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Editorial

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Welcome to the fifth issue of the DBS Business Review, and the last to be guest-edited by me. Five years on from its first issue, the DBS Business Review finds itself at a watershed moment. It is appropriate, at this time, to stop, reflect and consider the future direction of the journal. Before addressing some of these larger questions, it is important to note some personnel changes since the fourth issue. Matt Kelleher, the managing editor, has moved from DBS to UCC Library, and has been replaced at the helm of the DBS Library and Business Review by Trevor Haugh. The Business Review is also saying goodbye to Research Librarian Tiernan O'Sullivan, who was a leading participant in putting this fifth issue together, and is moving on to A&L Goodbody's Knowledge CentreLibrary. Shepherding this issue to publication will be one of his final acts with DBS library. Trevor and Tiernan were joined in putting together the issue by Digital Literacy Librarian Amy Fitzpatrick, who also worked on the fourth issue, and Information Skills and Research Manager Aoife Murphy who is a welcome addition. I would like to thank Trevor and the whole team for their hard work in bringing this issue forward and to wish Matt and Tiernan all the best in their new roles.

The fourth issue of the DBS Business Review was focussed on student-faculty partnerships in research, with each article having a student as either the sole author or as a co-author. This fifth issue sees a return to focus on the multidisciplinary, non-cognate and cross fertilisation aspects of the journal's scope. It is also welcoming to see contributions from industry experts and practitioners, which is another focus of the journal's scope. The research articles in this issue focus primarily on change and its impact. The topics covered range from the study of changes in processes in vastly different industries, through to assessing the impact

of regulatory change in compliance assurance and of decisions on branding in the sports nutrition market. The issue closes with a note for researchers on the analysis of categorical data.

Three of the articles in this issue discuss processes in very different disciplines from very different perspectives. Nikith Muralidhar's contribution offers a comparative study of image processing algorithms as a mechanism to improve defect testing in cast components, whereas James Fair considers changes to the process of making films and Kevin Stevenson explores a therapeutic approach to the counselling process. Each article highlights specific techniques-- convolutional neural networks and support vector classifiers, virtual production and the propeller model approach-- and explores the implications of using these techniques on processes. Despite looking at different areas, each article looks at what happens when practitioners take a technique for achieving a desired result and either add, adapt or draw out flaws that can be improved. Either way, the motivation is the same; improvement and enhancement of process to achieve better results. For Muralidhar, the enhancement is automation over a manual process to detect flaws; with Fair, the improvement involves using technology to re-create a quality output in a much more cost effective manner, therefore, lowering financial barriers for practitioners. Stevenson explores applying theory to practise to see if it has the desired enhancement for the client.

Articles from Della Hunter and Denise Louvet look less to the drivers of change and are more focussed on the implications or not of change. Hunter, in her investigation into diversity and compliance, sought to discover the extent to which regulatory changes relating to diversity were being reflected in compliance programmes. Here, the emphasis is not on driving change but rather discovering whether change has had the desired effect. Likewise, Louvet investigates whether the decision to adopt brand equity and pursue a strong brand has the desired effect in the highly competitive sports nutrition market.

To conclude, this fifth issue offers some advice for researchers in the shape of a research note from Emma Beacom, who highlights the importance for researchers on considering the assumptions of binary logistic regression, a useful statistical analysis method, before applying it to the data. The inclusion of a research note is a new development for the Business Review and is an example of a number of different ideas about what direction the journal should take.

As it arrives at its five-year, five-issue milestone, it is appropriate to ask what is in the future for the DBS Business Review? The title suggests a discipline focus, but, as is the case with the Dublin Business School, the Business Review is quite broad in its scope. Contributions from faculty and students and national and international academics are covered in the scope, as are industry experts and practitioners and such phrases as "dismantle disciplinary boundaries," "cross fertilisation" and "non-cognate disciplines." This broad subject scope is to be expected, given that DBS's disciplines range from arts and creative media to data analytics to marketing to psychoanalytic psychotherapy, and many more in between. DBS also proudly and

unashamedly promotes its industry focussed credentials, with its primary strategic objective being to create work-ready graduates. The emphasis on industry experts and practitioners in the DBS Business Review's scope is, therefore, to be expected.

During its brief publication history, the Business Review has had a broad remit and defining a distinct identity is among the questions the journal team and the next editor will be considering in the coming months. Many of these questions may also have relevance for any open access, peer reviewed academic journal. In their recent editorial for Information Polity, Ruijer & Piotrowski (2022) highlighted five major challenges for academic journals the first of which is (Open) Access versus Economic Sustainability, where they highlight the difficulty of viable open access. The DBS Business Review does have a sustainable model. Open access publishing is built into the fabric of the DBS Library. Much of the work required and the cost of publishing the Business Review is included as part of what the DBS Library does, and so is not overly reliant on goodwill, as tends to be the case with open access publishing. This approach begs the question, should open access publishing be another pillar of the standard work of an academic library, no less important than collection management? There is certainly a developing interest in promoting this by providers of education to the next generation of information and library professionals. An example of this can be found in The Open Librarianship module on the Msc in Information and Library Management in DBS.

Having a viable and sustainable foundation allows for the Business Review team to look to other potential changes. Managing Editor Trevor Haugh has started to scope out potential policy, process and personnel changes that have emerged from a comparison of the Business Review with other equivalent open access journals. Some of those changes, especially in terms of the personnel, are required before changes to content and editorial direction can be considered. However, I am going to take advantage of this being my final stint as guest editor to offer some suggestions for editorial direction.

DBS has made a specific commitment to celebrate practical and applied research, which is in line with its overall strategic objectives. This issue of the Business Review reflects that focus, with all of the articles investigating some form of practical application. There may be value in the Business Review making practical research a prerequisite for all future submissions. DBS stages an annual Practical and Applied Research Conference (PARC) each May, which offers the potential for a number of submissions in this vein., Submissions to the conference have helped form connections between DBS and the exciting research conducted across these different disciplines. This volume of the journal features articles by two experts who presented at the event. The benefit of these connections might prompt the editorial team to consider moving the Business Review from an annual to a semi-annual publication, resources and budget allowing.

DBS offers a wide range of topics and disciplines and to narrow the disciplines covered by the Business Review beyond those disciplines offered in DBS would not

make sense. The Business Review should continue to offer a potential route to publication for all staff, students and associates of DBS. Similarly, it is a noted aspect of the Business Review that its issues tend to contain a mix of contributions from DBS faculty and students and academics and practitioners from other institutions and industries. This coming together of faculty and students from DBS and beyond, with industry professionals should be encouraged. If there is a common thread through the different disciplines and subjects, however, it is a need to survive and thrive in a business environment. Therefore, while I would discourage the Business Review from overly narrowing its subject breadth, I would encourage it to seek out and prioritise practical research that addresses the challenges and opportunities found in the business environment, regardless of subject.

The inclusion of a research note was a welcome addition to this issue of the Business Review. I would encourage additional pieces that advise, support and help guide the practice and business of research. Possibly the editorial team could consider a section of the journal given over to such submissions.

It is challenging and scary to close doors and limit opportunities, however, there is also danger in trying to be everything to everyone. A clearly defined focus for the Business Review team and a clear message to contributors and readers of what the Business Review means will, I believe, pay dividends for the journal in the future in ensuring that it carves out its own valued relevance in the increasingly crowded space of open access academic publications.

Finally, I would like to take this opportunity to thank everyone who I have worked with on the past two issues of the DBS Business Review for all their help, support and tolerance. I look forward to remaining part of the Business Review team as a reader, a reviewer and, possibly, a contributor.

References

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The effects of brand equity on millennials' purchase decision for sports nutrition products in Ireland

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Abstract

Based on the theory of planned behaviour, this study investigated whether brand equity influences the purchase intention for sports nutrition products among millennials in Ireland and what factors influence their purchase decision. This research reports the results of a survey of 102 millennials. The results suggest that brand equity influences millennials' purchase intention and that it is also influenced by subjective norms and perceived behavioural control. Furthermore, the analysis shows a correlation between brand equity and its subdimensions (brand awareness/associations, perceived quality, brand loyalty) and purchase intention. This study contributes to the brand management literature in the sports nutrition industry and provides brand managers with various suggestions on how to build brand equity in their business practices.

Keywords: Brand equity, theory of planned behaviour, sports nutrition products, purchase intention, consumer behaviour, millennials, brand management

Introduction

Within only 83 years, the global sports nutrition industry has skyrocketed (Tricarico, 2021). In 2019 and 2020, the industry experienced a decline due to the pandemic. Nevertheless, a compound annual growth rate (CAGR) of 7% is forecast for Ireland, reaching €72 million by 2026 (Euromonitor International, 2021) and 12.50% globally by 2027 (Mordor Intelligence, 2021). Some contributing factors to the industry growth are: A greater demand for health-promoting products and consumers adopting more active lifestyles (Glanbia, 2021; Magill, 2022); the greater emphasis on preventative healthcare in Ireland, leading to strong demand for sports nutrition products, vitamins and supplements (Euromonitor International, 2021); and the targeting of recreational

users and women, signifying the transition from a niche to a mass market (Keogh, Li and Gao, 2019; Kades, 2022).

During the pandemic, fitness became a key element as consumers showed a greater interest in health and well-being (Euromonitor International, 2021b). Currently, the majority of Irish people try to stay active by exercising several times a week (Magill, 2022). Since restrictions on exercise have been relaxed, there is also a growing demand for sports nutrition products (The Market Research Society, 2021). Millennials born between 1981 and 1996 in particular (Beresford Research, 2022) want to exercise more and improve their diet (Deloitte, 2021). This generation takes a holistic view of health and considers exercise and nutrition very important to their overall health (Panner, 2019). They are seen as the fittest generation: 76% of millennials exercise at least once a week, and the average millennial spends $56 a month on supplements (Billitz, 2022). A report by Innova Market Insights (2021) states that millennials are very adventurous when it comes to trying new flavours and are the most likely to add sports nutrition products to their typical shopping basket.

As competition increases and the number of new entrants rises, brands must discover a way to differentiate themselves. Therefore, brand equity is becoming increasingly important in the sports nutrition industry. The concept refers to a strong brand which uses its value to gain a competitive advantage, differentiate itself and drive brand success (Rossi, Borges and Bakpayev, 2015). However, understanding the customer perspective of a strong brand can be a complex process. For this reason, Keller (1993) and Aaker (1996) developed the Consumer-Based Brand Equity (CBBE) model, which captures the value of a brand from the customer's perspective.

CBBE can have a positive impact on a brand, for example by increasing consumer purchase intention (Buil, Martínez and de Chernatony, 2013; Azzari and Pelissari, 2020). However, it appears that the sports nutrition industry has received little attention from researchers, and only one study by Wesana *et al.* (2020) examined the value of sports nutrition brands in Belgium and consumer preference by profiling users and non-users of sports nutrition products. However, it did not investigate whether consumer purchase intention was influenced by brand equity, nor what factors influence consumer purchase intention for sports nutrition brands. The theory of planned behaviour can be applied to the study of intentions and behaviour, using its three dimensions: Attitudes, subjective norms and perceived behavioural control. The model has been used by researchers to study consumer purchase intention and behaviour for dietary supplements (Pawlak et al., 2008; El Khoury *et al.,* 2021; Chen, Chao and Chu, 2022). Nevertheless, it seems that it has not been associated with sports nutrition brand equity, nor has it been studied in the Irish market.

This study complemented the findings of Wesana *et al.* (2020) to shed more light on the importance of branding and, furthermore, the factors that influence consumer purchase intention in the sports nutrition industry. It was attempted to answer the following research questions:

1. Is millennials' purchase intention for sports nutrition products influenced by brand equity?

2. What is driving Irish millennials' purchase intention for sports nutrition products?

Research Model and hypothesis

The study model examines the factors that capture the value of a brand from the customer's perspective through the adoption of CBBE and TPB model.

The conceptual framework (Figure 1) was adopted from Abdullah et al. (2018), who appear to have been one of the first to link Aaker's (1996) brand equity model with Ajzen's (1991) TPB model to examine the impact of both models on consumers' willingness to pay premium prices. The conceptual framework was adapted for the purpose of this study by replacing the variable "willingness to pay premium prices" with "purchase intention". As suggested by scholars and conducted by Wesana *et al.* (2020), brand equity was assessed using three indirect measures: Brand awareness/associations, perceived quality and brand loyalty. In addition, overall brand equity was measured as an individual construct to assess the additional value of a brand due to its brand name and to better understand how the three sub-dimensions contribute to brand equity.

Figure 1: Conceptual Framework adapted from Aaker (1996) and Ajzen (1991)

CBBE

Keller (1993, p. 8) defines CBBE "as the differential effect of brand knowledge on consumer response to the marketing of the brand". In other words, brand knowledge stored in a consumer's memory might elicit a more favourable brand response when exposed to the same marketing efforts of a familiar versus unfamiliar brand. For example, a consumer who sees an advertisement for whey protein on social media might respond positively when they see that the advertisement is from the sports nutrition brand they know, whereas they might not respond to an unfamiliar brand's advertisement. Therefore, consumer behaviour can be influenced by CBBE and benefit a brand. Keller identifies four sequential steps that are critical when building a strong brand: (1) creating a brand identity, (2) creating brand meaning through unique and favourable brand associations, (3) generating positive brand responses, and (4) building consumer-brand relationships that are characterised by loyalty (Keller, 2001).

In contrast, Aaker (1991, p. 15) defines brand equity as "a set of brand assets and liabilities linked to a brand, its name and symbol that add to or subtract from the value provided by a product or service to a firm and/or to that firm's customers". He identifies four dimensions that can assess brand equity from the customer perspective: awareness, associations, perceived quality, and loyalty. Furthermore, brand equity can be assessed from a company perspective by looking at market behaviour (Aaker, 1996). Although the approach to assessing brand equity differs between the two scholars, the dimensions chosen are similar and have brand loyalty as the core and desired outcome. Nevertheless, research indicates that most scholars use Aaker's approach by assessing CBBE with three indirect measures: awareness/associations, perceived quality, and brand loyalty (Yoo, Donthu and Lee, 2000; Yoo and Donthu, 2001; Brunetti, Confente and Kaufmann, 2019; Wesana et al., 2020). This study adopts the CBBE scale proposed by Yoo, Donthu and Lee (2000) as it has been recommended and validated by Brunetti, Confente and Kaufmann (2019) and Wesana et al. (2020).

Brand awareness/associations

Brand awareness refers to "customers' ability to recall and recognize a brand" (Keller, 2001, p. 8), while brand associations are "anything linked in memory to a brand" (Aaker, 1991, p. 15). The terms tend to be linked, as brand awareness reflects the level of brand knowledge that goes beyond mere brand name recognition and includes various brand associations stored in the consumer's memory (Çifci et al., 2016). For example, a consumer might recognise the logo of a sports nutrition brand or some product features that they have been exposed to before. In addition, various brand associations are linked together in a consumer's memory, which together create a brand image and make up the consumer's brand knowledge (Yoo, Donthu and Lee, 2000). Ideally, associations are formed that the consumer associates with a need to be satisfied or a product/service category (Keller, 2001). In such cases, brand recall can be greater when consumers want to satisfy a need and the brand might be in the top-of-mind. Therefore, brand awareness/associations are often considered a crucial precursor to perceived quality, as they influence its strength and emergence (Buil, Martínez and de Chernatony, 2013).

Yoo, Donthu and Lee (2000), Keller (2001), and Sasmita and Suki (2015) argue that brand awareness/associations positively influence brand equity whereas Wesana et al. (2020) discovered that this influence is insignificant. However, the researchers argue that perceived quality and brand loyalty offset the insignificant effect of brand awareness/association on brand equity. Therefore, further research should be conducted to investigate the impact of brand awareness/associations on brand equity. To investigate the findings of Wesana et al. (2020), this study hypothesised:

H1: Brand awareness/associations does not influence brand equity.

Perceived quality
Zeithaml (1988, p. 3) defines perceived quality as "the consumer's judgement about a product's overall excellence or superiority". In this case, a consumer's subjective judgement determines product quality rather than actual manufacturing quality. Therefore, consumers' feelings reflect their perceived quality of a particular brand (Aaker, 1991). Since consumers tend to transfer their perceived quality to products of the same brand, they prefer to buy brands they know (Azzari and Pelissari, 2020). Moreover, perceived quality tends to be higher when consumers perceive a brand as credible, which could influence their purchase intention. However, this relationship is moderated by pleasure-seeking behaviour (Saleem, Rahman and Omar, 2015).

Many scholars discovered that perceived quality positively influences brand equity (Yoo, Donthu and Lee, 2000; Buil, Martínez and de Chernatony, 2013; Wesana *et al.*, 2020). Therefore, a positive effect of perceived quality on brand equity was expected in this study:

H$_2$: Perceived quality positively influences brand equity.

Brand loyalty
Brand loyalty is at the core of brand equity, which refers to "the attachment that a customer has to a brand" (Aaker, 1991, p. 39). It reflects the relationship between the consumer and a brand and its strength (Keller, 2001). Loyal consumers are committed to a brand and prefer to buy its products. Consequently, switching to competitive brands is less likely (Yoo and Donthu, 2001; Wesana *et al.*, 2020).

To date, brand loyalty has been studied by many researchers in different industries, and many agree that brand loyalty is the strongest driver of brand equity (Aaker, 1996; Buil, Martínez and de Chernatony, 2013; Saleem, Rahman and Omar, 2015). However, it seems brand loyalty has not been studied much in the context of the sports nutrition industry. In support of previous findings, Wesana *et al.* (2020) argue that brand loyalty is the strongest driver of brand equity. Gabriels and Lambert (2013) found that consumers have a higher purchase intention for sports nutrition brands when the brand name is on the product label, suggesting that brand loyalty may influence consumer purchase intention. Nevertheless, research in that industry remains limited, but should be expanded given the potential benefits that brand loyalty could offer brands. Therefore, this study examined the relationship between brand loyalty and brand equity and its influence on purchase intention by hypothesising:

H$_3$: Brand loyalty positively influences brand equity.

Purchase intention

When consumers are loyal to a brand, their purchase intention for that brand is generally greater when they have to choose between it and an alternative (Yoo and Donthu, 2001). Purchase intention refers to "consumers' disposition towards buying a brand, or continuing its use" (Aydin and Ulengin, 2015, p. 111). Usually, it is not necessary to convince loyal consumers to buy that brand. Instead, loyal consumers tend to recommend that brand to others and persuade them to buy it by spreading positive word of mouth (WOM) (Wesana *et al.*, 2020). Since consumers freely promote the brand, brands do not have to pay, but gain organic brand awareness and potentially attract new customers. In addition, loyal consumers buy the brand repeatedly, seek out information about the brand themselves and engage with brand communities (Keller, 2001).

