals and the wonderful, often unsung heroes who just keep things moving behind the scenes.

The way we'll defeat the virus is through human endeavour. To do that and solve all the other challenges we're facing as a species, like the climate emergency, we're going to need to be at our collective best.

That's why, during 2021, I've added another lens to my human risk work. I now also focus on the opposite of human risk — what I call 'human reward'—getting the 'best' out of people. Note 'the best,' not 'the most'. This isn't about exploiting human capital. It's about ensuring that we harness the full talents and capabilities of everyone.

If we just focus on human risk, we'll mitigate the worst excesses of human behaviour. But we'll also constrain human reward and miss opportunities. Conversely, if we just focus on human reward — unleashing human capital in an unchecked manner — we'll run excessive human risk. As ever in life, the trick here is balance. Thanks to the human reward lens, one of the things I've noticed is that we're often not very good at walking this tightrope.

Processes are designed with one or the other in mind.

How often do we find a compliance approval process that considers the question of whether more regulatory risk could and should be taken? Very rarely, if my experience is representative. Because they're designed and operated by people who are incentivised to minimise risk, not optimise it. Of course, there are areas where we don't want people pushing the envelope — you don't want banks testing the limits of what is or is not money laundering or financial crime. Nor do you want creativity when it comes to health and safety regulations. But I've also found areas in my work where adopting a binary approach to approvals misses valid business opportunities.

Equally, consider remuneration policies —how often do bonus schemes reward employees for turning down business which promises short-term gain but risks long-term pain for the company? Very rarely. Because they're designed with one outcome in mind. Of course, you don't want to create perverse incentives. We need to avoid encouraging people to pretend to onboard unsuitable clients just to reject them.

I've discovered that if we review human reward-based processes with a human risk lens and vice versa — in other words, we look for a more balanced view— we can get better behavioural outcomes. By way of example, an approval process that simply results in a 'yes' or 'no' sets up a dynamic where the person requesting

approval has two potential outcomes: success or failure. Since the latter is undesirable, they are incentivised to ensure the former. But what about, I mused with one of my clients, if we designed the process so that it could actually result in them being allowed to do even more than they'd originally contemplated? Might that not change the way they approached it?

As I write this, the jury is still out, but anecdotally there's far more engagement with the process than there was before. We're experimenting with some changes to the process to make something human risk-driven, and reflect more human reward thinking. That's not something I would've recommended at the start of the year.



What will 2022 bring? Given recent history, I think making detailed forecasts is a dangerous game, but I'll venture one prediction I know I can stand behind. Next year, I'm taking Human Risk — and thereby the Diversifi network — into Germany by moving from London to Munich. This feels appropriate since 2020 Christian would probably have sought human risk reasons to highlight why moving to another city during a global pandemic wasn't a good idea. He'd have been right up to a point. But he'd have missed a few things. Fortunately, thanks to the past year's experience, 2022 Christian will be bringing some human reward thinking to the decision and is ready for a new challenge. Let's see how this works out...

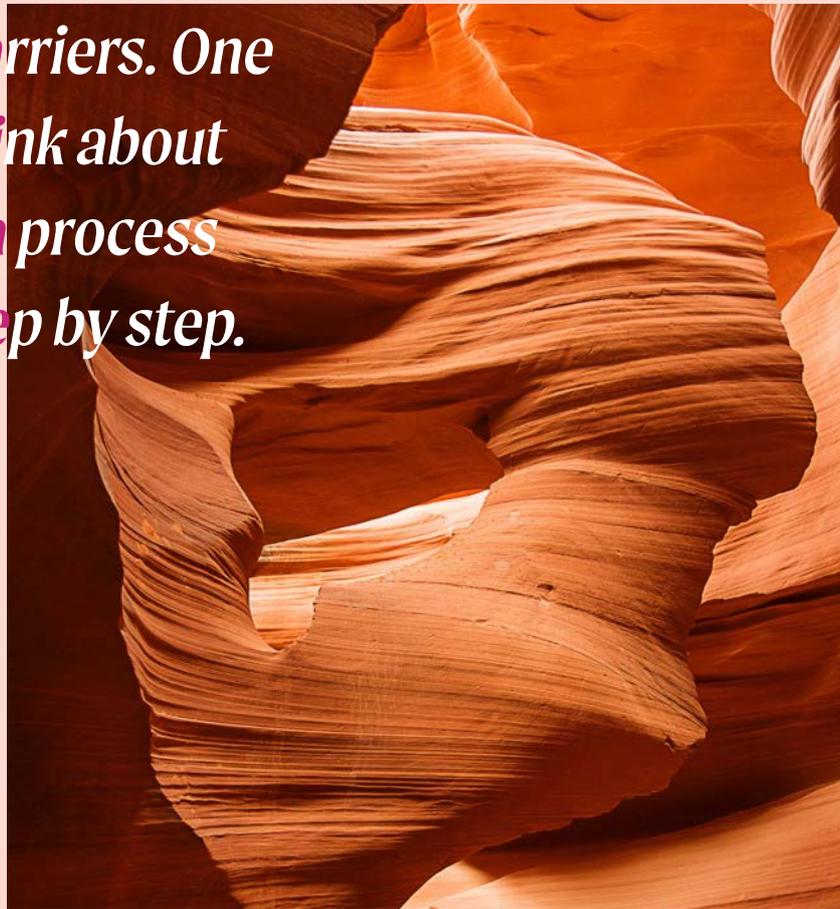


SQUARE PEG INSIGHT

How to layer behavioural barriers in a decision- making process

Elina Halonen
The Netherlands

My starting point for any behaviour change project is to understand the factors that are influencing behaviour, but some projects turn into an analytical swamp after the first stage of mapping barriers. One way to solve that is to think about the target behaviour as a process and layer the barriers step by step.



Although they might be positioned differently, many consumer insights projects are fundamentally about behaviour change if their goal is to understand what motivates or stops people when it comes to buying a product. So, mapping out barriers with a model like COM-B is a great option and it works extremely well as a structured approach to understanding the problem.

TROUBLE AHEAD

In some cases, the analysis grinds to a halt when you try to see how the barriers fit together or how you might prioritise solutions in a practical way - especially as both barriers and solutions might need to be tailored to different target audiences. In short, it becomes hard to see the woods from the trees!

One way to solve this is to categorise barriers and drivers into different layers according to the decision-making steps: **Spark-Solutionize-Select**.

The steps are meant to be conceptual and work as an analytical tool - not necessarily as clear identifiable phases in a decision making process because they tend to merge into a whole in the person's mind. For that reason, they are also often unlikely to be able to articulate it if asked directly, but we can distinguish them in the research and analysis.



STEP 1

Spark

The process is *sparked off* by a core need someone has. These goals are the initial triggers for consumption (e.g. need for energy, entertainment, transport) and a fundamental need the person is trying to satisfy.

They're typically situational needs brought about by physiological or environmental states (e.g. thirst or running out of petrol) and, as such, linked to functionality. A person can have more than one core need, but typically one is the most salient, non-negotiable one which ultimately determines the final choice and other drivers then build on this core need.

EXAMPLE:

It's 3pm and you're feeling a bit tired at your desk - you need some energy to get through the rest of your work.

Spark

CORE NEEDS:

- The initial triggers for consumption
- The fundamental need you want to satisfy
- Sparked by physiological or environmental states

SPARK

STEP 2

Solutionise

Once you have identified a core need more or less consciously, you look for a solution to fulfil it - i.e. a category of products, services or other options.

This process is influenced by the beliefs, perceptions and attitudes you hold about various product categories, and it's influenced by your past experiences. Category perceptions are shaped partly by time of day, locations, physical availability and habits (e.g. morning coffee) as well as beliefs about people who use or buy the category (user perceptions).

EXAMPLE:

The coffee machine is broken, so you walk outside to find something else. An energy drink might help - you had one last week and it seemed to perk you up.

Solutionise

CATEGORY & USER PERCEPTIONS:

- Beliefs, perceptions and attitudes you hold about various product categories
- Informed by your past experiences
- Shaped partly by time of day, locations, physical availability and habits



STEP 3

Select

Once you've chosen a category that you feel fulfills your need, brand or product perceptions will come into play as you select the product or service.

As with category level barriers or drivers, the beliefs, perceptions, and attitudes someone holds are important factors in how they make decisions. Unlike category level factors, brand and product perceptions are usually less influenced by time of day and tend to remain more stable over time. These perceptions can be about many things - from the (perceived) performance of the product to more emotional factors.

EXAMPLE:

The shop has a nice selection of energy drink brands and even different flavour options. You've never really liked the grisly logo of Monster and, to be honest, the can is a little bit too big for you. Red Bull it is - and that new berry flavour seems really light and refreshing, which is a bonus on a hot day like today!

Select

BRAND & PRODUCT PERCEPTIONS:

- Emotional factors or performance / attributes of the product
- Usually not as strongly influenced by time of day as other barrier levels
- User perceptions can also influence here

Unlike category level factors, brand and product perceptions are usually more stable and less influenced by time of day. These perceptions can be about many things from the (perceived) performance of the product to more emotional factors.

However, physical availability can have a big influence on choice at this stage - even if there are few product or brand barriers. If your products are not available at the places where consumers want them, they might switch to competitors or even to a different category.

Spark

CORE NEEDS:

I'm feeling tired... I need energy!



Energy drinks are so unhealthy. Coffee is a natural energy booster.



Instant coffee is awful... I need a proper coffee!



I don't like the taste of Starbucks coffee...



Solutionise

CATEGORY & USER PERCEPTIONS:

Energy drink gives me a quick boost!

Monster Can is too big for me... but the fruity flavours are refreshing.



Select

BRAND & PRODUCT PERCEPTIONS:

Red Bull is really effective, it always works for me.



The fruity flavours are tastier than the classic Red Bull.





I chose energy drinks because some parts of this process have been me at different stages of my life, but it could just as easily be some other category - for example, I have used this to understand processes as different as reading newspapers or charging electric vehicles!

Depending on the category, the full picture can be much more complex, with different target audiences experiencing barriers at different places. When it comes to behaviour change, silver bullets and simple solutions are rare because humans are complex and behaviour is always multiply determined, often in a dynamic way.

CONCLUSION

Using a layered approach to categorising behavioural influences helps to simplify the situation and ultimately develop a range of solutions that target the right barriers, at the right stages and for the right target audience!

HEURISTICA

How to solve Bayesian problems

Pedro G. Del Carpio
Peru



STEP-BY-
STEP GUIDE
USING THE
HYPOTHESES
STRENGTH
CHART

Making decisions in life, from mundane to very consequential, requires that we have some kind of knowledge – subjective or objective – about the probability of the outcomes our actions could create.

Imagine we are confronted with the challenge of jumping a gap between two cliffs. To make a decision we need a sense of the chance we will make it to the other side. From a probabilistic approach, we want to come up with a degree of belief about our hypothesis being true (here, the tentative assumption that we will have a successful jump); based on what we know about the world and the constant stream of data the context unveils[i].

Continuing with our example, after finding out that the gap is approximately 1.5 meters (4.92 feet) long, how likely is it that we will land on the other side? What should we do? And what about if we are jumping upwind? Extrapolate this metaphor to any dilemma that resonates with you.