Many scholars argue that purchase intention is positively influenced by brand equity (Holehonnur *et al.*, 2009; Buil, Martínez and de Chernatony, 2013; Sasirekha and Sathish, 2017; Azzari and Pelissari, 2020). Due to brand knowledge and familiarity, consumers perceive less risks during their decision-making process. For example, if a consumer is familiar with the quality of a brand, these perceptions can be transferred to other products of the same brand, reducing the potential risk of a purchase (Azzari and Pelissari, 2020). Moreover, the time needed to make a purchase is reduced. Therefore, the hypothesis was made:

H$_4$: Brand equity positively influences purchases intention.

Theory of planned behaviour

The theory of planned behaviour model assumes that behavioural intentions are antecedents of consumers' actual behaviour, which depend on the information available and the consumer's evaluation of that information (Madden, Ellen and Ajzen, 1992; El Khoury *et al.*, 2021). Behavioural beliefs (attitude towards behaviour) and normative beliefs (subjective norms) influence intention. Moreover, perceived behavioural control, a control belief, either indirectly influences intentions of directly influences behaviour (Madden, Ellen and Ajzen, 1992).

One forms attitudes by believing that one's behaviour will lead to a certain outcome, which can be evaluated as desirable or undesirable (i.e., favourably vs. unfavourably) (Ajzen, 1991; Ahmed *et al.*, 2020). For example, a consumer might believe that using whey protein for exercise will help build more muscle and therefore consider purchasing it. The more positively the feelings associated with performing the behaviour are valued, the greater the attitude towards performing the behaviour. Thus, the behavioural intention is greater.

Subjective norms reflect how consumers perceive the opinion of significant others, such as close friends, family, or colleagues, about a behaviour (Ajzen, 1991; Chen, Chao and Chu, 2022). Therefore, one's own behaviour can be influenced by the social influence of others. For example, if a close friend regularly uses sports nutrition products to enhance their performance, the consumer may view the purchase behaviour positively and be more willing to perform the behaviour themselves (i.e., purchase intention).

Perceived behavioural control refers to a consumer's perceived difficulty in performing a particular behaviour. Perceived behavioural control can either directly predict behaviour or indirectly influence behaviour through intentions (El Khoury *et al.*, 2021). The greater the perceived behavioural control, the more likely the consumer is to perform a particular behaviour (Ajzen, 1991). For example, when consumers feel that the decision to purchase products from a particular sports nutrition brand rests solely with them, they have a stronger sense of perceived behavioural control.

El Khoury *et al.* (2021) discovered that users of dietary supplements have more positive attitudes, stronger intentions, and higher perceived behavioural control towards using such products. Furthermore, subjective norms play a critical role in the use of supplements. Nagar (2020) found that gym supplement users' attitude is strongly influenced by the benefits associated with consumption, that subjective norms influence attitude and purchase intentions, and that attitude significantly influences behavioural intentions. However, research on what drives consumer purchase intention for sports nutrition products, especially among Irish millennials, is still limited. Furthermore, it seems that no scholars have yet attempted to integrate the TPB with the CBBE model to better understand millennials purchase intent for sports nutrition products.

Attitudes and brand equity

Attitude has a big impact on a consumer's behavioural intention, especially when the behavioural outcome is desired (Abdullah et al., 2018). Suppose a consumer has had a positive experience with a familiar sports nutrition brand. Previous brand experiences may influence whether a consumer includes that brand in their evoked set and intends to purchase it again (Keller, 1993). Therefore, it can be argued that the consumer has developed a positive attitude towards the brand, meaning that purchase intention is potentially greater, vice versa. Nonetheless, attitude was excluded from parametric testing in this study as the researcher used a rating scale to learn more about millennials' attitudes towards sports nutrition products and the main reasons for their purchase decision.

Subjective norms and brand equity

The views of important people about consumers' behavioural intentions are reflected by subjective norms (Abdullah *et al.*, 2018). How a significant other feels about the consumer's intention to purchase products from a particular sports nutrition brand could influence the consumer. For example, if a close friend only uses and endorses products from a particular sports nutrition brand, the consumer is more likely to try that brand as well and vice versa. So, the way someone else perceives the value of a brand could influence the consumer positively (in cases of positive brand equity) or negatively (in cases of negative brand equity). This study hypothesised:

H₅: The attitude of significant others towards the brand influences the consumer's purchase intention.

Perceived behavioural control and brand equity

Whether consumers believe they have enough resources and opportunities to perform a particular behaviour is reflected by their perceived behavioural control. If a consumer feels confident to perform a certain behaviour, their belief is stronger (Abdullah *et al.*, 2018). In terms of purchase intention, a consumer might perceive a high level of brand equity. However, if a consumer does not have enough money to afford a premium sports nutrition brand, they would be willing to spend the money but have a low ability to make the purchase. Consequently, their purchase intention might be low. Nevertheless, Yoo, Donthu and Lee (2000) argue that consumers are willing to pay higher prices for brands with high brand equity. Thus, if the consumer had enough money to afford the brand, they would feel a higher level of perceived behavioural control, which would imply a greater willingness to purchase the desired brand. A hypothesis was made:

H₆: Perceived behavioural control towards the brand influences the consumer's purchase intention.

Methods and procedures

Participants

The target population for the survey included individuals from the Millennial generation, i.e., individuals born between 1981 and 1996 (Beresford Research, 2022). Therefore, individuals between the ages of 26 and 41 were targeted. Millennials had to use sports nutrition products and live in Ireland, as the study focused on the Irish market.

There are currently approximately 1,056 million millennials living in Ireland (Euromonitor International, 2022). However, not every millennial is a user of sports nutrition products, so there was no exact number of the target population. Given the short 12-week period for this study, a total sample size of 100 respondents was considered acceptable. A response rate for surveys is between 50% to 60% (Story and Tait, 2019). Thus, the survey was shared with at least 200 millennials to achieve the desired sample size.

As no sampling frame could be created or accessed, non-probability sampling was used, meaning that individuals were selected based on the researcher's judgement or for convenience purposes. The probability of being selected was hence unknown. A mix of purposive and snowball sampling was used. Therefore, the researcher used her own judgment to first identify some individuals she knew from her network who met the sampling criteria. These individuals were encouraged to share the questionnaire with other members of the target population.

Materials

The outcome of this study was based on objective facts and not on the subjective reality perceived by one individual. Therefore, a positivist paradigm was adopted as that the relationship between variables was empirically tested (Kivunja and Kuyini, 2017). A survey explored the relationship between brand equity, purchase intention and their influencing factors. An online questionnaire (Appendix 4) was created in Google Forms to collect categorical and continuous data.

Section A contained three control checks to enhance the validity of the survey by ensuring that participants were millennials, lived in Ireland, and used sports nutrition products. Data were collected on a nominal and ordinal scales. Those who did not meet the sampling criteria were automatically excluded from the survey.

Section B measured the variables investigated in this study. Participants had to rate various statements on a 5-point Likert scale ranging from 'Strongly disagree' to 'Strongly agree'. Scale items for all constructs were adapted from different sources (Appendix 1). The scale collected interval data. Three to four items measured each construct to allow for a better assessment of reliability and construct validity (Kyriazos and Stalikas, 2018). The only exception were scale items A1 – A3 for attitude, as consumers had to rank the importance of three statements at the end of this section to determine which of the three statements was most important to them and to learn more about their attitudes towards sports nutrition brands.

Section C included two further demographic questions to identify participants' gender and their current employment status. Both items collected nominal data as participants had to select a category they identified with. The questions allowed the researcher to identify possible patterns. Both questions are considered rather sensitive questions and were consequently asked at the end of the survey to ensure that participants did not hesitate and possibly drop out of the survey at the beginning. The survey ended after this section.

Results

A total sample size of 110 respondents was obtained, Eight respondents did not meet the sampling criteria and were consequently excluded. Their responses were deleted. This left a total sample size of 102 respondents, all of whom lived in Ireland and used sports nutrition products.

Figure 2: Gender distribution

Figure 2 illustrates that 63.73% of the sample were male, while 36.27% were female. This outcome was expected, as sports nutrition products still appear to be more popular among men (Wesana et al., 2020). Table 1 shows that 57.84% (59 in total) of the respondents were between 25 and 31 years old, while 42.15% (43 in total) were between 32 and 41 years old. Therefore, more respondents belonged to the younger generation of millennials.

Table 1: Gender and age distribution

		Age		Total
		25 – 31	**32 – 41**	
Gender	**Female**	23	14	37
			29	
	Male	36	43	65
	Total	59		102

Furthermore, 94 respondents indicated they are employed full-time, while eight said they are students. The survey was given to personal trainers who sent it to their clients, which explains why most respondents worked full time, as students may not be able to afford personal training.

Attitude towards using sports nutrition products

Attitude was one variable included in the TPB model. In this study, however, attitude was excluded from parametric testing. Instead, to learn more about respondents' attitudes towards sports nutrition brands, they had to rank three statements from most important (1) to least important (3). Table 2 summarises the mean ranks from the Friedman test.

Table 2: Attitude Ranks

Variable	Mean	Rank
I believe that using dietary supplements from my brand will…		
A1: … improve my performance.	1.88	2
A2: … improve my physical appearance.	1.75	1

A3: … help me maintain/achieve a balanced diet for a better general health.	2.36	3

A2 appeared to be the most important statement for many respondents as it achieved a mean score (mean = 1.75) closest to 1, followed by A2 (mean = 1.88) and A3 (mean = 2.36). Thus, most millennials primarily use sports nutrition products to improve their physical appearance. Secondly, to improve their performance and lastly, to help them maintain and/or achieve a balanced diet for a better general health.

Normality of distribution

To determine whether the data of the dependent variable purchase intent were suitable for parametric tests, the normality of distribution was assessed. A normal probability plot was created in SPSS as shown in Figure 3. A normal distribution was assumed if the line on the graph was straight and diagonal (Pallant, 2007).

Figure 3: Normal Probability Plot Purchase Intent

The diagonal line in Figure 3 indicated that the data were normally distributed. Although there were a few residuals, the line was still diagonal and mostly straight. Therefore, purchase intent was used for parametric testing.

Assessing reliability and validity

A Cronbach's alpha score was measured for each construct to determine the internal consistency of items and assess the reliability of the measurement instrument. The score indicated how well items captured the construct, ranging from 0 to 1 (Saunders, Lewis and Thornhill, 2019). Since less than 10 items were used to measure a construct, a score of 0.500 was considered acceptable, although a score of 0.700 would have been desirable (Pallant, 2007).

Table 3: Cronbach's alpha

Variable	Number of items	Cronbach's alpha
Overall Brand Equity	4	0.792
Brand Awareness/Associations	4	0.680
Perceived Quality	4	0.801
Brand Loyalty	3	0.794
Attitude	4	-
Subjective Norms	3	0.844
Perceived Behavioural Control	4	0.740
Purchase Intent	3	0.842

Table 3 illustrates that all constructs were considered reliable, as they achieved a score of at least 0.500. However, brand awareness/associations obtained a score below the desired 0.700. As mentioned previously, attitude items A1 – A3 were measured on a ranking scale ranging from 1 to 3. Only item A4 was measured on a 5-point Likert scale, which was not enough to assess Cronbach's alpha. Therefore, no Cronbach's alpha score could be reported for attitude and the construct was excluded for inferential analysis.

Inferential results

The following sections present the results of parametric tests done to investigate the hypotheses. A standardised multiple regression was performed to assess the relationship between several independent variables (BA, PQ, BL, OBE, SN, PBC) on one dependent variable (PI). A confidence interval of 95% was chosen, meaning that a probability value (hereafter referred to as p-value and reported as 'Sig.' in tables displayed in this study) was compared with a significance level of 0.05. Findings were considered significant if the p-value < 0.05.

Brand equity and purchase intent

The first research question that this study aimed to investigate was whether millennials' purchase intention for sports nutrition products was influenced by brand equity. A standardised multiple regression analysis was used to assess the ability of brand equity (OBE) and its subdimensions (brand awareness/associations [BA], perceived quality [PQ], and brand loyalty [BL]) to predict consumers purchase intent (PI). In addition, to see if any of the variables correlate. No problems with multicollinearity were identified as the tolerance score of all variables was greater than 0.10 and VIF scores below 10. The reported R Square value was 0.637. In other words, 63.70% of variance in purchase intent was explained by the independent variables.

Table 4: ANOVA[a] Brand Equity and Purchase Intent

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	14.210	4	3.553	42.536	0.000[b]
Residual	8.096	97	0.083		
Total	22.306	101			

a.   Dependent Variable: Purchase Intent

b.   Predictors: (Constant), Brand Equity, Brand Awareness/Associations, Perceived Quality, Brand Loyalty

The ANOVA table (see Table 4) showed that the finding was statistically significant as the p-value < 0.001 < 0.05. Therefore, the overall regression model was considered significant, as $F(4, 97) = 42.56$, $p < 0.001$, $R^2 = 0.637$. Moreover, the

predictors were able to account for a unique amount of variance in the dependent variable as each had a significant finding with a p-value < 0.05 (p-value BA = 0.037, p-value PQ < 0.001, p-value BL = 0.012, p-value OBE = 0.001). Nevertheless, BA had a negative standardised coefficients beta value of -0.165, meaning that as the variable increased by 1 SD, PI decreased by 0.165 SD. At the same time, BA had the greatest influence on PI, as the reported p-value was highest for this variable. PQ (beta = 0.389), BL (beta = 0.261), and OBE (beta = 0.364) reported a positive beta value, meaning that as any of the variables SD increased, so did the SD of PI.

Furthermore, the findings suggested a significant relationship between the different variables as each had a p-value < 0.05 for Pearson correlation. The correlation matrix in Table 5 shows the correlations between the different variables and reports the r value, which reflects the strength of the relationship and its direction.

Table 5: Correlation Matrix Brand Equity and Purchase Intent

Variables	PI	BA	PQ	BL	OBE
PI	1.000	0.383	0.670	0.695	0.711
BA	0.383	1.000	0.573	0.514	0.526
PQ	0.670	0.573	1.000	0.609	0.596
BL	0.695	0.514	0.609	1.000	0.778
OBE	0.711	0.526	0.596	0.778	1.000

All variables had a positive relationship as all reported r values were positive. Therefore, variables changed in the same direction, meaning that, for example, as PQ increased, so did BL. Apart from the relationship between PI and BA, which had a moderate relationship, all other variables had a strong relationship as a r value > 0.50 was reported. The following table summarises the conclusions drawn about H_1 to H_4.

Table 6: Hypotheses Brand Equity and Purchase Intent

Hypothesis	Accepted	Rejected
H_1: Brand awareness/associations does not influence brand equity.		x
H_2: Perceived quality positively influences brand equity.	x	
H_3: Brand loyalty positively influences brand equity.	x	
H_4: Brand equity positively influences purchases intention.	x	

As can be seen in Table 6, apart from H_1, $H_2 - H_4$ were supported. A more thorough discussion follows later in the discussion section.

Theory of planned behaviour and purchase intent

The second research question of this study was to discover what is driving millennials' purchase intention for sports nutrition products. Another standardised multiple regression analysis was used to assess the ability of subjective norms (SN) and perceived behavioural control (PBC) to predict consumers purchase intent (PI). As mentioned before, attitude was measured on a ranking scale and therefore excluded for parametric tests.

The tolerance and VIF score of the variables indicated again that no problems with multicollinearity existed, as respective values were greater than 0.10 and below 10. The R Square value was 0.210, meaning that 21% of variance in purchase intent was explained by subjective norms and perceived behavioural control.

Table 7: ANOVA[a] TBP and Purchase Intent

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.681	2	2.340	13.145	0.000[b]
Residual	17.625	99	0.178		
Total	22.306	101			

a.   Dependent Variable: Purchase Intent

b.   Predictors: (Constant), Subjective Norm, Perceived Behavioural Control

The ANOVA table (Table 7) demonstrated that the p-value < 0.001 < 0.05. The finding was therefore significant as well as the overall regression analysis, as $F_{(2, 99)}$ = 13.15, p < 0.001, R^2 = 0.210. However, only SN (p-value = 0.001 < 0.05) had a significant finding as a predictor of PI and was able to account for a unique amount of variance in the dependent variable. As the SD of SN (beta = 0.383) increased by 1, so did PI by 0.383. On the contrary, PBC did not account for a unique amount of variance in PI, as the coefficient had a p-value = 0.280 > 0.05. Nevertheless, the correlation matrix suggested a positive relationship between PBC and PI, as the p-value < 0.001 < 0.05.

The correlation matrix below illustrates the strength of the correlation between the different variables, reflected by the reported r value. The finding for all variables was significant, as a p-value < 0.05 was reported for Pearson correlation.

Table 8: Correlation Matrix TPB and Purchase Intent

Variables	SN	PBC	PI
SN	1.000	0.552	0.448
PBC	0.552	1.000	0.328
PI	0.448	0.328	1.000

Table 8 shows that there was a strong relationship between PBC and SN (r = 0.552 > 0.5) while the relationship between PI and SN (r = 0.448 < 0.5) as well as PI and PBC (r = 0.328 < 0.5) was moderate. For that reason, H_5 and H_6 were supported, as can be seen in Table 9. In the next section, a more detailed discussion on the findings and its implications follows.

Table 9: Hypotheses TPB and Purchase Intent

Hypothesis	Accepted	Rejected
H_5: The attitude of significant others towards the brand influences the consumer's purchase intention.	x	
H_6: Perceived behavioural control towards the brand influences the consumer's purchase intention.	x	

Discussion and implications

The aim of this study was to investigate whether brand equity influences the purchase intention for sports nutrition products among millennials in Ireland and what factors affect their purchase decisions. The results and implications thereof are summarised in Table 10.

Table 10: Summary of results

Hypothesis	Sig.	Result	Main finding
H_1: Brand awareness/ associations	<0.001	Rejected	Brand awareness/ associations influenced brand equity.
H_2: Perceived quality	<0.001	Accepted	Perceived quality influenced brand equity.
H_3: Brand loyalty	<0.001	Accepted	Brand loyalty influenced brand equity.