PART 1

Updating Beliefs

The capacity to form a sufficient sense of possible scenarios' likelihood is a critical cognitive tool for countless human endeavors. In an uncertain and dynamic world, even the difference between life or death could depend on the ability to update our probability estimates, and act accordingly. However, although we have been born with the required mental apparatus to solve probabilistic inference tasks, these mechanisms are not enough to handle all kinds of problems.

Carefully read the next case and give your best estimate:

"The probability of breast cancer is 1% for women at age forty who participate in routine screening. If a woman has breast cancer, the probability is 80% that she will get a positive mammography. If a woman does not have breast cancer, the probability is 9.69% that she will also get a positive mammography. A woman in this age group had a positive mammography

in a routine screening. What's the probability that she actually has breast cancer?" (Gigerenzer & Hoffrage, 1995, p. 4).

The answer is 7.7%.

If you gave a wrong answer — or don't even know how to solve the problem— you

are not alone. In fact, the study in which the case was originally explored (Eddy, 1982) showed that 95% of physicians estimated the probability of cancer to be about 75%. The implications of a sound or flawed probability estimation are not trivial— just think of how many people would incorrectly undergo a surgery based on a faulty calculation like this one.



The right way to solve these types of problems is via a mathematical equation known as the Bayes' Theorem (Figure 1). This powerful and simple tool (only basic algebra needed) gives us the assurance that if the input is correct, we will always get the right answer. Thus, it provides the normative way in which humans should solve such probabilistic inquiries[ii].

Since the publication of "the mammography problem," psychology researchers have extensively examined this and other similar cases, in order to determine if people intuitively use the Bayesian approach. The results have empirically confirmed the great difficulties we have dealing with probabilistic inference tasks when complete information is unavailable, the problem is intricate, or exactness is demanded.

Overall, two main paths of research have

been established:

On one hand, the heuristics and biases program of Amos Tversky and Daniel Kahneman (1974) suggests that people are bad Bayesian estimators because our minds overlook the role of prior probability information in our judgment, known as the base-rate neglect. Instead, humans rely on heuristics — mental shortcuts, simple rules of thumb for decision-making — to figure out the answers, which although generally useful, could lead to systematic errors.

On the other hand, Gerd Gigerenzer's evolutionary point of view argues that humans are not adapted to solve Bayesian inference problems that communicate data in probability format (i.e. a number between 0 to 1, or in percentages)— like in the Tversky and Kahneman research. However, when people are asked to solve tasks with data in a natural frequency

format (e.g. 8 out of 107) results improve significantly (Gigerenzer & Hoffrage, 1995).

More than two decades of research have validated the benefits of using the frequency format to improve Bayesian problem-solving. The studies have shown a variety of effect sizes, but overall the results are consistently positive. Based on these findings, the proponents of this approach have aimed to make it the standard way of instruction (Sedlmeier, 1997; Sedlmeier & Gigerenzer, 2001). In spite of the efforts, the probability format has remained the established way to present information for Bayesian inference tasks. Furthermore, a study showed that even when people received information in frequencies, almost half of them end up using probabilities in their calculations (Weber, Binder & Krauss, 2018).

We can conjecture different explanations for the resistance to change, but the concept that I think correctly synthesizes them is convenience: people are familiarized with information in probability format, and any switch that requires cognitive effort is unlikely to succeed. This essay claims that switching to frequencies is unnecessary. Anyone can smoothly and reliably use the probability format if we: a) understand the meaning of the elements that form the theorem, and b) have an aid that helps us with the collection and organization of the information we need.

In the next chapters we will detail the meaning of each piece of the theorem, present a visual aid for organizing the required data, and solve the mammography problem with a simple set of steps.

$$p(H|E) = \frac{p(H) * p(E|H)}{p(H) * p(E|H) + p(-H) * p(E|-H)}$$

PART 2

Improving Bayesian Reasoning

The Bayes' theorem might seem intimidating at first glance; but just think of it as an already available 'recipe' with the instructions required to solve a mystery, conveniently simplified using a few variables and symbols.

Consider the statement: "The value of energy equals mass times the speed of light squared." Rather than using 12 words, it can be streamlined in an equation of 5 characters, simply $E=mc^2$. In this line, the Bayesian formula is just a frugal way to display what would otherwise require a long list of instructions.

Let's deconstruct the theorem and put it in layman's terms.

$$p(H|E) = \frac{p(H) * p(E|H)}{p(H) * p(E|H) + p(-H) * p(E|-H)}$$

- Posterior probability
- Prior probability
- Probability of occurrence of the evidence E given the hypothesis H
- The competing hypothesis of H
- Probability of occurrence of the evidence E given the competing hypothesis

The probability of occurrence is represented by the letter p followed by parentheses.

H represents the hypothesis we are inquiring about.

The new evidence is represented by the letter E .

The sign “ $|$ ” means given.

What we aim to find is the posterior probability $p(H | E)$, that is to say, the probability of occurrence of the hypothesis H given the new evidence E .

$p(H)$ or prior probability represents the probability of the hypothesis we are assessing, without taking into account the new evidence. Its value expresses what we already know about the state of the world. It might have a subjective or objective

origin.

$p(E | H)$ is the probability of occurrence of the evidence E given the hypothesis H . Put in other words, “if the hypothesis is true, how likely is the evidence?”.

$\neg H$ represents the competing hypothesis of H . These hypotheses are complementary, that is $\neg H$ means not H . Therefore, adding up their probabilities should total no more than 1 (or its equivalent 100%).

$p(E | \neg H)$ is the probability of occurrence of the evidence E given the competing hypothesis. In other words “if the competing hypothesis is true, how likely is the evidence?”.

In order to solve the equation, the remaining task is establishing the numerical value of each concept. Not surprisingly, this is the most challenging part of the whole process. We have to be able to identify and extract the probabilities of interest from the case in hand, but almost always the information is not explicitly stated. The next section presents a novel visual tool, which aims to make the resolution of this issue significantly easier.