H$_4$: Brand equity	<0.001	Accepted	Brand equity influenced purchase intent.
H$_5$: The attitude of significant others	<0.001	Accepted	The attitude of significant others influenced millennials' purchase intent.
H$_6$: Perceived behavioural control	<0.001	Accepted	Perceived behavioural control influenced millennials purchase intent.

intention. Brand loyalty was the strongest driver of brand equity. Thus, sports nutrition brand managers should focus on building loyal relationships with customer as this will have a positive effect on brand equity and consumer purchase intention.

Brand awareness/associations Apart from H$_1$, all other hypotheses examined in this study had a significant finding and were therefore accepted. More details are discussed next.

First research question: brand equity and purchase intent

The first research question investigated whether millennials' purchase decision for sports nutrition products is influenced by brand equity. This study also explored the effect of brand awareness/associations, perceived quality, and brand loyalty as subdimensions of brand equity. The results for H$_2$ – H$_4$ were significant, suggesting that brand equity influenced millennials' purchase decision for sports nutrition products. Moreover, brand equity was influenced by perceived quality and brand loyalty. H$_1$ was rejected as the result was insignificant. However, it was hypothesised that brand awareness/associations does not influence brand equity, which this study controverted. Nonetheless, an inverse relationship between brand awareness/associations and purchase intention existed. Thus, purchase intention decreased as brand awareness increased. The introductory text of the survey indicated that respondents were asked to answer the following statements while thinking of the last sports nutrition brand they purchased. Therefore, if the last brand purchased was one that the respondent did not like, their intention to purchase it again could be lower, which could explain this result.

Moreover, purchase intention positively correlated with all variables. Therefore, sports nutrition brand managers should consider brand awareness/associations, perceived quality, brand loyalty, and overall brand equity as they can influence Irish millennials purchase

The first hypothesis addressed was:

H$_1$: Brand awareness/associations does not influence brand equity.

Given the insignificant finding, H_1 was rejected. Thus, brand equity in this study was influenced by brand awareness/associations and the results of Wesana *et al.* (2020), who found an insignificant relationship, were refuted. Instead, the findings of Keller (2001) and Sasmita and Suki (2015) were supported, who discovered a positive influence of brand awareness/associations on brand equity.

For brand equity to emerge, one can argue that consumers must first be aware of a brand and have some knowledge of it by linking brand associations in their memory. Brand awareness is a crucial first step before consumers can form an image of quality or build a relationship with that brand. Otherwise, neither a brand image nor brand knowledge can emerge, as no associations are made. This assumption is supported by Keller's (2001) CBBE model and the four steps he suggests for building a strong brand. He considers each step of the pyramid as a precursor to the next and argues that brand loyalty at the top cannot be achieved without the other steps. Brand awareness is at the bottom of the pyramid and refers to the brand identity that a consumer has created through a high level of awareness. Therefore, creating a strong brand would not be possible without brand awareness/associations, which explains why this variable positively influences brand equity.

There was a moderate relationship between brand awareness/associations and purchase intent, which contradicted the findings of Azzari and Pelissari (2020). However, an invert relationship existed, suggesting that as consumers' knowledge of a brand increases, their purchase intention decreases. Nevertheless, this could only be the case if consumers do not like a brand and thus do not intend to repurchase it.

Furthermore, in support of Saleem, Rahman and Omar's (2015) findings, brand awareness/associations influenced brand loyalty. When consumers buy a brand regularly, they may have positive feelings towards it, identify it when they want to satisfy a need, and may even have it as a preferred choice, meaning that loyalty has been created through awareness. This assumption is supported by Aaker (1996), who argues that there are different levels at which brand awareness can occur, ranging from mere brand recognition (having heard of a brand name), to top-of-mind (recalling a brand first when wanting to fulfill a need), to brand knowledge (knowing what the brand represents), and having an opinion about a brand. The importance of different levels of brand awareness varies, depending on how long a brand has been on the market and how established it is.

Consequently, sports nutrition managers should consider brand awareness/associations as an important driver of brand equity and ultimately purchase decision of Irish millennials. It is recommended that niche or new brands focus on brand recognition to ensure awareness among millennials, while well-known brands should aim to be at the top of mind. In this way, brand knowledge is strengthened, and consumers ideally form a positive opinion of a brand.

Perceived quality

The second hypothesis addressed was:

H_2: *Perceived quality positively influences brand equity.*

As expected, the result was significant. Thus, brand equity was positively influenced by perceived quality as the finding of various researchers confirmed (Buil, Martínez and de Chernatony, 2013; Aydin and Ulengin, 2015; Wesana *et al.*, 2020). Moreover, there was a strong correlation between perceived quality and purchase intent, confirming the findings of Sasirekha and Sathis (2017). Thus, perceived quality was found to be a strong driver of purchase intention and an antecedent of brand loyalty.

Aaker (1996) claims that perceived quality is a key dimension of brand equity, allowing brands to charge higher prices. Furthermore, Keller (2001) argues that consumers need brand experience to judge its performance, i.e., the quality of its products. When brands meet or exceed customers' expectations, they can build loyal relationships. If the opposite is the case, consumer dissatisfaction arises and the likelihood of future purchases decreases. It is therefore logical that perceived quality has a positive impact on brand loyalty and ultimately on brand equity and purchase intent.

Focusing on intrinsic and extrinsic product attributes could help brand managers of sports nutrition brands to influence consumers' perception of the quality of their products and brands. For example, the packaging and design of the product can signal quality. Simply creating a strong brand can signal quality to consumers, and consumers are more likely to transfer their perception of quality to other products of the same brand. Higher prices can also signal higher quality, and enhancing the brand image through appropriate marketing efforts can improve quality.

Brand loyalty

The third hypothesis addressed was:

H_3: *Brand loyalty positively influences brand equity.*

The significant result confirmed that brand loyalty positively influenced brand equity. In fact, supporting the findings of various scholars (Aaker, 1996; Saleem, Rahman and Omar, 2015; Wesana *et al.*, 2020), brand loyalty had the strongest effect on brand equity. Furthermore, a strong correlation between brand loyalty and purchase intent existed and the variable was influenced by brand awareness/associations and perceived quality. Buil, Martínez and de Chernatony (2013) claim that brand loyalty is influenced by brand awareness, brand associations, and perceived quality, which this study confirmed. Moreover, the findings of Yoo, Donthu and Lee (2000) were supported, who argue that brand loyalty is one of the three components of the CBEE model, all of which influence brand equity.

Considering that brand loyalty is the desired outcome of CBBE, it makes sense that this variable had the strongest effect on brand equity. Loyal consumers have a positive attitude towards this brand because strong, positive brand associations have been created. It can also be assumed that customers' expectations tend to be met or exceeded, which strengthens the relationship between brand and consumer. Consequently, the consumers' purchase intention increases.

To support this assumption, Keller (2001) and Aaker (1996) argue that the core of the CBBE model is brand loyalty. Keller (2001) considers loyalty as the psychological attachment a consumer has with a brand that reinforces activities such as repeat

purchases, positive WOM or seeking brand information. Aaker (1996) argues that customer satisfaction and loyalty go hand in hand, as satisfied consumers are more likely to become loyal. In either case, consumers have a positive attitude towards the brand, which results in desirable responses, activities, and a relationship, i.e., a strong brand was created.

It is recommended that sports nutrition brand managers invest in building loyal relationships with millennials to positively influence their purchase decision. Bharadwaj and Bezborah (2021) already suggested that giving free samples could increase brand loyalty for sports nutrition products, but only if placed effectively.

Overall brand equity

The fourth hypothesis addressed was:

H_4: *Brand equity positively influences purchases intention.*

The significant result suggested that purchase intention was positively influenced by brand equity, which supported the finding of various scholars (Holehonnur *et al.*, 2009; Sasirekha and Sathish, 2017; Azzari and Pelissari, 2020). Moreover, the results indicated that brand loyalty was the strongest driver of brand equity, followed by perceived quality and brand awareness/associations.

Brand equity means that a brand has created a strong position in the market. Its brand name signals value and consumers tend to be loyal. Therefore, it was expected that brand equity positively influences millennials' purchase intention. Moreover, risks associated with making a purchase are reduced, as consumers are familiar with the brand (Azzari and Pelissari, 2020).

It is recommended that sports nutrition brand managers reconsider how the CBBE model can be applied to their brand, as this study confirms that it can drive purchase intent among millennials and increase sales. In addition, brand equity allows brands to differentiate themselves, which means consumers are less likely to switch to competitors, allowing them to charge higher prices and achieve a higher financial return.

Second research question: TPB and purchase intent

The second research question addressed in this study was to determine what is driving millennials' purchase intention for sports nutrition products and the theory of planned behaviour was applied. The results indicated that subjective norms and perceived behavioural control correlated with purchase intention. In other words, significant others and the sense of control millennials perceive when using sports nutrition products influenced their purchase decision.

Attitude

The results indicated that consumers consider improving their physical appearance to be most important for using sports nutrition products. This was followed by enhancing performance and maintaining/achieving a balanced diet for a better overall health. This findings supports that of Keogh, Li and Gao (2019), who found

that the most important reason for recreational users of whey protein products in Ireland was to improve their body and health function. Moreover, El Khoury *et al.* (2021) discovered that the main goal for supplement users in Canada was to improve their physical appearance, performance and general health. For that reason, one can assume that users of supplements across different countries use them for similar reasons. It seems that enhancing one's physical appearance is the strongest driver influencing consumers' purchase intention for sports nutrition products.

Subjective norms

The fifth hypothesis addressed was:

H₅: The attitude of significant others towards the brand influences the consumer's purchase intention.

The significant result suggested that subjective norms and purchase intent moderately correlated, which confirmed El Khoury *et al.* (2021) and Chen, Chao and Chu's (2022) findings, who argue that consumers' purchase intention is affected by the opinion of significant others. In the context of this study, the significant finding suggested that important others such as friends can influence millennials' purchase intention for sports nutrition products.

Therefore, sports nutrition brand managers should aim to influence the perceptions of a wider audience of supplement users, for example through social media. However, this study did not clarify who consumers consider to be significant others and whether influencers are part of this group. Influencer marketing is widely used in this industry and as a source that consumers trust (Euromonitor International, 2021b). Therefore, further investigation is recommended.

Perceived behavioural control

The last hypothesis addressed was:

H₆: Perceived behavioural control towards the brand influences the consumer's purchase intention.

There was a moderate relationship between perceived behavioural control and purchase intent. However, the relationship was not as strong as that between subjective norms and purchase intention. Nonetheless, the results suggested that the greater the sense of control, the greater millennials' purchase intention, confirming the findings of El Khoury *et al.* (2021) and Chen, Chao and Chu (2022).

When a consumer feels they have control over a particular behaviour, their intention may be greater. Respondents in this study had a strong sense of control when using sports nutrition products, as indicated by the composite mean (mean PBC = 4.52). In addition, their intention to purchase a brand of their choice was high (composite mean PI = 4.24). Although this study did not examine price premiums or specific brands, given the above results, it can be argued that price premiums did not influence millennials' perceptions of control and resources (i.e., money), regardless of their employment status. This result is supported by Ajzen (1991) who claims that

the fewer barriers consumers expect to face, the greater their perceived behavioural control and intention to perform a behaviour.

It is suggested that communication from sports nutrition brands gives consumers a sense of control, i.e., they feel free to use the products, which could positively influence their purchase intention.

Limitations and future research

Although the present study was the first to integrate the theory of planned behaviour and CBBE model to examine the impact on millennials' purchase decision for sports nutrition products, it had some limitations, such as being limited to Ireland and Irish millennials. Therefore, the results are limited to this study and cannot be generalised to the entire population.

Although the items of the scale for the survey were taken from other sources that had been tested for reliability and validity by previous researchers, the results indicated that some of the items were not very useful. As the items were taken from studies in other countries, it is possible that consumer attitudes have changed over time. Consequently, the items in the scale should be reconsidered and new items developed specifically for Ireland. It is also recommended that the brand awareness/associations be split for future research, as the Cronbach's alpha was below the desired value of 0.700, and that attitudes be measured on a rank scale to account for parametric testing.

The study took a general approach and did not examine the impact on specific sports nutrition brands, which should be done in the future to identify patterns in consumer responses. In this way, strong brands could be identified and used as a benchmark. In addition, researchers should find out what drives consumer loyalty to sports nutrition brands, as this was the strongest driver of brand equity, but previous research in this industry is limited.

Conclusion

This study was conducted in Ireland and aimed to investigate whether brand equity influences millennials' purchase intention for sports nutrition products in Ireland and what factors influence their purchase decision. In conclusion, brand equity influenced millennials' purchase intention for sports nutrition products and was influenced by all its three subdimensions. Moreover, millennials' purchase intention was influenced by the attitudes of significant others and their own perceived behavioural control. Therefore, sports nutrition brands in Ireland should invest in brand equity as it can have a positive influence on millennials' purchase intention and therefore drive brand success.

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Appendices

Appendix 1: Variable item table

Variable	Item code	Original item	Source	Adapted item	Hypothesis
Overall Brand Equity	OBE1	It makes sense to buy X instead of any other brand, even if they are the same.	Yoo, Donthu and Lee (2000)	It makes sense to buy the brand I use instead of any other brand, even if they are the same.	4
	OBE2	Even if another brand has the same features as X, I would prefer to buy X.		Even if another brand has the same features the brand I use, I would prefer my brand.	

	OBE3	If there is another brand as good as X, I prefer to buy X.		If there is another brand as good as the brand I use, I prefer to buy my brand.	
	OBE4	If another brand is not different from X in any way, it seems smarter to purchase X.		If another brand is not different from the brand I use in any way, it seems smarter to buy my brand.	
Brand Awareness/ Associations	BA1	I know what X looks like.	Yoo, Donthu and Lee (2000)	I know what the brand I use looks like.	1
	BA2	I can recognise X among other competing brands.		I can recognise the brand I use among other competing brands.	
	BA3	Some characteristics of X come to mind quickly.		Some characteristics of the brand I use come to mind quickly.	
	BA4	I can quickly recall the symbol or logo of X.		I can quickly recall the symbol or logo of the brand I use.	
Perceived Quality	PQ1	X is of high quality.	Yoo, Donthu and Lee (2000)	The brand I use is of high quality.	2
	PQ2	X appears to be of very poor quality. (r)		The brand I use appears to be of very poor quality. (r)	
	PQ3	The likelihood that X is reliable is very high.		The likelihood that the brand I use is reliable is very high.	
	PQ4	X must be of very good quality.		The brand I use must be of very good quality.	

Brand Loyalty	BL1	I consider myself to be loyal to X.	Yoo, Donthu and Lee (2000)	I consider myself to be loyal to the brand I use.	3
	BL2	X would be my first choice.		The brand I use would be my first choice.	
	BL3	I will not buy other brands if X is available at the store.		I will not buy other brands if the brand I use is available at the store.	
Purchase Intent	PI1	I am willing to purchase organic foods if they are available.	(Wang *et al.*, 2019)	I am willing to purchase the brand I use if it is available.	4, 5, 6, 7
	PI2	I Intend to buy organic foods if they are available.		I Intend to buy the brand I use if it is available.	
	PI3	My willingness to buy the product is very high.	Legendre and Coderre (2018)	My willingness to buy the brand I use is very high.	
Attitude	A1	I believe that using dietary supplements will improve my performance.	Khoury *et al.* (2021)	I believe that using dietary supplements from my brand will improve my performance.	5
	A2	I believe that using dietary supplements will improve my physical appearance.		I believe that using dietary supplements from my brand will improve my physical appearance.	

	A3	I believe that using dietary supplements will help me maintain/achieve a balanced diet for a better general health.		I believe that using dietary supplements from my brand will help me maintain/achieve a balanced diet for a better general health.	
	A4	I believe that dietary supplements are safe.		I believe that dietary supplements from the brand I use are safe.	
Perceived Behavioural Control	PBC1	Whether I take or do not take dietary supplements from now on is entirely up to me.	Khoury *et al.* (2021)	Whether I purchase or do not purchase dietary supplements from the brand I use from now on is entirely up to me.	7
	PBC2	It is easy for me to take dietary supplements from now on.		It is easy for me to purchase dietary supplements from this brand from now on.	
	PBC3	I have complete control over whether to take or not to take dietary supplements from now on.		I have complete control over whether to take or not to take dietary supplements from the brand I use from now on.	

	PBC4	Whether I take or do not take dietary supplements from now on is beyond my control.		Whether I purchase or do not purchase dietary supplements from the brand I use from now on is beyond my control.	
Subjective Norms	SN1	My personal trainer would support the use of caffeine-containing products to enhance sports performance.	Samoggia & Rezzaghi, 2021	My personal trainer would support the use of dietary supplements from my brand to enhance sports performance.	6
	SN2	Many people who are important to me would support the use of caffeine-containing products to enhance sports performance.		Many people who are important to me would support the use of dietary supplements from my brand to enhance sports performance.	
	SN3	My teammates would support the use of caffeine-containing products to enhance sports performance		My friends would support the use of dietary supplements from my brand to enhance sports performance.	
Demographic	D1	N/A	N/A	Please indicate your age group.	
	D2			Are you currently living in Ireland?	

	D3			Do you use sports nutrition products?	
	D4			To which gender do you most identify?	
	D5			Please indicate your employment status.	

Appendix 2: Information Sheet

Information Sheet for Participants: Online survey

Research project title: The effects of brand equity on millennials' purchase decision for sports nutrition products in Ireland

Student Researcher: Denise Louvet (10581276@mydbs.ie)

Research Supervisor: Eva Perez (eva.perez@dbs.ie)

About the Project

Dear Participant,

My name is Denise Louvet, and I am a master's student at Dublin Business School. I am carrying out my thesis project under the direct supervision of Eva Perez about brand management.

The aim of the project is to learn more about the importance of branding in the sports nutrition industry.

I would like to invite you to take part in an online survey. If you agree to take part in the online survey, you will be asked several questions about your purchase decisions of your preferred sports nutrition products. The survey should take no longer than 10 minutes.

Data Protection

The data you provide as part of this questionnaire will be fully anonymous. I will not gather any direct personally identifying information about you or anyone close to you. You will be asked to provide optional demographic information of a broad nature about yourself. Your data will be collated into a larger dataset and analysed at the group rather than the individual level. Your data will only be used for academic purposes and will not be shared with anyone for commercial purposes.