PART 3

A Picture is Worth a Thousand Words

Images have the capacity to convey a vast amount of information in a very efficient way. Carefully observe Rembrandt's *The Night Watch*.

With an accomplished use of light and shadows, colors, symbolisms and composition of elements, the painting is able to express the intricacies of the situation the civic militia is experiencing. With just a brief look, we are able to perceive the movement and direction of the group. We can quickly grasp the hierarchies of the characters in the story's system, their relationships, and their social background. We are even able to imagine what they are thinking, and feel their emotions.

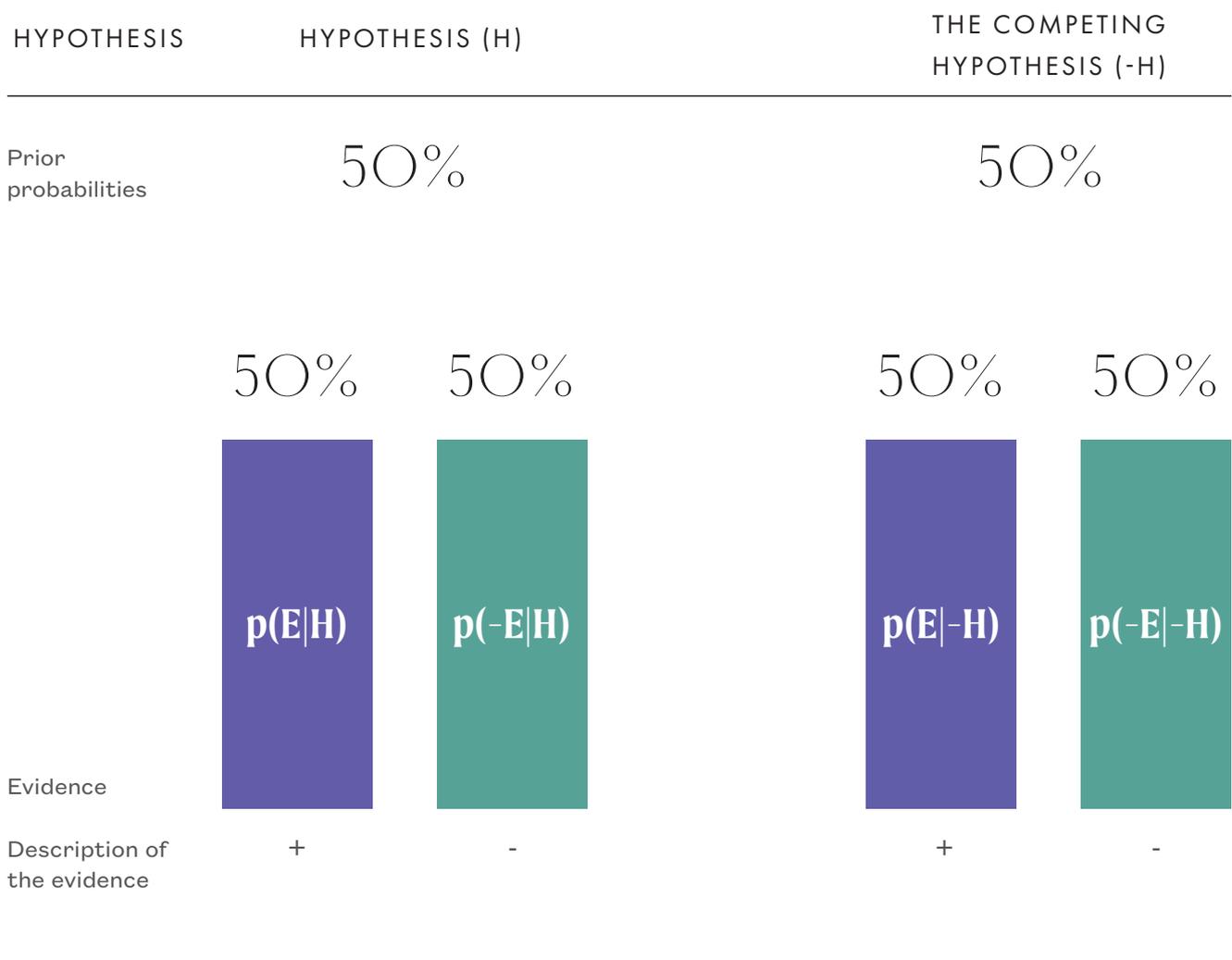
As one of novelist Ivan Turgenev's characters said about the power of the visual, "the drawing shows me at one glance what might be spread over ten pages in a book."

In mathematics, visual representations are used to translate abstract information into forms that make the organization and understanding of the problem easier to achieve (van Garderen & Montague, 2003). Through our visual capabilities, images make mathematical thinking an intuitive experience; facilitating the discovery of patterns and sequences, detecting important information and drawing inferences at a glance (Zimmermann & Cunningham, 1991). In this regard, the mechanisms behind Bayes' inference have been visually depicted in different ways, for example with Venn diagrams, decision trees or square units. Although they are useful for some, they are insufficient for many people.

Here we introduce an alternative approach, the Hypotheses Strength Chart.

images convey
a vast amount
of information

The Hypotheses Strength Chart



The version displayed in the figure represents an idle state of the chart, assigning a 50% probability for all its values.

The Hypotheses Strength Chart (HSC) is a schematic diagram that facilitates the visual representation of the mathematical concepts involved in Bayesian reasoning. It works as a graphic organizer of data, in which the spatial arrangement of its elements conveys the underlying relations between the different information required to solve the theorem. It is also a visual cue that reminds us in a glimpse of all the pieces we need to identify and where they fit into the system. Once collected, the values can be directly added to the formula to obtain the posterior probability we aim to know.

The version displayed in the figure represents an idle state of the chart, assigning a 50% probability for all its values.

From a high-altitude view, the chart's division into left and right regions forces us

to think in terms of an unbreakable dualistic nature, where the hypothesis (H) we want to evaluate can't exist without including its opposite (-H) in our calculations. Critically, it visually emphasizes the most important idea behind Bayesian inference: fundamentally it is a 'strength test' between two competing hypotheses. In this match, their interaction with the new evidence will determine the winning hypothesis and the precise value of the posterior probability.

From a low-altitude view, the chart facilitates the identification of each conditional probability; that is, the probability of an event given another event, such as $p(E | -H)$. The topographical configuration helps us overcome this counter-intuitive task, by nudging us to independently evaluate E and -E under each hypothesis. Specifically, the bars with the plus symbol (+) visually answer how likely the evidence is, assuming the

certainty of the hypothesis (whether the one at the left or right region). The bars with the negative symbol (-) simply take the complementary value; they answer the inquiry of how likely is the observation of opposite evidence given the hypothesis being considered.

In the next chapter we will show how to use the HSC chart, integrating it into the solving process of a Bayesian inference problem.



PART 4

The HSC Algorithm

Suppose we are at the end of autumn. Usually at this time of the year, it rains 25% of the days. When it rains, on 70% of the days we see dark clouds in the sky. But on 20% of the days that it doesn't rain, we also see dark clouds. You look up and see dark clouds in the sky. What's the probability it will rain today?

The algorithm (or sequence of instructions) necessary to answer this inference problem is the following series of steps:

Step 1: Plot a Hypotheses Strength Chart.

Step 2: Identify the main hypothesis (the statement you want to evaluate as being true or false based on the evidence) and its opposite version. Name and add them to the chart.

Step 3: Identify the evidence of the case (the specific new finding or fact relevant to the case in hand). Describe it and add it to the chart.

HYPOTHESIS	IT WILL RAIN TODAY (H)	IT WON'T RAIN TODAY (-H)
------------	------------------------	--------------------------

Prior probabilities

25%

70%



20%



Evidence

There are dark clouds

+

-

+

-

Step 4: Find the values of $p(H)$, $p(E|H)$ and $p(E|-H)$ from the provided word problem. To do so, use the list of meanings of section II, and simply update the sentences with the information of the given case. Then add the resulting probabilities to the chart.

$P(H)$ = What's the probability of it raining today, without taking into account that there are dark clouds?

= 25%

$P(E|H)$ = If it will rain today, how likely is it that there will be dark clouds?

= 70%

$P(E|-H)$ = If it won't rain today, how likely is it that there will be dark clouds?

=20%

As you can tell from the current state of the chart, the height of the bars must increase or decrease depending on the attached probability.

Step 5: Compute and add the remaining values $p(-H)$, $p(-E | H)$ and $p(E | -H)$ and add them to the chart (iii). Conveniently, they can be obtained by simply calculating the complementary value of their counterpart concept.