What are the risks and benefits of taking part in this study?

In addition to providing much appreciated assistance to the student researcher, the main benefit of taking part in this study will be your contribution to academic research, which aims to expand knowledge and generate new insights. There will be no risks posed to you as a participant in this study, either physical or psychological, beyond that which is normally expected of day-to-day activities.

If you are interested in taking part…

If you are interested in taking part, please review the information provided in the consent form and if you are happy to proceed with the study then please indicate your willingness to take part by ticking the appropriate box / signing your name where appropriate.

You are under no obligation to take part in this study or to provide a reason if you decide not to take part. You may choose not to take part without fear of penalty. If you agree to take part, you have the right to cease participation and withdraw your data at any time for any reason without fear of penalty. The data will not be used by any member of the project team for commercial purposes.

Appendix 3: Consent Form

<u>Consent Form</u>

I voluntarily agree to take part in this research study.

I understand that I am not obliged to take part in this study and that my participation in the study is entirely voluntary.

I understand that I am free to withdraw from the study at any time or refuse to answer any question without the need to provide reason and without fear of negative consequences.

I understand that my responses will be anonymous.

I understand that in the case of completing an anonymous questionnaire, it will not be possible to subsequently withdraw my data due to the fact that there will be no personally identifying information attached to my responses.

I understand that I will not benefit directly from participating in this research.

I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

I understand that signed consent forms will be retained for some time until the exam board confirms the results of their dissertation.

I confirm that I have had the purpose and nature of the study explained to me in writing and

I have had the opportunity to ask questions about the study with satisfactory answers provided.

I confirm that I have read and fully understood the information provided and statements above.	Yes	No
	☐	☐
I agree to take part in this survey.	Yes	No
	☐	☐

Appendix 4: Questionnaire

Section A:

(D1) Please indicate your age group. (18-24 / 25-31 / 32-41 / 42-52 / 53+)

(D2) Are you currently living in Ireland? (Yes / No)

(D3) Do you use sports nutrition products? (Yes / No)

*The survey will automatically end if:

1. An age group lower than 25 or greater than 41 was selected for D1

2. 'No' was selected for D2 and D3

Section B:

Please read the following statements carefully and think of the sports nutrition brand you last bought. Select the answer that best describes your personal opinion of the statement provided. If you select 1 it means that you strongly disagree with the given statement. If you select 5 it means that you strongly agree with the given statement. If you are unsure what to answer, please select 3 for 'neutral'.

(BA2) I can recognise the brand I use among other competing brands.

(PQ1) The brand I use is of high quality.

(OBE2) Even if another brand has the same features as the brand I use, I would prefer my brand.

(SN2) Many people who are important to me would support the use of dietary supplements from my brand to enhance sports performance.

(BL1) I consider myself to be loyal to the brand I use.

(PQ2) The brand I use appears to be of very poor quality. (r)

(PI3) My willingness to buy the brand I use is very high.

(PBC2) It is easy for me to purchase dietary supplements from the brand I use from now on.

(OBE1) It makes sense to buy the brand I use instead of any other brand, even if they are the same.

(PQ4) The brand I use must be of very good quality.

(BL3) I will not buy other brands if the brand I use is available at the store.

(BA1) I know what the brand I use looks like.

(SN3) My friends would support the use of dietary supplements from my brand to enhance sports performance.

(OBE3) If there is another brand as good as the brand I use, I prefer to buy my brand.

(SN1) My personal trainer would support the use of dietary supplements from my brand to enhance sports performance.

(PI2) I Intend to buy the brand I use if it is available.

(PQ3) The likelihood that the brand I use is reliable is very high.

(BA3) Some characteristics of the brand I use come to mind quickly.

(PBC1) Whether I purchase or do not purchase dietary supplements from the brand I use from now on is entirely up to me.

(BL2) The brand I use would be my first choice.

(BA4) I can quickly recall the symbol or logo of the brand I use.

(PI1) I am willing to purchase the brand I use if it is available.

(PBC3) I have complete control over whether to take or not to take dietary supplements from the brand I use from now on.

(A4) I believe that dietary supplements from the brand I use are safe.

(OBE4) If another brand is not different from the brand I use in any way, it seems smarter to buy my brand.

(PBC4) Whether I purchase or do not purchase dietary supplements from the brand I use from now on is beyond my control.

Please rate the following statements from 1 (most important) to 3 (least important): I believe that using dietary supplements from my brand will...

(A1) improve my performance.

(A2) improve my physical appearance.

(A3) help me maintain/achieve a balanced diet and general health.

Section C:

(D4) To which gender identity do you most identify? (Female / Male / I prefer not to say)

(D5) Please indicate your employment status. (Employed Full-time / Employed Part-time / Unemployed / Student / Retired)

The survey ends here. Thank you for your participation.

Appendix 5: Coding sheet

Question	Answer questionnaire	Code meaning
D1	18-24	1
	25-31	2
	32-41	3
	42-52	4
	53+	5
D2 D3	Yes	1
	No	2
D4	Female	1
	Male	2
	I prefer not to say	3
D5	Employed Full-time	1
	Employed Part-time	2
	Unemployed	3
	Student	4
	Retired	5
OBE1 – OBE4 BA1 – BA4	Strongly disagree	1

PQ1 – PQ4 BL1 – BL3 PI1 – PI3 A4 PBC1 – PB4 SN1 – SN4	Disagree	2
	Neutral	3
	Agree	4
	Strongly agree	5
A1-A3	Most important	1
	Important	2
	Least important	3

Where do we go from here?: Virtual Production and the potential impact on regional filmmaking

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Abstract

Virtual Production (VP) has seen enormous growth in the last few years. The technology enables filmmakers to project locations onto a giant LED wall backdrop in a studio space, providing a photorealistic setting at the click of a button. Exciting though these developments are for the industry, our governments need to explore and understand what the trend away from traditional filmmaking may mean. There could be some hidden consequences that impact upon existing policy objectives. This paper focuses specifically upon the potential challenges that regional filmmaking may face as a result of VP; including a loss of production revenue in the local economy, possible skills migration and a threat to screen tourism. The paper argues that interventionist policy making, similar to successful tax relief schemes that have invigorated the UK cultural industries in recent years, could help steer the new technology in directions that help meet wider policy agendas, rather than usurp them.

Keywords: Virtual production, screen tourism, filmmaking, Government policy, Cultural industries.

Virtual Production

Recently there has been a growth in Virtual Production (VP) within filmmaking, with series such as Mandalorian and House of the Dragon using the technology to

notable effect. VP involves filmmakers returning to the studio environment rather than location-based filmmaking. Live action footage is captured against large LED video walls (called volumes) which can screen photorealistic backgrounds at the click of a mouse. The technology utilises game engine softwares used in the computer games industry, and opens up possibilities for greater convergence between games and films.

The VP process has potential economic and environmental benefits. Productions no longer need to travel to remote locations with big crews and deal with unstable weather or unpredictable sound. House of the Dragon was based just outside of Watford, despite using many similar locations to the original Game of Thrones series, which was filmed in Northern Ireland. This convenience has led some to believe that VP will become a significant mode of production in the coming years. The pandemic has already highlighted the benefits of filming in a controlled environment and has accelerated its adoption. Even those who doubt the economic and environmental benefits (after all, it is an expensive new technology) concede that it is much more effective than green screen in particular contexts, especially when the background is reflected on costumes or props and does not require onerous amounts of post production fixes.

There is already plentiful discussion around organisational structure and skills shortages (Bennett, et al., 2021), potential new roles (Carpio and Birt, 2022) and the technological challenges of VP (Jobin, 2022) (Shan and Chung, 2022). However, there is less discussion around the wider impact of what this technology may bring to location filmmaking, especially in regions outside of traditional production centres. This paper aims to explore some of the potential impacts that VP may have on regional filmmaking, and why that may be of concern to policymakers, industry stakeholders and regional authorities. It is not intended as a predictor of the future, or as a concrete direction for future policy to take. The paper has an exploratory purpose; asking whether we have thought through the opportunities and threats that this technology may bring, and considering whether other outcomes could be possible if we wanted them to be so?

Location, Location, Location

The potential environmental benefits of virtual production should be commended. It is an innovative solution that could reduce the carbon footprint of productions, especially those that require journeys to remote and distant, difficult locations. Last summer, Broadcast magazine championed the UK's first carbon neutral virtual production film; 'the short film was shot in just one location in London, with the action virtually taking place in ten different areas - such as the Scottish Highlands and streets of Japan.' (Miller, 2021). While carbon neutrality was the focus of the article, it inadvertently raised the spectre of a different problem.

Locations doubling as other locations is standard practice within filmmaking and has been since the start of cinema. In recent years the UK has done an excellent job of attracting international productions via tax relief and excellent resources, but also a diversity of film locations and infrastructure. But does VP damage the asset? Why visit the UK for its unique locations if they can all be recreated virtually anywhere around the world? Burns describes how:

> WPP recently used drones to scan and capture (to a 15 billion point mesh) a four-mile section of forest in the Scottish Highlands. It then used the power of Microsoft Azure cloud and the Nvidia Omniverse multi-GPU real-time platform to translate this into an incredibly detailed fly through simulation of the physical landscape on a LED wall for use in automotive advertising (Burns, 2021).

The benefit for the advertiser is obvious: this photorealistic scan can then be used multiple times on various adverts, all without the need of returning to film separate cars each time. The benefit for the environment is also clear, if it prevents the carbon outputs of each separate visit. But the regional impact in less clear. What happens to the regional creatives who contributed to those separate productions in Scotland?

So far the UK has been the beneficiary of taking work that may have been produced in other countries. VP has in fact encouraged more production to the UK, and has been an opportunity to bring productions like Amazon's new Lord of the Rings series to a studio in Bray and Bovingdon, rather than New Zealand. The cost of production and the extended Covid lockdowns were supposedly a factor in this decision. Either way, the fact that the UK is currently attracting these productions is to be commended. The present concern is that the productions are migrating from regional bases to new infrastructure close to the existing concentration of London centric filmmaking. Amazon's studios in Bray, Shinfield studios in Reading, the Virtual Production stage at Leavesden, MARS Volume in Ruislip. All new infrastructure, all built around London. While this increasing volume of film production in the south may contribute to our economic growth overall, it may inevitably result in a decrease in regional location filming expenditure. This goes in the opposite direction of recent Governmental policy desires of 'levelling-up' or creating a 'northern powerhouse' in other regions.

A longer term concern is whether VP enables other countries and economies to use UK locations as backdrops without having to set foot in the country and contribute to the economy. The UK creative industries already attract most of their international productions as a result of favourable tax relief and it is unclear it would be seen as such a desirable location were the tax incentives to stop. The exclusivity of locations can no longer be leveraged as an additional counterweight, especially if they are widely available as computer assets that can be reused over and over again.

Skills flight?

Bennett et al. (2021) recognise that the VP process needs new skills, as the workflow requires the traditional filmmaking roles, plus expertise from games and VFX, to work alongside one another in production. Aside from the VP process resulting in specific skills shortages, a lot remains uncertain about these new roles will work in a wider context of the creative industries. For example, will these new roles be studio-based? If so, does it draw potential skilled creatives away from regional hubs towards the studio facility? What happens to existing regional, traditional production crew if their skillset is no longer needed and their content is now produced miles away in a studio?

Conversely, VP technology could potentially offer the opportunity to work remotely, which may provide a platform for regions to incentivise more creatives to locate there. This would require robust connectivity infrastructure. It is difficult to determine with the technology at such a nascent stage which way the organisational structure will go. Perhaps the skills shortage will lead creatives to have more negotiating power around freedom to work from home? Perhaps it was the allure of travelling to different locations that attracted creatives in the first place?

Optimistically, returning to a studio base has the potential for a portion of the crew to be continuously employed by the facility rather than as freelancers, especially those involved the calibration and workflow of the VP technology. This would certainly help with skills retention and may see a more significant return to apprenticeships, like the original studio system a century ago.

Pessimistically, it is possible to envisage even more precarity than currently exists. A previous example of such precarity within the VFX industry was Life After Pi (2014), a documentary detailing the unviable business model and unsustainable practices of VFX work, much of which remains today. Industry practitioners had to migrate from place to place, sometimes country to country, to find work. VP, with its shared heritage of traditional filmmaking and VFX, could also develop along similar, precarious lines.

Set-jetting and screen tourism

Aside from the income provided by productions in regional areas, and the retention and employment of a creative community of practitioners, film production has wider economic benefits (spillover) in sectors like tourism.

The BFI (2018, p.56) reported that in 2016, inbound tourists spent an estimated £597.7 million in film-related screen tourism in the UK. Eight percent of leisure visitors to Scotland (around 700,000 domestic and international overnight visitors) were influenced by time-travel TV drama Outlander. The show, particularly popular in

the US, has been so successful in attracting 'set-jetters' to its filming locations the Scottish tourist board calls it 'The Outlander Effect'. Visitors to Blackness Castle near Edinburgh (scene of a heroic rescue in Season One) rose almost 400% by the time Season Five hit screens. There have also been so many Bollywood productions in Scotland that a map has been made for visitors to find the different locations (Visit Scotland, no date). In Northern Ireland, Belfast City Council estimated that Game of Thrones had

> 'in 2018 alone… helped attract one in every six out-of-state visitors to Northern Ireland which amounts to approximately 350,000 people and a spend of over £50 million' (Belfast City Council, 2021).

Yet, if we break the link between real places and the stories told about them, will audiences lose the desire to 'see for themselves'? As a wider purpose of VP is to offer seamless integration with virtual reality (VR) or metaverse experiences, where users can interact with the exact location via their VR headset (Giardina, 2022), the long-term future of screen tourism becomes threatened. Perhaps this is a good thing, given that tourism is also a major polluter with a significant environmental impact?

Again, it is possible to imagine a different outcome, where VP actually encourages tourism to areas as a result of including them in productions. It will be interesting to see whether House of the Dragon results in specific tourism to Northern Ireland who were not fans of the original Game of Thrones. Even if this is the case, regions will be wary of reducing their local economies to tourism alone, especially if local creative talent has to leave to find significant work.

Conclusion

At this point, it is clear that VP has already led to disruption to both the film industries and the wider economies around it. The impact of the overall disruption is currently unclear. It is likely that the potential for VP has been overestimated, and rather than becoming a dominant mode of production, it simply adds to range of existing production methods, replacing some but not all. For example, there are obvious benefits of VP over green screen, if calibrated and organised properly (Jobin, 2022). For it is also clear from existing reports that VP is encountering challenges, from skills shortages to technological issues. Recently published news (Giardina, 2022) suggests that the Warner Bros Leavesden stage, used to produce House of the Dragon, has already dismantled the VP rig due to a shortage of traditional studio space. The same article argues that the VP capacity has outstripped demand, especially when there are not enough skilled practitioners to execute it properly. However, these setbacks are to be expected in an emergent field that is yet to establish itself. Ultimately the potential for economic savings and environmental benefits mean it will continue to develop and become more popular.

The challenge is managing the technology as it develops. Left to develop in a free market, there is potential for increased precarity, from migrating skills to lost revenue

in the regions, and potentially lost revenue in the national economy if the production goes elsewhere. The UK has a successful track record of using interventions such as tax relief incentives to develop and support the film and TV industry. Governments should now be concentrating on the wider picture, for ways the new technology can deliver outside of the capitals. If VP means films can be made anywhere, why not encourage them to be made, and companies to be based, in areas that need economic support? For example, less than 3% of the UK's film companies are currently based in Scotland (BFI, 2021), despite more than 8% of the population living there. Seeing as the technology has much in common with the games industry in terms of skills and infrastructure, why not spread it more evenly like the games industry too? (Matteos, Garcia and Bakshi, 2022) Tax relief and infrastructure investment can be more nuanced to deliver on ambitions to improve regional economies. Governments could also choose to incentivise productions with tourism-boosting potential if they consider the long-term economic benefits to be worth the environmental impact. Those loyal to the traditional style of filmmaking will continue to reduce carbon footprints, so perhaps compromise can be reached. If not, a concern is that the good policy work done in recent years to improve regional production can be reversed with this technology, and production becomes even more entrenched around London as a result of developing existing infrastructure.

There are already examples of VP being established in regional universities to address the continuing professional development (CPD) skills gap. For example, Ulster University opened a VP studio at their Belfast campus in February 2022. This is an obvious way in which to decentralise VP, but their presence alone does not ensure creatives stay in the region once their training or education is complete. Viewed cynically, these substantial investments can be seen as a continuation of the out-sourcing of research and development risk, and subsequent training expenses, by an entertainment industry that has greatly reduced its own capacity for research, development and training because of the freelance labour model. Therefore, a wider policy emphasis should be placed on developing an economic moat that capitalises on the scale of production infrastructure and workforce, but also seeks other areas of the value chain to create opportunities for intellectual property and brand value. Universities should not be content with asking 'what does this technology do?' with an eye on training, but must ask 'what can this technology do?' with an eye on exploiting new possibilities.

Indeed, rather than reacting to VP, it is time to be bold and proactive. The technology has lots of potential to help us deliver on wider agendas like sustainability, inclusion and diversity. Can a return to studio filmmaking lead to a return of continuous employment, apprenticeships, visible career progression routes and remove precarity? Would this have a positive impact on the social class and status of the industry entrants? Can the technology enable and empower filmmakers that have previously been excluded from traditional filmmaking? Can it impact on the stories that are told and the ways in which they are told? This is especially true with the

potential symbiosis that VP has with games, another valuable creative industry in the UK.

A failure to consider the wider implications of VP may lead to an example of technological somnambulism; sleepwalking into a circumstance that has far bigger ramifications than we intended or realised (Winner, 2014). While predicting the future is not an easy task to accomplish, critically engaging with the wider opportunities and threats of VP will help to prevent unnecessary and additional disruption to a valuable contributor to our industry.

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Comparative Study of Image Processing Algorithms to Detect Defects in Cast Components

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Abstract

The non-destructive evaluation (NDE) of cast components is essential in the industrial sector. These cast components are prone to abnormalities like blowholes. Including such faults in the components reduces the fatigue life, which increases the risk of catastrophic accidents. Currently, humans analyse cast components using a variety of manual techniques. In order to create a category that would do away with manual testing, we suggest an automatic method for identifying flaws in casts. The method uses Convolutional Neural Networks (CNN) and Support Vector Classifiers (SVC) to determine whether a cast component has a defect or not and looks for them. The strategy may be advantageous to human examiners because it lightens their burden and greatly minimises the possibility of using defective parts in manufactured goods, according to the hypothesis.