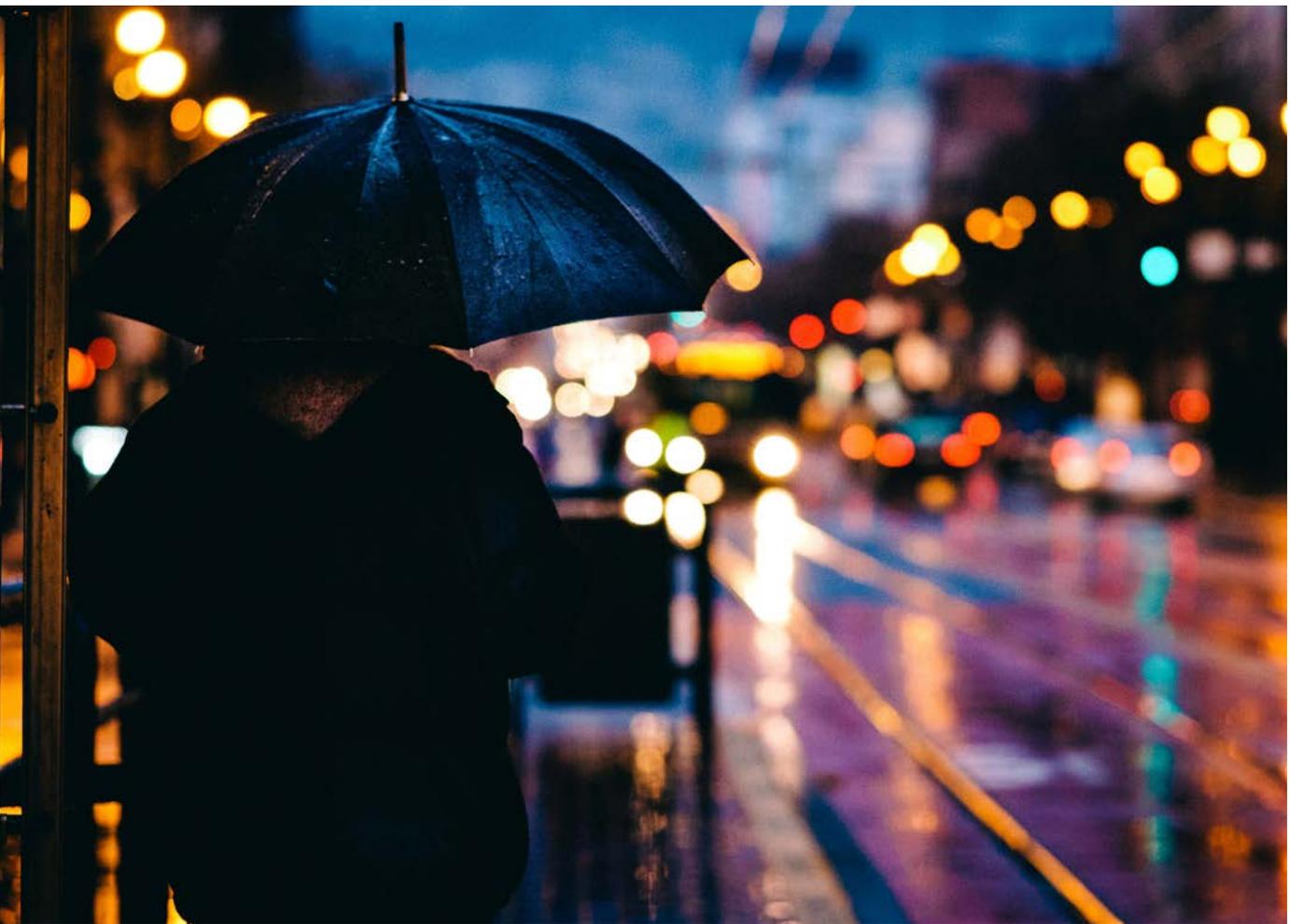
$$P(-H) = 100\% - 25\% = 75\%$$

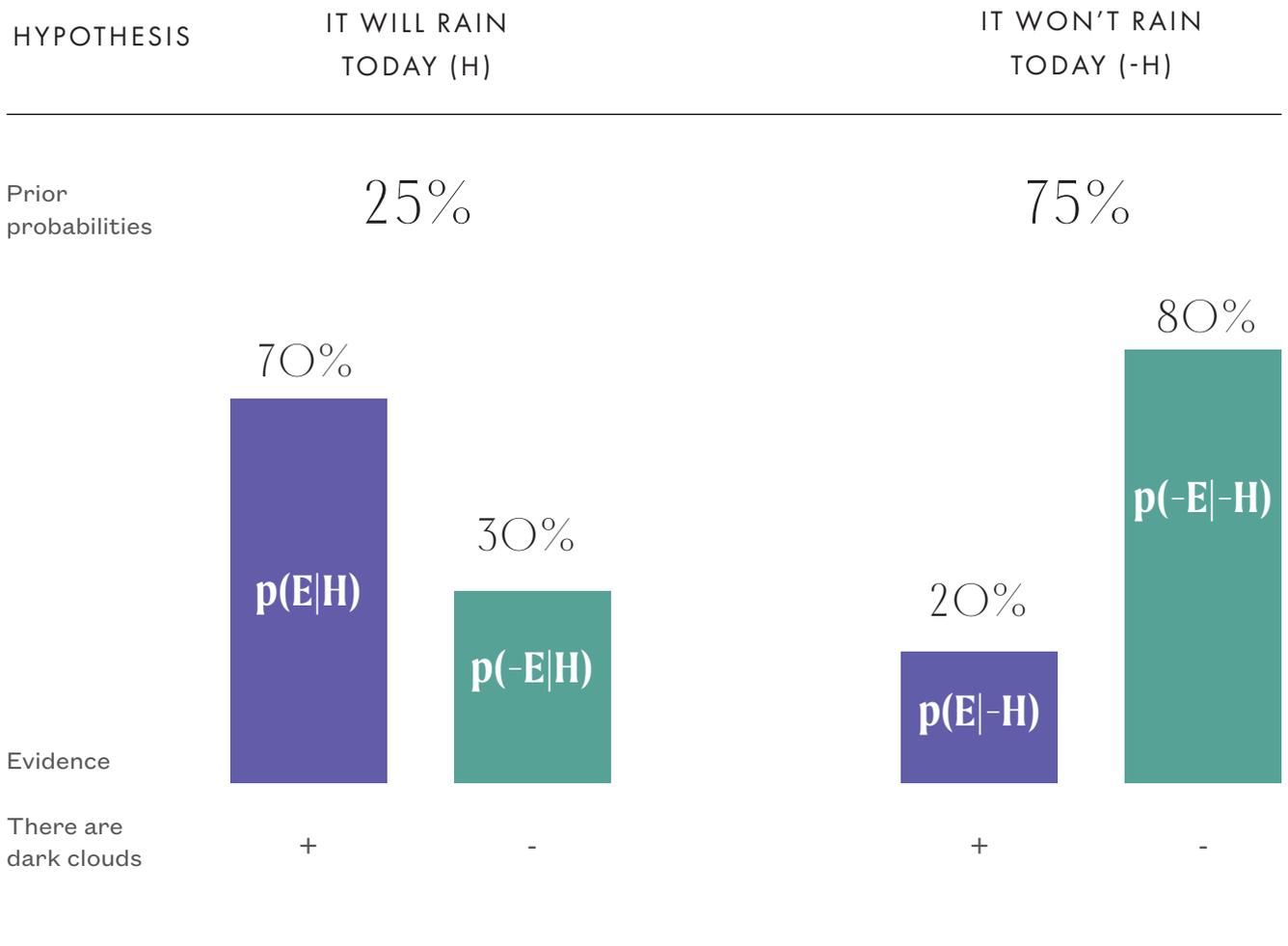
$$P(-E | H) = 100\% - 70\% = 30\%$$

$$P(-E | -H) = 100\% - 20\% = 80\%$$

After adding all the data to the chart, we have a full picture of the case.

Step 6: Export the required values into the Bayesian formula and proceed to solve it as any other equation. Like in this case, if the information was given in percentages, transform them into decimals (a number from 0 to 1).





Probability it will rain today if there are dark clouds =
$$\frac{p(H) * p(E|H)}{p(H) * p(E|H) + p(-H) * p(E|-H)}$$

Probability it will rain today if there are dark clouds =
$$\frac{0.25 * 0.7}{0.25 * 0.7 + 0.75 * 2}$$

Probability it will rain today if there are dark clouds = **0.538 = 53.8%**

PART 5

Solving the mammography problem with the HSC algorithm

We can't finish without solving the elusive mammography problem together. As shown in the previous section, one convenient fact about Bayesian inference is that the solution of the theorem only requires finding the values of three concepts: $p(H)$, $p(E|H)$ and $p(E|-H)$.

We begin by plotting the chart. Then we identify the hypothesis (the woman has cancer), and the evidence (the mammography test is positive).

We search in the problem for the value of $p(H)$. The background information says, "The probability of breast cancer is 1% for women at age forty who participate in routine screening." Therefore $p(H) = 1\%$. Note that this probability is what we know about the prevalence of cancer in that group of the population, regardless of the result of the test.

It is evident that if the $p(H)$ is 1%, the probability the patient doesn't have cancer

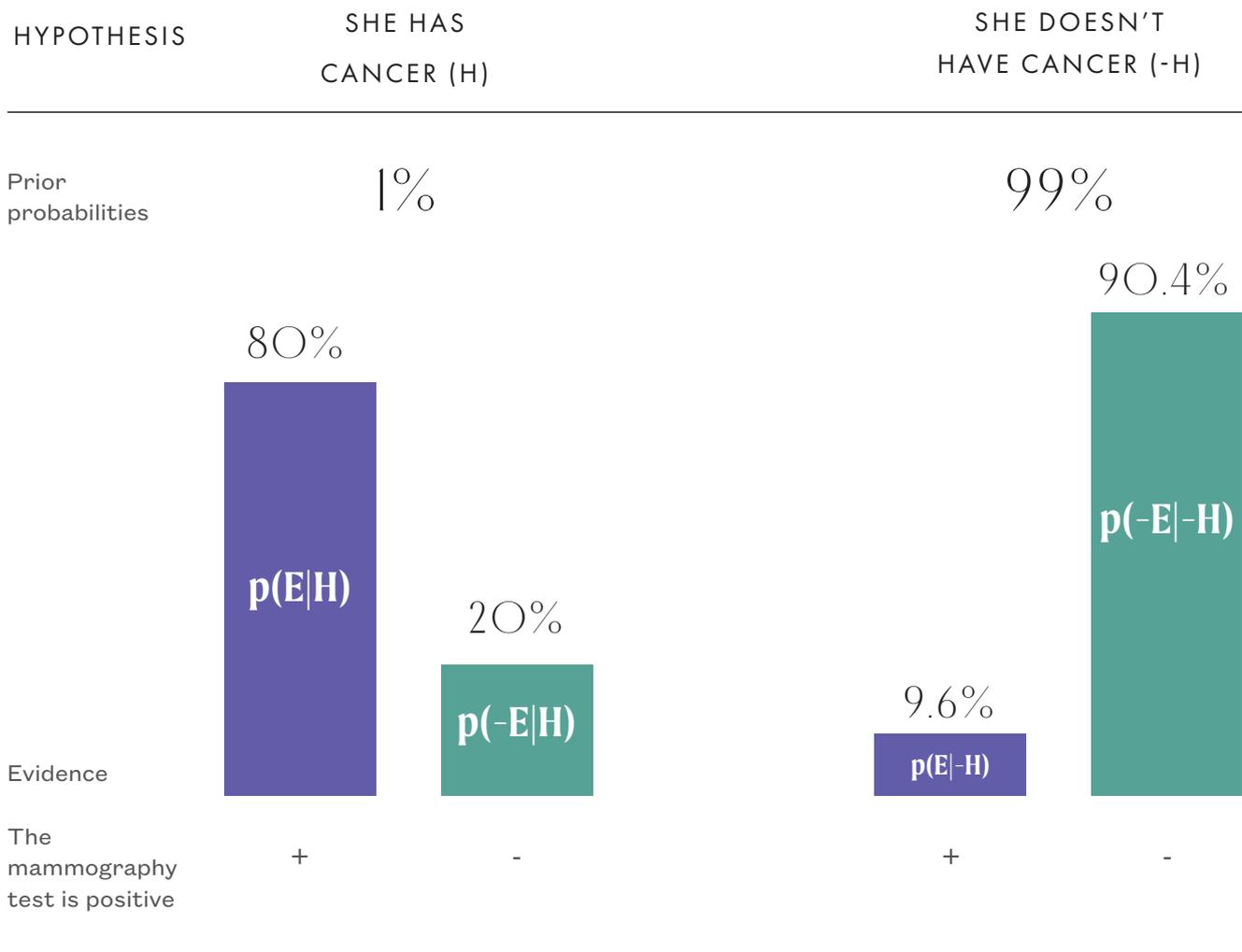
$P(-H)$ is 99%.

$P(E|H)$ means if the hypothesis is true, how likely is this evidence? The problem also offers this value directly. It says "If a woman has breast cancer, the probability is 80% that she will get a positive mammography." Therefore, $P(E|H) = 80\%$.

$P(E|-H)$ means if the hypothesis is not true, how likely is the evidence? The text says, "If a woman does not have breast cancer, the probability is 9.6% that she will also get a positive mammography." $P(E|-H) = 9.6\%$

Next, we find the values of the remaining concepts, that is $P(-E|H)$ and $P(-E|-H)$.

After adding all the data into the HSC we have a complete and organized panorama of the problem. The chart is finally active and functional, fully showcasing the story of the mammography case.



From this point the mathematical solution is straightforward. Following the conversion of percentages into decimals (by removing the % sign and moving the decimal point two places to the left), we can directly use the formula to obtain a precise value.