Keywords: Image classification, CNN, Deep learning, Machine Learning, Defect detection.

Introduction

Quality control is a crucial component of all industrial processes. Due to competition in the manufacturing industry, manufacturers must increase their product yield while adhering to tight quality control guidelines. To address the growing demand for high-quality products, intelligent visual inspection equipment is essential in manufacturing lines (Ferguson et al., 2017). A part or product is created via casting, which is the act of pouring molten metal into a mould. Inconsistencies in the product brought on by the casting process frequently detract from its quality. Early detection of defective products during the production process is possible with timely screening of these faults, which can help save time and money. It is ideal to automate quality

control wherever it is feasible to assure accurate and economical inspection, especially if fault detection must be carried out repeatedly throughout the manufacturing process. The primary drivers promoting the deployment of automated inspection systems are higher inspection rates, better quality requirements, and the need for more quantitative product evaluation unrestricted by human fatigue (Ferguson et al., 2017). Non-Destructive Examination (NDE) is a procedure used on completed components. NDE is a technique for examining modifications to a material, component, structure, or system, without causing damage to the original part, to look for defects, discontinuities, or atypical changes. Depending on the various types of faults, the right NDE techniques for castings must be used. There may be surface, subsurface, or inner problems, but it's crucial to carefully inspect all three areas for discontinuities. The proper NDE techniques for various fault types are shown in Table 1.

Table 1: Types of defects and their inspection method

Defects	Inspection Method
Surface	Visual testing with Liquid Penetration
Sub-Surface	Magnetic Particle testing
Internal	Ultrasound or Radiography

Need for visual inspection

The manufacturing industry is under pressure to create and apply automated inspection techniques for the detection of casting faults. Depending on the part's design and manufacturing technique, such faults may be imperfections like fractures or tearing, inclusions from chemical reactions or foreign objects in the molten metal, or porosity brought on by gases or shrinkage. Each of these faults carries the risk of producing a fracture site and serving as a stress raiser. Casting fracture could result from pressure on this location. Castings such as steering knuckles, control arms, transmission mounts, impellers, and cross members are essential structural components (Chen, Miao, and Ming, 2011). These castings must be trustworthy and of the highest standard. Because they are open 24 hours a day, 7 days a week, today's casting producers require optical and X-ray inspection systems that can function at production line rates. Dynamic analysis is possible with imaging technology, which lowers false rejects. The technician can operate several machines simultaneously and only needs a little training. The following items can be visually inspected:

- Metals
- Non-Ferrous Metals

- Glass
- PVC
- Ceramics
- Food and cosmetic items

Most industries use at least one sort of visual examination. Comparing visual inspection to other types of inspection, its advantages include being inexpensive, requiring little in the way of equipment, and requiring no prior knowledge from the technician.

Research problem

Any produced component that is manually examined must go through a labour-intensive, subjective, time-consuming, and potentially biased process. For assisting inspectors in checking welds and casts based on a set of criteria, an automatic inspection system is advised. In comparison to human inspectors, this technology would produce evaluation results that are more trustworthy, consistent, efficient, and objective (Dong, Taylor, and Cootes, 2021).

Methodology

Crisp DM

Under the umbrella of data science, the topic of maximising the value of data has become substantially more volumetric and sophisticated. However, it has also significantly increased in exploratory-ness. In contrast to the usual data mining process, which starts with specified business goals that translate into a clear data mining task, which finally turns data to knowledge, data-driven and knowledge-driven stages interact. In other words, the methods for maximising the value of data have evolved with data itself. CRISP-DM is the name of a data mining process model that seems to be independent of industry. The iterative process from business knowledge to implementation consists of six stages.

- Business Understanding

The business comprehension phase's main goal is to comprehend a project's objectives and specifications. The remaining three tasks in this phase, except for job number three, are essential project management procedures that are applicable to the majority of projects.

- Understanding the Data

The next stage is data understanding. It focuses attention on locating, obtaining, and evaluating data sets that might help you meet project objectives in addition to building the foundation of business understanding.

- Preparing the Data

Data preparation is one of the most important and time-consuming data mining processes. According to estimates, data preparation takes up a significant portion of a project's time and work. This cost can be decreased by devoting adequate time and effort to the first stages of business and data understanding, but the data preparation process would still require a lot of work.

- Modelling the Data

Modelling is typically done across several iterations. Before fine-tuning a model or going back to the data preparation step for any necessary adjustments by their preferred model, data miners often run several models with the default settings. Rarely can an enterprise successfully address a data mining challenge with a single model and a single execution. Data mining is so fascinating because it allows you to examine a problem from a variety of perspectives.

- Evaluation

Make sure the models developed during the modelling phase satisfy the technical and practical specifications of the previously defined data mining success criteria. But one should evaluate the results of the work using the project's original set of commercial success criteria. This is crucial to ensuring that the business can use the results produced.

- Deployment

Deployment is the process of using new insights to enhance the business. Utilising data mining findings to implement change within your organisation is another definition of deployment. These results will undoubtedly be useful for planning and making marketing-related decisions, even though they might not be officially included 12 into your information systems.

Understanding the Dataset

During the casting process, a liquid material is poured into a mould with a hollow chamber in the desired shape, and the material is then allowed to solidify. The purpose of this data collection is to identify casting problems. Casting faults are unwanted flaws that occur during the metal casting process. There are many different types of casting flaws, including metallurgical flaws, blow holes, pinholes, burrs, shrinkage flaws, flaws in the material used to make the mould, and errors in the metal-pouring procedure. Defects are not desirable in the casting industry. Every industry has a quality control division whose job it is to weed out these inferior goods. The main problem, however, is that this examination process is manual. This process takes a long time and is not totally precise due to human error. The entire order could be rejected if there was a mistake. The corporation suffers a large loss as a result.

The dataset includes items made by the casting industry. The impeller for the submersible pump can be seen in every image in the dataset. There are 7348 total

photos in the collection. Each of these photographs has a resolution of (300*300) pixels and is in grayscale. All of the images have previously undergone enhancement. Additionally, there were 512x512 grayscale images. This data collection does not involve any augmentation. Included in this are 781 photographs that have been classified as defective and 519 that have been classified as non-defective. Figure 1 illustrates the two types of categories—defective and excellent products. Two files were created from the data that was used to train and test the classification model. Both the train and test folders contain the subfolders def front and ok front.

1. Train: def front contains 3758 and ok front contains 2875 images

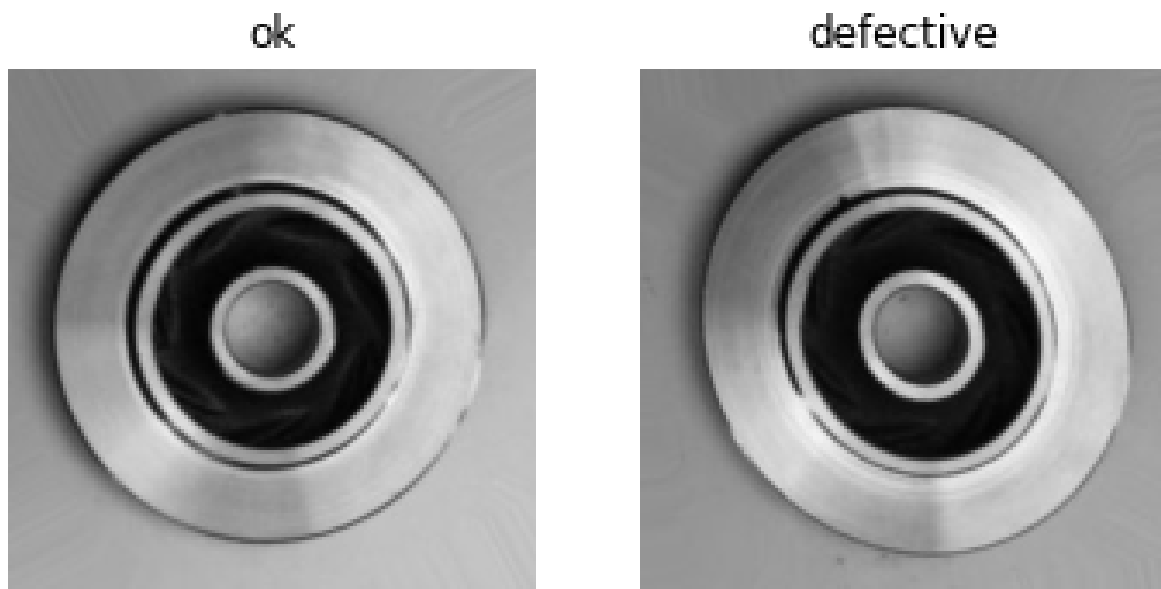2. Test: def front contains 453 and ok front contains 262 images

Figure 1: Sample images from the dataset. Image on the left shows a non-defective product. The image on the right shows a defective product.

Splitting the data

How to split the data for training and testing is a basic issue that machine learning and deep learning (ML/DL) practitioners face. Even if it appears straightforward at first, its complexity cannot be determined unless it is carefully examined. Inaccurate training and testing sets may have unforeseen consequences on the model's output. It could result in the data being either over- or under-fitted, which would lead to erroneous conclusions from the model. The data should be divided into three sets: a train set, a test set, and a holdout cross-validation or development (dev) set. These sets should have the following information and serve the following purposes:

1. Train Set: The data that would be input into the model would be included in the train set. Simply said, this information would inform our model. A regression model, for example, might discover gradients to lower the cost function by making use of the examples in this data. These gradients will then be applied to save costs and improve data prediction. Figure 2 shows the division between "ok" and "not ok" photos.

2. Validation Set: The trained model is validated using the development set. Since it serves as the foundation for our model evaluation, this setting is the most crucial. If there is a significant discrepancy between the error on the training set and the error on the development set, the model is overfitting and has a high variance.

3. Test Set: The data that were used to assess the trained and approved model are in the test set. It demonstrates the effectiveness of our entire model and the likelihood that it will forecast an irrational event. Several assessment criteria (such as precision, recall, accuracy, etc.) may be utilised to gauge the effectiveness of our strategy.
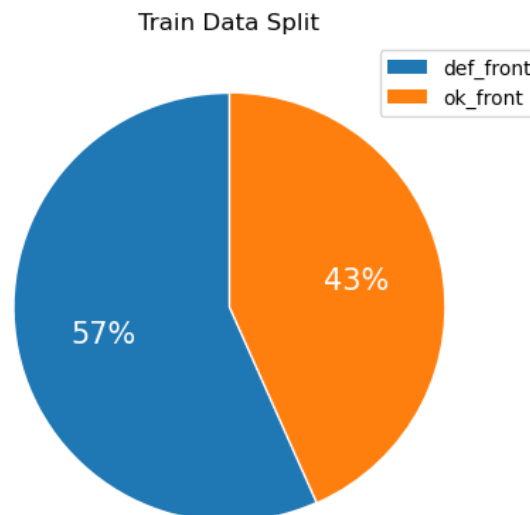

Figure 2: Split percentage of the dataset.

Image Augmentation

Image augmentation is a technique that modifies the original image in numerous ways to produce multiple altered versions of the same image. Depending on the augmentation techniques utilised, such as shifting, rotating, flipping, etc., each duplicate image differs from the others in a few significant ways. The target class is unaffected by these edits to the original image; they only provide a different perspective for capturing the object in real life. These methods of picture augmentation not only expand the size of one's dataset but also provide some variation, which enhances the model's ability to generalise to unseen data.

Additionally, the model becomes more trustworthy when it is trained on recent, minimally altered photographs. However, it leaves it out of the original corpus of images; It merely transmits the modified images. The model would then repeatedly see the actual images, overfitting our model. Another advantage is that ImageDataGenerator requires less RAM. This is because when we don't use this class, all the photographs load at once. However, we load the images in chunks while using it, which consumes significantly less RAM. In general, convolutional neural networks (CNN) is the most popular algorithm for any image processing algorithms since it serves as the foundation for more complex algorithms. This method is exclusively utilised for CNN because it works well for deep learning algorithms. The split count across the Training, Validation, and Testing sets is displayed in Figure 3.

Several crucial variables for this strategy include the ones listed below:

- Directory: This is the location of the aren't folder, which includes a subdirectory containing all the pictures for the various classes.
- Target_size: The input image's size.
- Color_mode: If the photographs are black and white, set colour mode to grayscale; otherwise, set it to RGB for colourful images.
- Batch_size: The size of the data batches.
- Class_mode: Set to categorical for 2-D one-hot encoded labels and binary for 1-D binary labels.
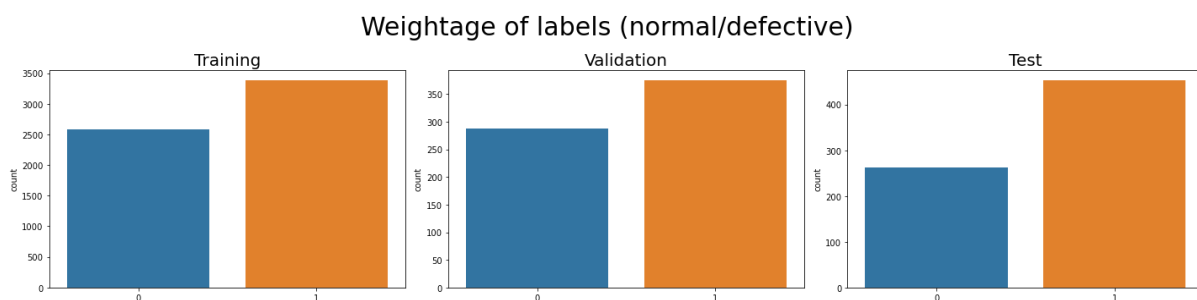- Seed: set to replicate the outcome is a seed.

Figure 3: Split percentage of the dataset.

Model Building

Convolutional Neural Networks (CNN) and Support Vector Classifiers (SVC) were chosen for this problem statement because they serve as the foundation for sophisticated image processing techniques. CNN carries out feature extraction automatically, and SVM functions as a binary classifier.
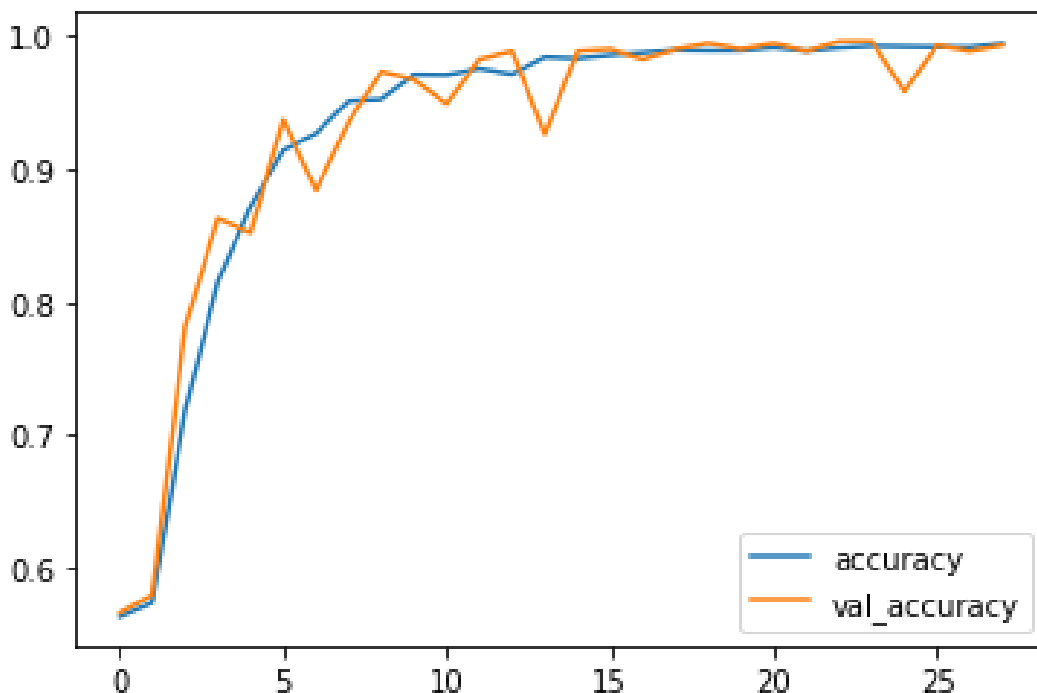
Results

Analysing results of the CNN model

One of the main strategies used to fight this overfitting pestilence known as regularisation is early stopping. The model tries to follow the loss function on the training data by changing the parameters. As the validation set, a distinct set of data is maintained. The validation set's loss function is recorded as training proceeds. Instead of running through all the epochs, the model quits when the validation set has not improved (also known as early stopping). The graphs in Figure 4 demonstrate that the model is not overfitting the data, and this is supported by the fact that both the train loss and the validation loss simultaneously went to zero. Additionally, accuracy on both the train and val sides moves closer to 100%. The model was designed to run for 100 epochs; however it was stopped after 28 because the validation did not improve.