Probability
she has cancer
given the test
is positive

$$= \frac{p(H) * p(E|H)}{p(H) * p(E|H) + p(-H) * p(E|-H)}$$

Probability
she has cancer
given the test
is positive

$$= \frac{0.01 * 0.8}{0.01 * 0.8 + 0.99 * 0.096}$$

Probability
she has cancer
given the test
is positive

$$= 0.077 = 7.7\%$$



TAKEAWAYS AND BEYOND

Knowing how to solve probabilistic inference tasks is a skill that substantially improves our judgment and decision-making processes. In the last decades, different methods aiming to facilitate Bayesian reasoning were created, but the search for superior ways is still ongoing.

The HSC algorithm is a novel tool to teach and solve Bayesian tasks. With the support of a chart, it makes the identification and organization of the information required to

solve the theorem pretty straightforward. Therefore, we believe it is a strong and convenient alternative to the frequency format approach.

Importantly, the HSC algorithm method has the potential to be useful beyond the mechanical resolution of textbook tasks. After some practice, it can develop in the users the intuition and skills necessary to successfully solve their own real-world problems, which should be the final goal of any Bayesian training program.

NOTES

[i] Importantly, decision-making must take into account both the probability of occurrence and the severity of the consequences. Many times the latter is overlooked, leading us to severe negative results — or even fatal — if the unlikely outcome ends up happening. If “falling from the cliff” could be deadly, you might be making the right decision by simply don’t taking the gamble. For extensive explanation see the Incerto series by Nassim Taleb.

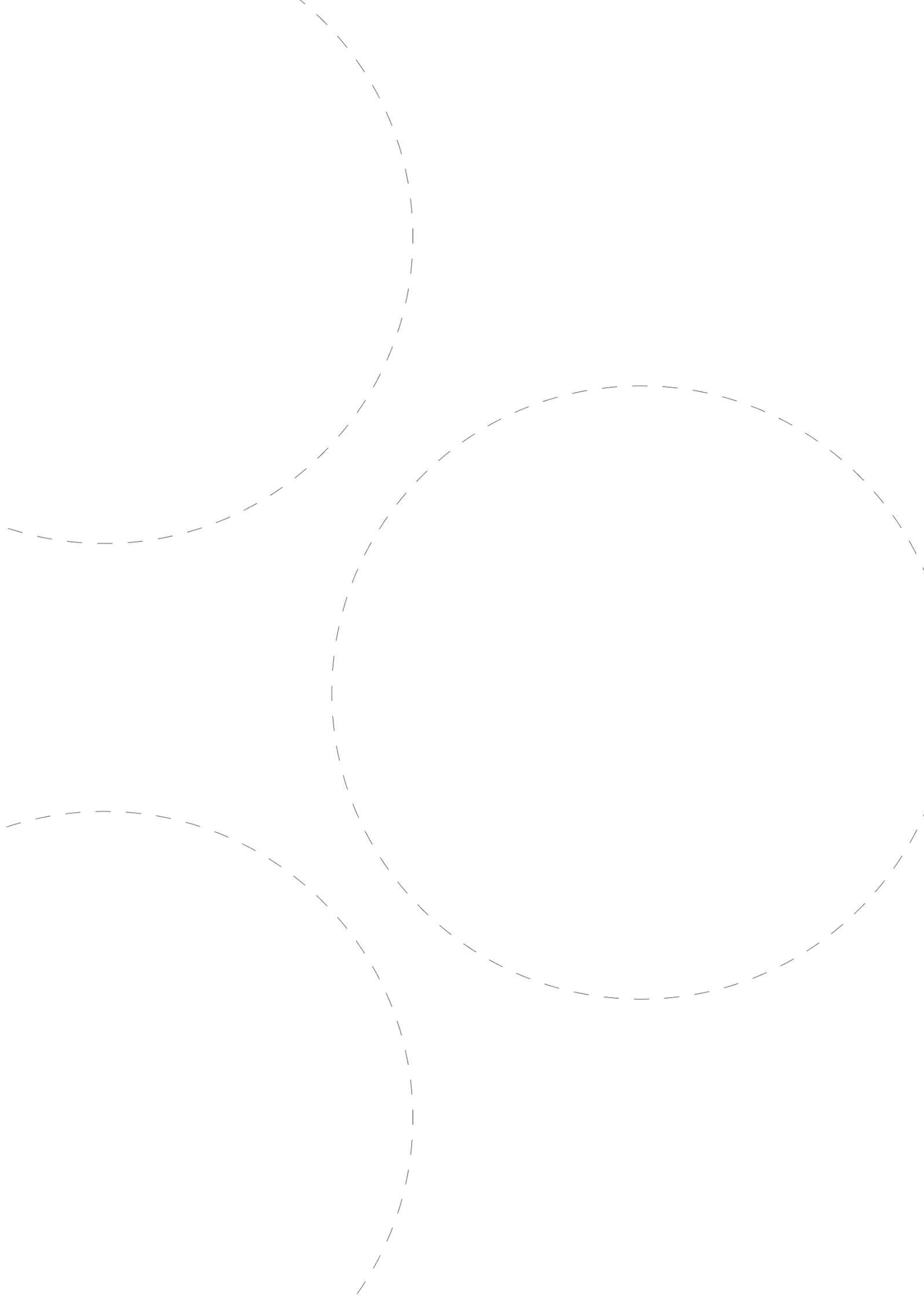
[ii] The derivation of the formula is beyond the goal of this article. An extensive explanation can be found here <https://plato.stanford.edu/entries/bayes-theorem/>

[iii] The HSC algorithm assumes the information provided in the case is $p(H)$,

$p(E | H)$ and $p(E | -H)$; only because that’s the tradition in this kind of word problems. However, any case could potentially offer data about $(-H)$, $p(-E | H)$, $p(E | -H)$ or a mix of all sets. In this situation, take what the problem states and compute the value of the complementary concept. For example, if the case tells you $p(-E | H)$ is 25%, $p(E | H) = 100\% - 25\% = 75\%$.

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