The callback function was implemented as it allowed for the following:

- Save the model at regular intervals
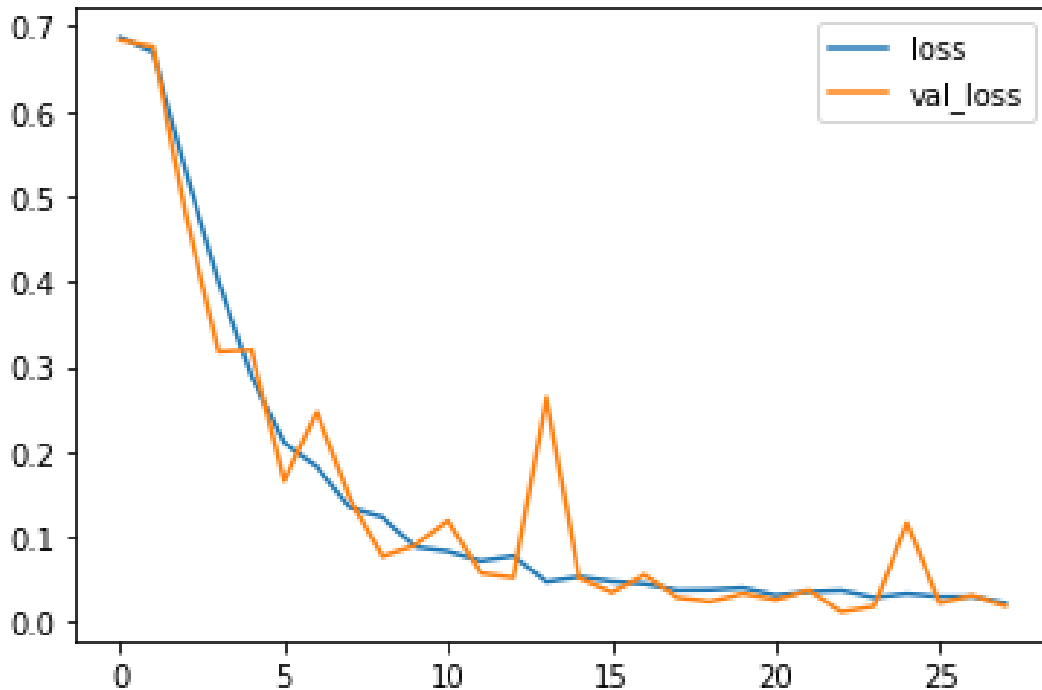- Callback can be used on fit, predict and evaluation of the model

Figure 4: CNN Model performance

Analysing results of SVC model

In a graph, a classification model's receiver operating characteristic (ROC) illustrates how well it performs at each level of categorization. The number of False Positives and True Positives increases when the categorization criterion is lowered because more objects are categorised as positive. AUC measures the entire two-dimensional region that is covered by the entire ROC curve. AUC offers a comprehensive evaluation of performance across all available categorization criteria. The probability that the model values a randomly selected positive example higher than a randomly selected negative example is known as the AUC. The huge AUC in Figure 5 of the SVC ROC curve shows the model's strong performance.
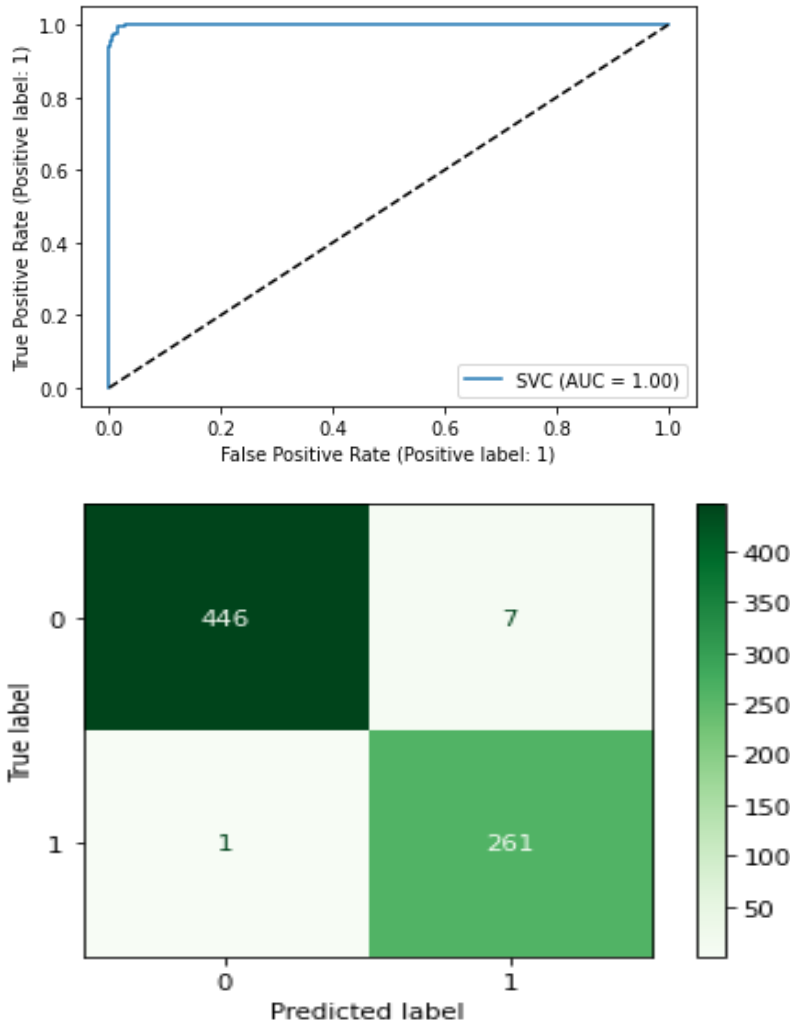
Figure 5: SVC Model performance

Model Comparison

The classification performance of the SVM and CNN models was compared. Figure 6's findings show that the CNN has the highest level of classification accuracy for the dataset. The SVM model ignores the dataset's rich spatial information and only uses the spectral signature of each image pixel. Using additional spatial information acquired from surrounding pixels, the methodologies for classifying defects' classification accuracy are improved. Since spatial information can improve classification accuracy, a CNN uses rich spatial characteristics at multiple scales to reflect the spatial structure of the data and classify each pixel in the image. A high precision rate indicates that the classifiers are performing as they ought to. A significant portion of all pertinent incidents have been recovered, as indicated by a high fractional value of recall. It's interesting to note that CNN's accuracy is higher at 99.86% compared to SVC's lesser accuracy of 98.88%. It is necessary to consider

the precision, recall, and accuracy values when determining the discriminative capability of risk models. In this situation, a CNN is preferable to an SVC.

	precision		recall		f1-score		support	
	CNN	SVC	CNN	SVC	CNN	SVC	CNN	SVC
Metrics								
0	0.996198	0.997763	1.000000	0.984547	0.998095	0.991111	262.000000	453.000000
1	1.000000	0.973881	0.997792	0.996183	0.998895	0.984906	453.000000	262.000000
accuracy	0.998601	0.988811	0.998601	0.988811	0.998601	0.988811	0.998601	0.988811
macro avg	0.998099	0.985822	0.998896	0.990365	0.998495	0.988008	715.000000	715.000000
weighted avg	0.998607	0.989012	0.998601	0.988811	0.998602	0.988837	715.000000	715.000000

Figure 6: Model comparison

Deployment

Deployment, the action of incorporating a machine learning model into an already-existing production environment, enables you to use data to help you make informed business decisions. This is the final stage of the machine learning life cycle.
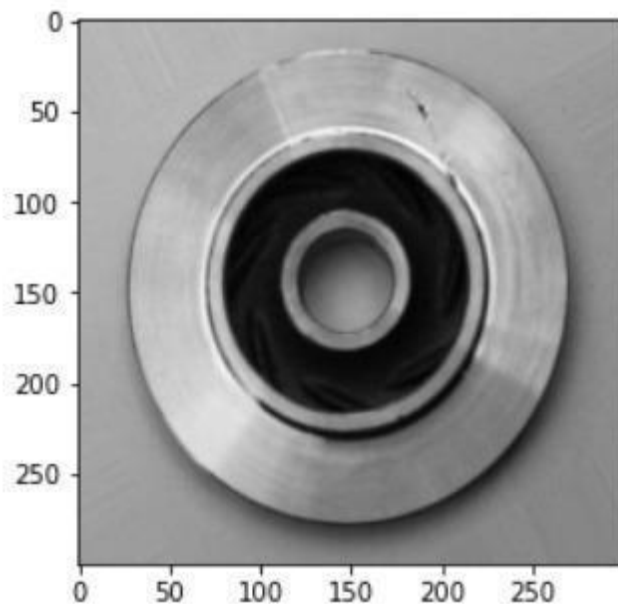
```
1/1 [==============================] - 0s 94ms/step
[[0.]]
Component is not defective!
```
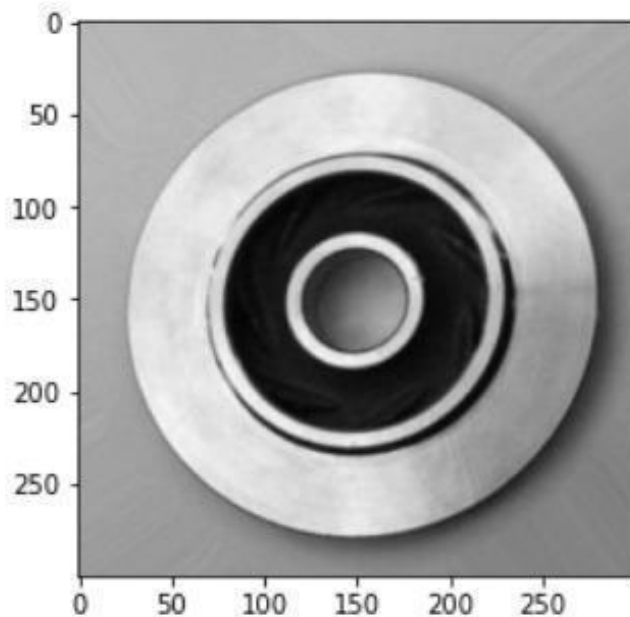

Figure 7: Custom predictions

The "cnn model.hdf5" file is used to store the best-performing model. You can call this whenever you want and use it to make predictions. The model has been saved now. The saved model can be called to generate personalised forecasts. A for loop and a specific file path for the user to upload are included in the code. The model will be able to provide a binary output (Defect or not) once the path has been provided. This is demonstrated in Figure 7.

# Conclusion and Future work

Conclusion

CNN are a serious contender for image recognition. CNN can evaluate sequence data, but they are best at sorting through large amounts of image data to find non-linear associations. For these classifications, SVC is a margin classifier that supports a number of kernels. When class labels are quite lengthy, SVC has problems predicting the classes. Although parallelization is a challenge for SVC as well, it is a feature of the CNN design. Accuracy ratings do not reflect reality when compared to visual perception of the overall classification of each image. However, data must be ready for kernel window processing because to the way CNN functions. Based on past research, the Kernel window for this inquiry was 7*7 pixels.

It was important to use layers of the CNN in order to reduce the dimensions of the data that are decreasing noisy bands. The approach required to be improved in order to increase the dataset training samples. SVC classifiers have fared better in terms of accuracy in image classification despite the accuracy of 99.86% claimed by CNN. Figure 8 below shows predictions from both models CNN and SVC. Even when only a few photographs were used for training, our method still produced good results.

This implies that the suggested technique is appropriate for identifying anomalies in both other photos.

Key takeaways:

- Early stopping technique is utilised to avoid unnecessary under-fitting and over-fitting due to usage of too few or too many epochs in our model.
- Data Augmentation the Keras ImageDataGenerator class' primary advantage is that it is intended to give real-time data augmentation. Meaning that while your model is still being trained, it is instantly producing enhanced pictures.
- We built and trained our model without any pre-trained weights. We used the callback function built in keras to save our model.
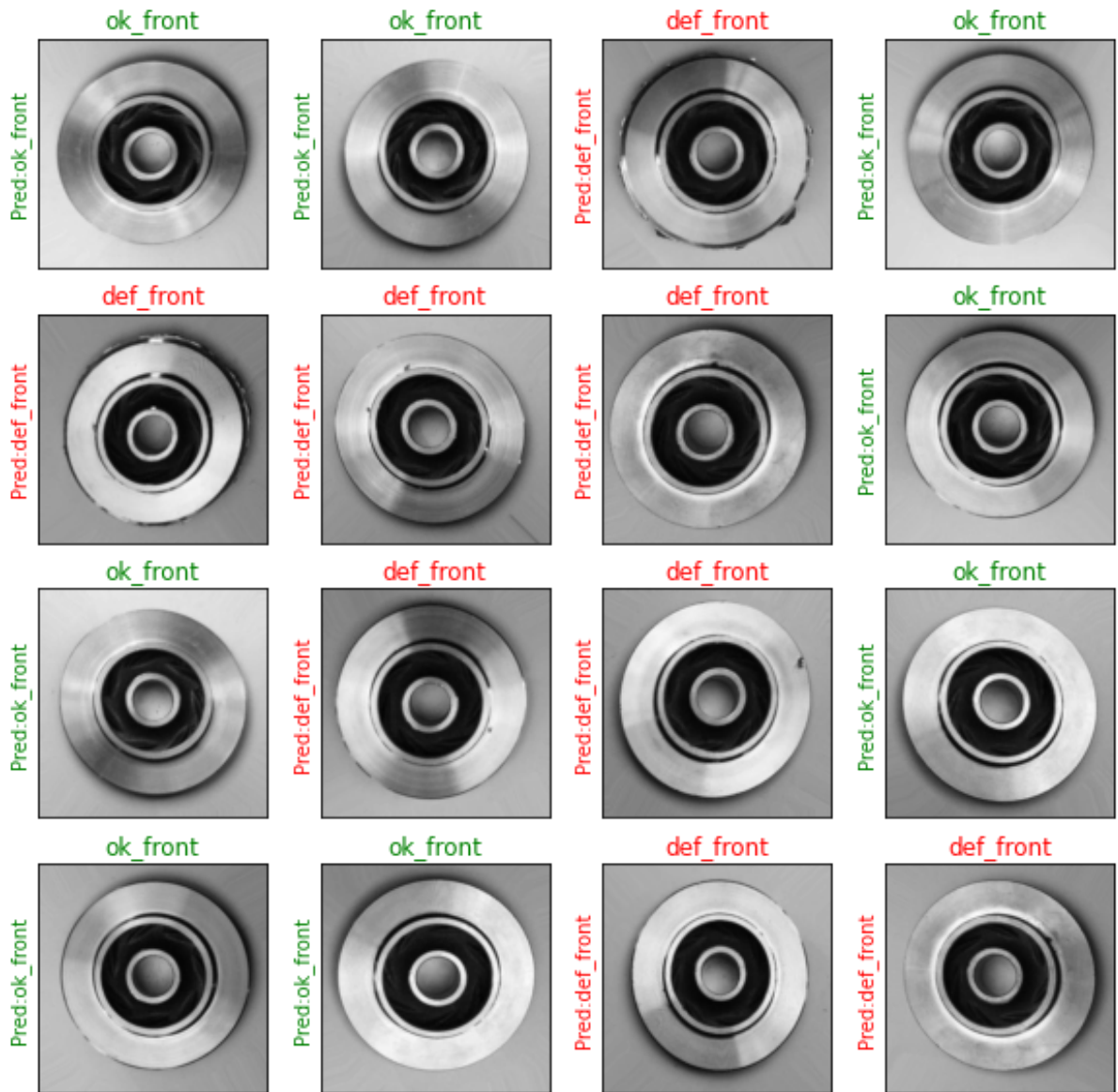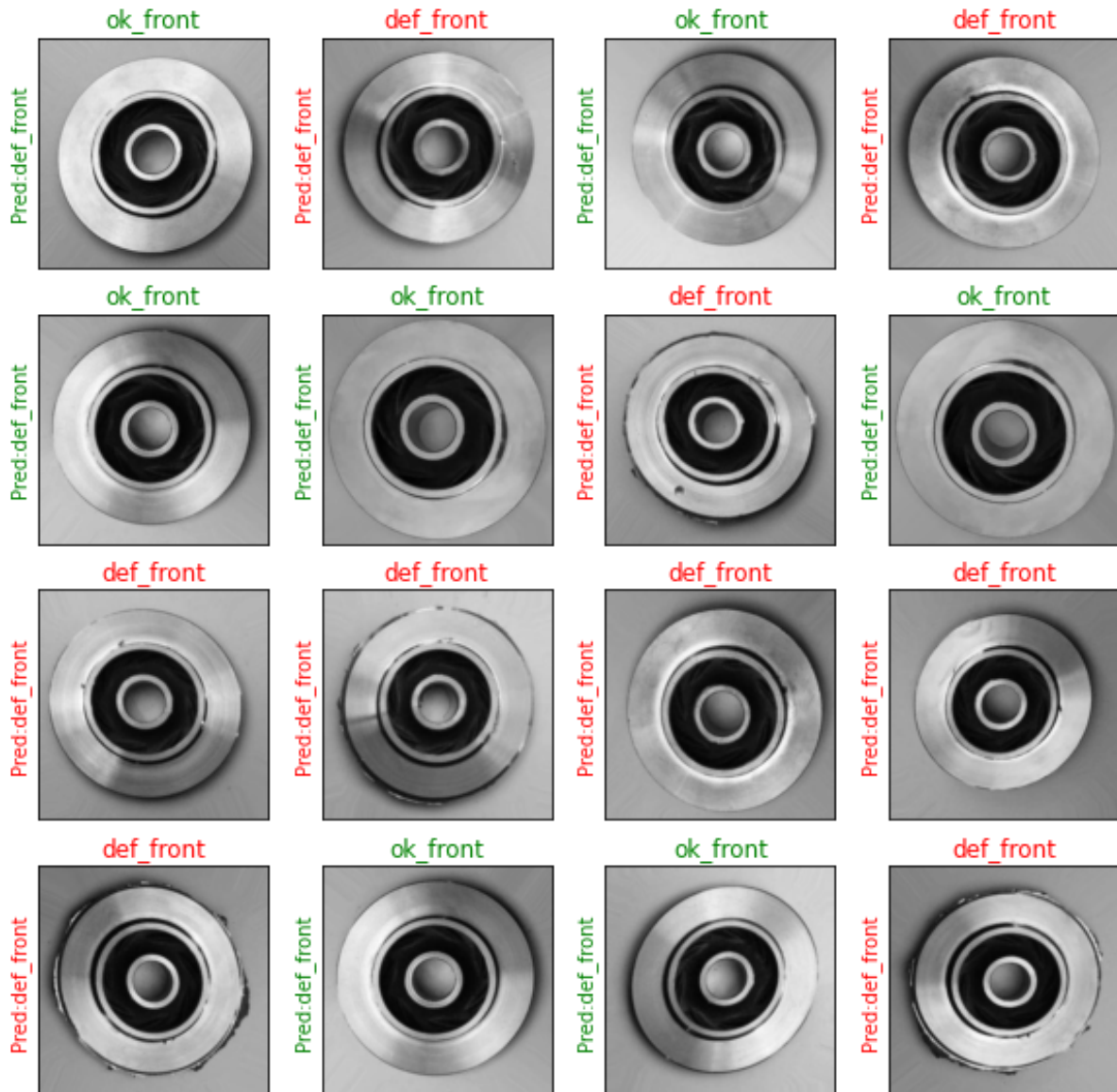
Figure 8: Predictions SVC (left) and CNN (right)

Future work

Only the defect classification utilising two methods is covered in this study. In the future, the use of Region Based CNNs (R-CNNs), which would use an image localization technique to find flaws in the cast components could lead to new insights. In essence, this method would outline a bounding box around the area of interest. A box would be drawn around the defective area in our scenario. Weld/cast pictures databases, on the other hand, are few. As demonstrated in our study, we may train our model on more recent photos to enhance its functionality. This has the potential to be employed in industries like aerospace and automotive where a high level of safety is required. The stored model can easily be set up on Streamlit or

Heroku. This would essentially allow the user to upload their own images and the model should be able to predict the class.

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An investigation into the relationship between diversity and compliance in Irish organisations

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Abstract

The aim of this research was to investigate the perceptions of senior compliance professionals in Irish organisations regarding potential connections between the area of diversity and compliance. The research followed a qualitative design to address the research questions and to gather and summarise the data. Semi-structured interviews were used to gather primary data from senior compliance professionals based in five organisations spanning the public sector and the financial services sector. The Central Bank of Ireland ('Central Bank') report Behaviour and Culture of the Irish Retail Banks (2018a) was reviewed alongside Irish and UK Corporate Governance Codes and Corporate Governance Reviews in the UK. The Central Bank in their reviews of retail banking following the financial crises of 2007 - 2008, have suggested that increasing diversity on boards is related to an improvement in culture and behaviours. The variables in the research are diversity in the form of gender and compliance in public sector organisations as opposed to private financial services companies. The following themes emerged from the results found. Diversity is not a topic in Compliance Programmes and companies are largely not making the link with improvements in diversity having a positive effect on compliance. However, in assessing future risks, financial services companies are aware of the changing regulatory environment and are taking account of diversity in the Compliance Programmes. Analysis of the interviews suggested that a collaborative type of leadership model is viewed as conducive to an inclusive culture where diversity can be embedded. The future focus now needs to move

from not alone having diversity in the workplace but to the proactive inclusion of those diverse people in the organisation.

Keywords: Diversity, compliance, financial services, banking, corporate governance.

Introduction

There is extensive Irish legislation outlining requirements for companies to prevent discrimination and to cultivate a work environment that accommodates diversity. In addition, there are Codes of Conduct applicable to Irish state bodies which highlight the importance of diversity for the governance of these bodies.

A moral argument for increasing diversity in society has been made elsewhere, but are there connections between diversity and any other positive outcomes? This research investigates whether there is a relationship between diversity within organisations and the level of compliance demonstrated by these organisations.

The Basel Committee taskforce for Banking Supervision was formed in the early 1970s. It consists of Banking Commission representatives and some leading European banks. Their responsibilities include articulating the concept of compliance for the banking and financial services sector. The Basel Committee defines compliance as referring to laws, rules and standards which generally covers matters such as standards of market conduct, conflicts of interest, the fair treatment of customers and the suitability of advice provided to customers (Basel Committee on Banking Supervision, 2005). The Basel Committee produced best practice guidelines in an effort to rebuild trust in the financial services industry following the Financial Crisis of 2007 – 2008.

In the Irish financial services industry, the Central Bank carried out Behaviour and Culture Reviews (2018a) in the five retail banks operating in Ireland at that time. The Central Bank concurrently conducted Diversity and Inclusion Assessments in the retail banks. These assessments acknowledged the key role which diversity and inclusion has to play in fostering effective culture. Some of the benefits of a diverse and inclusive culture that the Central Bank identified were the avoidance of group-think, protection against overconfidence in decision making and the encouragement of more internal challenge (Central Bank, 2018a). It was found that the Irish retail banks could take additional actions to improve diversity and cultivate an inclusive working environment.

Organisations both in the financial services sector and in the public sector, constantly face pressure to improve their levels of compliance. This research investigates whether actions taken to increase diversity and create an inclusive work environment are an avenue which can help achieve this objective. Secondary data provided by the Report on the Behaviour and Culture of the Irish Retail Banks (Central Bank, 2018a) provided triangulation for the research..

Literature Review

The main sources of information were a review of Irish legislation that related to diversity in the workplace, the Central Bank report Behaviour and Culture of the Irish Retail Banks (2018a), Irish and UK Corporate Governance Codes and UK Corporate Governance Reviews.

The basis for equality in the workplace in Ireland is contained in the Employment Equality Acts (1998 – 2015) which set standards in terms of discrimination covering the following nine grounds; gender, marital or family status, sexual orientation, religious belief, age, disability, race or membership of the Traveller community. The legislation outlines steps which may be taken by employers to promote equality particularly in relation to gender, people over 50, disabled and the Traveller community. The Equal Status Acts (2000-2015) prohibit discrimination in the provision of goods and services, accommodation and education on the basis of the nine grounds.

In 2015 the European Parliament reviewed policy on gender equality in Ireland, exploring changes in legislation, policies and practices with emphasis on the period from 2012 – 2015. The report concluded that Ireland had a strong statutory legislative framework for gender equality in employment and service access. However, it stated that the policy framework for gender equality was weak with gender receiving little or no attention in the policy-making process within employment or social policy over the period of the economic crisis of 2008 (European Parliament Directorate-General for Internal Policies, 2015). It found that women are hugely underrepresented in the Irish political and decision-making systems. An effect of this underrepresentation is a lack of priority given to key issues affecting women.

The Irish Code of Practice ('the Code') for the Governance of State Bodies (Department of Public Expenditure and Reform, 2016) contains proactive wording on gender diversity in relation to Board composition. The Code stipulates that annual Board self-assessment in State bodies should evaluate the boards composition in consideration of the balance of skills, experience, independence, knowledge and diversity, specifically gender. The Code also states that appointments should be made objectively keeping in mind the benefits of gender diversity. The Inter-departmental Review of Gender in State Boards (Department of Justice and Equality, 2019) recommended that each State Board adopt a diversity and inclusion policy by 2020. It stated that Boards should explain how they are using the policy to comply with gender balance. The Department of Public Expenditure and Reform (2021) reported that over 50% of all state boards had met the goal of having at least 40% female members.

In the UK, an evaluation of women's involvement in Boards took place in the Davies Review (Department of Business, Innovation and Skills, 2011). The Hampton-Alexander Reviews, carried out by an independent review body, built on this work. This organisation conducts annual reviews of gender balance in FTSE

company leadership. The recommendations in the 2018 Review included a target of 33% representation of women on FTSE 350 Boards, Executive Committees and in their direct reports by the end of 2020 (Hampton-Alexander, 2018).

In Ireland, the Balance for Better Business Report (Department of Justice and Equality, 2019), set out gender targets for certain companies. There is a target set of 33% female representation on boards of ISEQ 20 companies by 2023 and 25% for other listed companies. There was also a target of no all-male Boards by the end of 2019. In the third report from Balance for Better Business (Department of Justice and Equality, 2020), it has been noted that the target has not been met.

Relationship Between Diversity and Compliance

In defining Compliance, we need to look at corporate governance, which is defined as the internal means by which corporations are operated and controlled (OECD, 2004). Corporate governance as referred to as including Compliance with legal and regulatory requirements, the scope of the risks is shown below in Table 1.

Table 1: Scope of Legal and Regulatory Risk

Compliance	Compliance
Solvency	Risk/Capital management/Actuarial
Tax law/regulation	Finance
Prudential supervision	Finance
Stock exchange requirements	Legal
Adequate financial disclosures	Finance
Accounting standards requirements	Finance
Health and safety regulations	Human resources
Corporate governance legislation	Legal

The definition of diversity used by the Central Bank for the purpose of assessing the banks, is drawn from the Capital Requirements Directive, which states:

To facilitate independent opinions and critical challenge, management bodies of institutions should therefore be sufficiently diverse as regards age, gender, geographical provenance and educational and professional background to present a variety of views and experiences (Directive, 2013/36/EU).

The Canadian Report on Women on Boards argued that there was an additional symbolic reason to have women on boards. Gender balance on boards sent strong signals to stakeholders, with most having a diverse membership, that their voices would be heard at the top level of senior management in organisations (The Conference Board of Canada, 2002).

The Central Bank undertook a review of Behaviour and Culture in the Irish Retail Banks in response to a ministerial request to conduct an assessment following the 2008 financial crisis and the on-going tracker mortgage scandal. The Central Bank clearly acknowledged the importance of diversity in fostering effective culture. They found that diversity reduces the likelihood of group-think and fed into improving the level of internal challenge within organisations. The Central Bank stated that the absence of diversity could result in over-reliance on core assumptions and a downplaying of risks. The discussion of culture is pervasive in Compliance and there has been recognition of the close connection between culture and Compliance (Central Bank, 2018a). A relationship between culture and Compliance has been a recurring theme from articles published and continuous professional development provided by the Compliance Institute, the professional body for compliance professionals in Ireland.

Diversity initiatives may be employed as a method of shaping an organisation's culture in terms of values, norms and practices. There is evidence that gender diversity can influence corporate governance type behaviours. A Canadian study (Brown et al., 2002) found that Boards with three or more women, showed more positive corporate governance behaviours. Such behaviours included following conflict of interest guidelines, adhering to conduct codes, ensuring better communication and focus on non-financial measures such as employee and customer satisfaction. Another report found that diversity in the workplace results in better financial performance, innovation and team performance, (Catalyst, 2013). Low levels of diversity increase the risk of over-confidence in decision-making, lack of internal challenge and reluctance to change and excessive resistance to external challenge. The Central Bank cites these factors as contributing to the financial crisis, (Central Bank, 2018a).

Influence of Diversity on Risk Culture

Previous studies have identified a relationship between increasing diversity and risk culture. The Behaviour and Culture of the Irish Retail Banks report (Central Bank, 2018a) which assessed culture and behaviour also looked at associated risks and identified actions to ensure banks prioritise customers in future.

Reviews carried out by the Central Bank on Behaviour and Culture in the Irish Retail Banks provide evidence that assessments of diversity are moving onto bank Compliance Programmes (Central Bank, 2018a). The Central Bank have been influenced by initiatives undertaken by De Nederlandsche Bank (DNB), the Dutch Central Bank. The two bodies have collaborated on the development of Behaviour and Culture Reviews in the Irish Retail Banks. In tandem with these reviews, the Central Bank carried out Diversity and Inclusion Assessments of the retail banks (Central Bank, 2018b). DNB used a model for examining behaviour and culture in financial services organisations. The methodology used by the DNB is based on the Iceberg Model, see Figure 2 below:
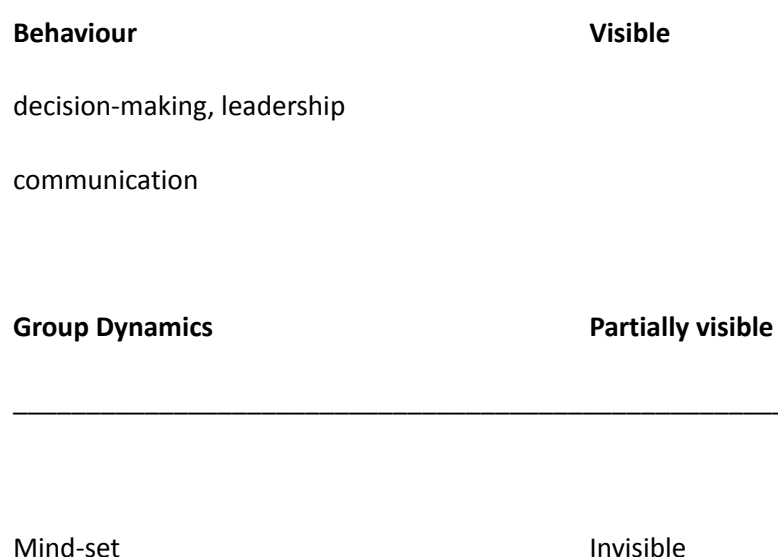
Behaviour   **Visible**

decision-making, leadership

communication

Group Dynamics   **Partially visible**

_____

Mind-set   Invisible

Figure 2: Iceberg model.

The Iceberg Model examines organisational behaviour and culture in three layers. At one level, visible behaviour in terms of decision-making is analysed. At the next level, partially visible elements such as leadership, communication and group dynamics are analysed. Finally, the model examines the underlying mind-set - factors that are invisible but play a role in shaping organisational behaviour and culture.

DNB emphasises that Compliance should be interpreted to signify conformity with rules but also with the spirit of the rules. Their approach expands what is analysed to include an understanding of risk culture. A risk culture that supports behaviours within a strong risk governance framework is recommended (De Nederlandsche

Bank, 2015). Diversity gives rise to positive components of an organisation's risk culture such as a culture of critical challenge and debate. This type of culture can result in better decision-making as teams are forced to accommodate and synthesise multiple perspectives.

The Central Bank, in the Demographic Analysis Report (2018b), took a serious view of diversity in senior ranks, stating that a lack of diversity at both senior management and Board level is a leading indicator of heightened behaviour and culture risks, (Central Bank, 2018b, p.3). Their gender analysis of applications to pre-approval controlled functions ('PCFs') found that 10% of applications were from females in 2012 but this rose to 29% in 2017. This was following a new Corporate Governance Code that made it a requirement to consider diversity.

The UK literature finds some evidence that diversity improves risk culture and reduces the risk of silo behaviours (Hampton-Alexander Review, 2017). To ensure that diversity is manifested in the risk culture, it must be entrenched at Board and senior management levels and in Risk Committees.

The Lehman Sisters hypothesis (Van Staveren, 2014) assessed gender differences along three dimensions of financial behaviour: risk aversion and response to uncertainty, ethics and moral attitudes and leadership. Women were found to be more risk and loss averse and less overconfident. The author of the article, Van Staveren, concluded that substantially more gender diversity in the top levels in finance would have helped to reduce some behavioural drivers behind the financial crisis.

In an address to the Women in Leadership Conference in 2019, The Central Bank Director General Derville Rowland said that when the financial crisis erupted with the fall of Lehman Brothers more than a decade ago, the crash was blamed in part, on a lack of diversity in financial services (Central Bank, 2019b). In the address, the Managing Director of the International Monetary Fund ('IMF') Christine Lagarde was quoted as having said that if it was Lehman Sisters rather than Lehman Brothers, the world might be different today.

How to Ensure that Diversity Becomes Embedded?

In order for these benefits to arise, diversity concerns need to become rooted in the way that business is conducted and mechanisms already in place should be used for monitoring and reporting. The Central Bank (2018a) found that actions taken in the banks to improve diversity are not typically subject to measurement and evaluation. This needs to happen to embed change. The Central Bank (2018a) confirms that some of the banks committed to making changes are focusing their actions on the ranks below the Board as well as Board level. The Central Bank is using the existing system of Risk Mitigation Programmes to ensure the banks develop action plans to mitigate risks. But who ultimately has responsibility for compliance in organisations?

The Deloitte and Association of Compliance Officers ('ACOI') now Compliance Institute Compliance Survey (2014) articulate that Boards must ensure that

responsibility to act compliantly rests primarily with management. However, compliance functions struggle with embedding a compliance culture (Deloitte and ACOI Compliance Survey, 2014).

For real change to happen, it needs to start at the top of the organisation. The Grant Thornton UK Corporate Governance Review places the responsibility for articulating and embedding culture with the Board. The review highlights the key stages where a company may embed values in the recruitment process, rewards structure, performance appraisals, training, internal and external communications (Grant Thornton, 2018). An effective diversity programme should be linked to the organisation's strategy. Individual diversity initiatives should support each other and not work against each other, (Ibec, 2005).

The need to further embed diversity was highlighted in the Irish Banking Culture Board ('IBCB') Employee Survey. The survey findings suggested that the banks had strengths in the areas of honesty, respect and competence. However, areas for potential improvement were identified. These included the organisations' resilience, responsiveness, accountability and openness. The survey highlighted the need to create an open environment where concerns can be raised and taken seriously and where diversity, including gender equality is actively promoted (IBCB, 2018).

The UK Financial Reporting Council (2018) emphasises the importance of a healthy corporate culture and high quality Board composition including a focus on diversity. The responsibility of the Nomination Committee for succession planning is outlined to develop a more diverse pipeline. The EU Commission stated that "sustainable diversity policies are an outcome of a successful change in corporate culture", (European Commission Directorate-General for Employment, Industrial Relations and Social Affairs, 2003, p.11).

A number of studies suggest that a change in culture results in a change in the predominant leadership style in diverse organisations. Leadership styles are evidenced in the behaviours and methods used by figures with management responsibilities in an organisation. A collaborative style of leadership encourages staff to express views and stimulates an inclusive working environment.

In its review of the Culture and Behaviour of the Irish Retail Banks, the Central Bank raised concerns in relation to leadership styles found in the banks. Some of the organisations examined displayed evidence of 'directive' or 'command and control' leadership. These leadership styles were criticised as hindering the development of an inclusive culture where employees felt comfortable sharing their concerns. For the banks to make extensive changes and move to balanced decision-making, there must be an emphasis on collaborative leadership to incorporate many perspectives, (Central Bank, 2018a). The report by the Central Bank posits that increasing empowerment and decision-making ability of senior staff would decrease executives' decision burden and allow space to make changes. Table 2 outlines the blockages experienced in moving to inclusive leadership.

 Table 2: Central Bank of Ireland (2018a, p.3) Behaviour and Culture of the Irish Retail Banks

Factors Blocking a Change to Inclusive Leadership
Executive committees have overloaded agendas as a result of legacy issues, mandatory items, regulatory items, and other environmental pressures
Many executive teams are in the 'forming' stage and members operate independently
Newly formed diverse teams can present challenges as the group needs to learn to listen and collaborate and understand perspectives before becoming effective

The blockages to inclusive leadership outlined above, would not provide an efficient long-term management structure in any organisational setting and would need to be addressed. These factors may be alleviated through fostering effective communication and empowering managers at all levels. The Central Bank has stated that there needs to be a credible threat of enforcement (Central Bank, 2018a). the Central Bank has been increasing the scale of conduct supervision with the introduction of dedicated teams and has stated that they will take robust enforcement action to promote principled and ethical behaviour by and within regulated financial services, (Central Bank, 2018a). To meaningfully address the acute lack of diversity at senior levels the following actions are required:

- Setting more ambitious goals and including targets and measures;
- Addressing the tendency for lip service paid to diversity Programmes;
- Better building of talent pipelines;
- Considering the overall construct and functioning of Executive Management when making appointments; and
- Identifying and reducing the barriers to change.

Literature Review Summary

A number of publications by regulators and governance organisations have reported findings indicating that diversity has a positive effect on compliance behaviours. Additionally, there is growing evidence of the value of diversity in Compliance Programmes. The Central Bank views diversity as vital in creating an appropriate risk culture and in promoting good governance. The Central Bank is the only Irish body which has promoted the incorporation of diversity and inclusion onto Compliance Programmes and thus mainstreaming diversity and inclusion. Diversity has been proven to have a positive effect on risk culture in organisations where diversity promotes internal challenge and independent thinking.

To have a lasting effect, diversity needs to be embedded in organisations to become the way that business is conducted. To ensure that this happens, there is a need for measurement and evaluation of progress (Central Bank, 2018). The most lasting transformation is manifested in leadership style as a change to an inclusive culture is conducive to the collaborative leader.

Methodology

The research carried out sought to answer the question of would the inclusion of diversity as a topic in a Compliance Programme, have any impact on compliance? Primary research generated a body of rich qualitative narrative data which was gathered through semi-structured interviews and then interpreted. A qualitative data collection method was chosen which involved in-depth investigations with small samples. Mono-method qualitative research was conducted through semi-structured interviews. The interpretivist research philosophy employed in the research influenced the choice of data collection method. The aim was to produce more detailed and richer research findings through interviewing data subjects in their natural working environments and drawing out their experiences.

Primary research was carried out with key individuals operating in compliance functions in different organisations at a specific point in time. The aim was to find out what the organisational experiences of the research participants had been in relation to assessing any linkages between diversity and compliance.

The research took place in five separate organisations with each having their headquarter functions based in Dublin; an international bank, an international insurance company, an international funds company, an organisation in the public sector and a semi-state organisation. Table 3 below provides for further detail on the organisations interviewed.

Table 3: Description of Organisations Researched

	Organisation Type	Employees	Location
1	Public Sector	3,000+	Offices throughout Ireland
2	Insurance company	500	6 Irish offices
3	Funds	2,500	Ireland
4	Funds	2,500	Ireland
5	Semi-state	1,000	Offices throughout Ireland

The organisations numbered from 2 – 4, all had an international aspect to their business. It should be noted that the international bank included, is not a retail bank in Ireland.

Results – Key Findings

The limitations of the research strategy used are acknowledged. The use of interviews to collect data consume considerable time and generate large volumes of information. The view of the interviewer may come across in the questions posed which could bias the response from the interviewee. This can be overcome by the interviewer identifying their own biases and then consciously taking on the persona of someone without these biases when conducting interviews.

Categories of Diversity Currently Monitored in the Organisation

Interviewees were asked about the different forms of diversity monitored in their organisation. Among the respondents, there were noted differences in the types of diversity which interview participants identified in their respective organisations.

> **Interviewee 1** said that their organisation exhibited a subset of all of the categories of diversity outlined in the definition used by the Central Bank being; age, gender, geographical provenance, educational and professional background.
> **Interviewee 2** reported that diversity in relation to disability, gender, race and age were monitored.
> **Interviewee 3** reported that gender and age were the categories which were tracked and reported by Human Resources to their Board.
> **Interviewee 4** stated that gender, disability and LGBT (lesbian, gay, bisexual and transgender) were the main categories addressed by their organisation.
> **Interviewee 5** reported that all categories outlined by the Central Bank were monitored and that they were also taking steps to track neurodiversity. This is defined by the Autism Awareness Centre as a move towards more equal treatment and acceptance for those on the autism spectrum and for disability in general.

Two of the organisations interviewed discussed their actions on disability and there was evidence of increasing action on disability by one other participating organisation. The Employment Equality Acts 1998 – 2015 allows for organisations to take positive action to promote disability which may have impacted the organisations in question.

Organisational Recognition of Relationship Between Diversity and Compliance

When asked if a connection between increasing diversity and Compliance was recognised at an organisational level there were mixed responses. Some participants reported that their organisation tracked diversity within the organisation, but their activities did not include reporting a relationship between diversity and

compliance. A few participants reported that increased diversity enabled factors which are associated with compliance such as internal challenge and the ability for a range of views to be expressed.

Interviewee 1 – Diversity is a concern discussed at Board level. Members review opportunities for progression and recruitment so that a suitable pipeline for diverse composition is in place.

Interviewee 2 – Within the organisation there is a recognition of a correlation between diversity and a broad conception of 'doing things better'. The explicit linking of compliance and diversity beyond this was not mentioned.

Interviewee 3 – At the level of the Board, there is an awareness of the importance of diversity of thinking and the positive effect of gender diversity on board membership. An explicit link between diversity and compliance beyond this was not mentioned.

Interviewee 4 – Diversity is treated as a priority as well as Compliance. Internally, the organisation has not linked the two as having a relationship.

Interviewee 5 – Ensuring diverse thought is highly important. A relationship between diversity and compliance had not emerged as a topic.

Diversity was not found to be part of Compliance Programmes in the organisations which took part in the research. Two participants, members of the financial services organisations regulated by the Central Bank, have focussed more on diversity in the expectation that they will be reviewed by the Central Bank for performance on diversity measurements in the future.

Formalised Compliance Programmes do not currently exist in the public sector apart from the Internal Audit and risk management reviews. However, compliance constitutes a large proportion of public sector Head Office functions such as Human Resources, Finance, ICT, Corporate Services, Health and Safety and Legal Services. Although Interviewee 5, which is a semi-state organisation, stated that they are very much looking at the effect on compliance in their organisation.

In the private companies interviewed, compliance goals were either linked directly to an annual bonus or there were formal processes in place linked to performance reviews and promotional opportunities.

Costs and Benefits

It was found that few organisations had an analysis completed in relation to the costs and benefits of diversity, see Table 4 below.

The interviewees had different views of the benefit of diversity. None mentioned a direct link with improved corporate governance or compliance. One interviewee explained benefits of diversity in terms of where savings could be made with staff

based in cheaper economies. Three interviewees expressed the benefits in terms of a moral case for diversity.

Table 4: Costs of Diversity

Interviewee	Responses in Relation to Cost of Diversity
Interviewee 1	Technology and travel costs to facilitate engagement with colleagues across locations versus the benefit of leveraging staff with different skills in a cheaper environment.
Interviewee 2	Value is more of a cultural interpretation and the costs are worthwhile, the return being new and improved behaviours.
Interviewee 3	An awareness of diversity at the level of Chairman and people see the benefits in terms of diversity of thinking, but it isn't coming through, they aren't walking the walk
Interviewee 4	Haven't been additional costs, existing staff have volunteered for groups and initiatives but analysis of surveys has been a cost. Part of a review of a training programme will involve a study of the return on investment in conjunction with Finance and HR
Interviewee 5	Part of a review of a training programme will involve a study of the return on investment in conjunction with Finance and HR

In terms of benefits of diversity, the participants in the research interviews said that the benefits of diversity experienced in their organisations were;

- Internal challenge;
- Diversity of thinking;
- Increasing innovation;
- Improving employee engagement; and
- Every 1% change in diversity results in a 3% return in revenue.

The benefits reported by the interviewees are reflective of the benefits reported in the literature on diversity. The Central Bank reports improvements in internal challenge and diversity of thinking resulting from the introduction of diversity (Central Bank, 2018a). The increased innovation, engagement and financial results are reported by Catalyst (no date), the non-profit organisation which compiles statistics in relation to gender balanced leadership.

When asked about costs that arose from managing a diverse workforce all interviewees highlighted communications.

> **Interviewee 1** identified language barriers as a blockage to good communication. The interviewee suggested additional language training could address this challenge.
> **Interviewee 2** identified communication as a challenge that arose with diverse teams. They highlighted the importance of emotional intelligence in improving communication levels.
> **Interviewee 5** mentioned communication in terms of supporting line managers through training on flexible working arrangements and the need to focus on productivity rather than presenteeism.

The challenges outlined by the interviewees supports what has been found in other research, evidencing that there are obstacles to managing diverse teams (Central Bank, 2018).

All organisations had been through unconscious bias training.

> **Interviewee 3** clarified the training had not been delivered from the gender perspective but was part of performance management training.
> **Interviewee 4** confirmed that the training had been prioritised for senior staff members first and to those participating in interview boards.
> **Interviewee 5** representing the organisation with a longstanding experience in diversity said that they were developing targeted training for managers in the area of inclusive leadership

All interviewees coincided in saying that there is a need to focus on inclusion in the future. Diversity is described as getting diverse people in place, but inclusion is the essential next step to enable a diverse workforce to work together efficiently

Themes and Recommendations

The following are the themes which emerged from the research undertaken.

Theme One

First of all, from the analysis of the research data generated by the interviews, the following theme emerged.

- Diversity is not currently a topic in Compliance Programmes and organisations do not include diversity as a variable which influences their performance on measures of compliance.

It is clear from the qualitative data derived from the interview participants, that a relationship between diversity and compliance is not being identified in the policies, strategies and mindset of compliance professionals. Diversity of different types is tracked and monitored within the organisation but there are alternative reasons for introducing diversity and inclusion programmes such as the moral case, international headquarters in the businesses and the impact of equality legislation.

Interviewees representing organisations whose core business is dependent on compliance were more likely to articulate a relationship between diversity and compliance. This was evident in the interview responses from the funds company who confirmed that they monitor the developments in the Central Bank to keep abreast of upcoming regulation. The Central Bank, as regulator of financial services in Ireland has the power of enforcement and as discussed in Chapter 2 section 2.2.3, fully intend to use their powers of enforcement in a robust fashion (Central Bank, 2018a). The speed at which change happens in the industry will be dependent upon the Central Bank timeframe to extend their diversity and inclusion assessments to the wider financial services sector.

The Inter-departmental Review of Gender on State Boards (Department of Justice and Equality, 2019) has made a recommendation that all State Boards should be required to adopt a diversity and inclusion policy by 2020. Organisations will need to set out organisation-specific objectives in relation to gender on the composition of the Board which should be reported annually. The review states that Boards should be required to explain how they are using the Policy to comply with the requirement for gender balance. This recommendation may be effective in instigating change in the public sector. There is no sanction as such for failing to comply with the recommendation but the potential reputational consequences for a State Board which finds itself highlighted for having a poor gender balance may motivate action.

Theme Two

- In terms of risk culture, financial services companies are mindful of the changing regulatory environment and are beginning to take diversity into account in the approach to Compliance Programmes.

In organisations where a core business is dependent on compliance, there was a better acknowledgement of the connection between diversity and compliance. This was evident in the interview responses from the funds company which confirmed that developments in the Central Bank's coverage of diversity are monitored to keep abreast of upcoming regulation.

The financial services sector has given more explicit treatment of the link between diversity and risk culture. One of the research participants, Interviewee 5, made the distinction that diversity of thought is not about being risk averse, but being risk aware. This is an important point in the identification of risk within organisations. If the grouping in the organisation charged with identifying risk is not diverse, they run the risk of groupthink sinking in and the group may prioritise certain risks only. This is supported by the literature and by the Lehman Sisters Hypothesis (Van Staveren, 2014) which concluded that women were found to be more risk averse and less overconfident in their behaviours.

Financial services companies are maintaining a watching brief on the Central Banks activity. The Central Bank will address the higher risk companies first which are

prioritised in the risk rating system. The lower risk companies know that those same requirements will eventually cascade to their risk category.

It is not always what an organisation does or the outcomes which it achieves that are the only important marks of success. In the move to address culture, there is increasing focus on the way that business is conducted, which includes the way key project teams and steering groups interact with one another.

Theme Three

- Diverse teams need to be empowered to work better together. Communications and the language barrier came up in the interviews as impediments of diverse teams.

A collaborative type of leadership model is conducive to an inclusive culture where diversity can be embedded. Future focus needs to be on Inclusion. Diversity is just the mix. Inclusion is about making the mix work together. (**Interviewee Two**).

Recommendations

The impact of diversity on a Compliance Programme could considerably strengthen the business case for diversity in the workplace and persuade management in organisations to support diversity and inclusion Programmes.

The following recommendations emerged:

- Align compliance with diversity in a Board approved compliance policy and assess the use of a transformational leadership model which encompasses collaborative leadership in the introduction of diversity and inclusion programmes.
- In the ever-changing business environment, organisations need to be flexible and adaptable and transformational leadership can assist with this goal. Leaders need to pay attention to the development of their staff and have the ability and willingness to provide intellectual stimulation. This is critical for leaders whose organisations are facing demands for renewal and change, (Bass, 1990).
- Develop a more balanced approach to the costs and benefits of diversity including the positive effect on compliance.
- Build the case for aligning diversity and inclusion with risk culture in terms of the identification of risks and positive corporate governance behaviours.
- Integrate diversity into existing Risk Management processes and establish the challenges to introducing diversity programmes in advance of roll-out in organisations and put in place actions to mitigate risks.
- Embed a collaborative management style through training and reinforced messages from senior management and Human Resources.

The Central Bank has been consistent in the messages which they have been communicating. At the Irish Fund Directors Association Diversity and Culture event, Colm Kincaid, Director of Consumer Protection spoke about diversity and inclusion, (Central Bank, 2019a). He said that in the Central Bank's Strategic Plan 2019 – 2021, they highlight diversity and inclusion as an essential part of what makes their workplace effective and fulfilling. He said that it is what will drive further improvements in the governance and risk management of regulated firms in the future.

Conclusion

The emergent themes from the research are outlined:

Diversity is not currently a topic in Compliance Programmes. Respondents are more likely to report a connection between diversity and compliance where the core business is dependent on Compliance.

In terms of risk culture, financial services companies are aware of the changing regulatory environment and are taking diversity into account in the approach to their Compliance Programme.

A collaborative leadership model is conducive to an inclusive culture where diversity can be embedded but the focus needs to be on inclusion in the future.

 In an article in The Irish Compliance Quarterly, Kelly (2019) stated that diversity initiatives have been implementing inclusion without recognising how that inclusion is based purely on assimilation. The next step is to build inclusion into work environments which needs to happen for diversity initiatives to be effective. The need to build the correct culture and an open environment is mirrored in the IBCB (2018) employee survey results.

The former President of the Compliance Institute, Ms Kathy Jacobs, has stated that equality, diversity and inclusion is clearly coming on to the compliance agenda, at the Annual Conference in 2020. This was a clear indication of the future for diversity and the growing link with Compliance. In the period since this public statement, the Compliance Institute has introduced gender diversity onto their Board membership. A Diversity and Inclusion Committee has been established by Compliance Institute in July 2022. The purpose of the committee is to empower diverse voices through ensuring that the Compliance Institute, in delivering its service, commits to ensuring diverse voices are welcomed, respected and heard.

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A Qualitative Analysis on the Client's Experience of the Propeller Model Approach to Counselling Therapy.

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Abstract

The successful development of psychotherapeutic and counselling approaches can reflect the evolution and innovation within the industry of psychological treatment. Measuring the benefits of an approach involves inquiry into how it is conducted, the practitioner conducting it, and even the setting in which it is conducted. The aims of this exploratory study are to discover if a psychotherapeutic approach, the Propeller Model Approach, serves its purpose of increasing self-awareness for clients. Such awareness is distinguished in the study as intrinsic and instrumental and aims to build on the theoretical framework that self-awareness

is beneficial to the human condition. In order to conduct the study, a semi-structured interview was conducted with five clients engaged in counselling therapy after an individual online counselling session. Each session utilized the Approach implemented by the practitioner for the study who was also the principal researcher. To understand the nature of the participant experience of the Approach, a phenomenological interpretivist epistemology was adhered to. The use of abduction assisted in connecting the ontological construction of participant feedback from their interaction with the Approach to new potential hypotheses. The data of the feedback was analysed through a reflexive thematic analysis that respected the hermeneutical nature of the coding and thematization of the data. The study serves as an example of evidence-based research into a new psychotherapeutic approach and can guide practitioners interested in utilizing the Propeller Model Approach to counselling therapy or for general exploration into human identity.

Keywords: counselling, evidence-based research, propeller model approach (PMA), psychotherapy, self-awareness

Background

It can be argued that any structured therapy that is provided by an empathic therapist who facilitates client engagement through healthy behaviour, will lead to equal effects in terms of therapeutic benefits (Wampold, 2015). Considering there is an estimate of more than five hundred approaches to psychotherapy to date and that many of them are without any proven value, nor any research backing or academic support (Wootton & Johnston, 2022), it can be difficult to gauge the approach to choose when engaging with a client. The psychotherapeutic approach in this study had never been used in counselling therapy previously to this research project, besides on the researcher themselves. This experience was noted in *Living With(in) Your Ends: An Approach to a Novel Life*, which will be available in the latter half of 2023.This study thus aims to serve as the start of an evidence base for the Propeller Model Approach (henceforth: PMA) and as a guide to its implementation.

The Theoretical Framework: The Benefits of Self-Awareness

The theoretical framework for this project and PMA in general, is based on the notion that self-awareness is a value 'in itself' that can have therapeutic repercussions. The importance of this awareness can be considered to extend beyond positive mental health and well-being and include a fruitful impact on daily functioning (Sutton, 2016). It can be argued, in a Hegelian sense, that human desire is what is required for self-awareness, as self-consciousness needs transcendence of self via desire for other desires to finally culminate in a dialectic with other human beings and the world (Kojeve, 1969). It can also be argued that self-awareness can be considered instrumental in organizational terms, by allowing effective leadership from employees in virtue of maintaining clear self-awareness that cultivates satisfaction in the work environment and increased profitability for business (Eurich, 2018).

Self-awareness theory contends that awareness of self leads human beings to judge one's behaviour through personal standards, as the creation of the third-person imagery required for such standards allows for life events to be juxtaposed to a conceptual self (Libby & Eibach, 2011). Self-awareness in this sense involves attention to oneself, but also being consciously aware of one's dispositions and attitudes (Ninivaggi, 2020). For human functioning, self-awareness can be considered a necessary condition for rationalization that refers to the capacity for practical deliberation or critical reasoning (Smith, 2020). Meta-awareness is also a way of describing self-awareness, and its development can be considered to refer to the ability to self-regulate (modulate behaviour) and involve a positive relationship between otherness (i.e. the environment and other human beings) and a self that is meant to transcend self-focused needs and increase prosocial characteristics; hence the qualities of clarity and equanimity often being developed alongside mindful awareness (Vago & Silbersweig, 2012).

The key concept of self-awareness present in PMA allows it to be found within the camp of other psychotherapies which also share the importance of this humanistic concept of awareness, such as existentialist, gestalt, and daseinanalytical therapies. PMA can be considered existential in virtue of adhering to the proposition (one of six propositions for existential psychotherapy) that every human being has the capacity for their own self-awareness (Center for Substance Abuse Treatment, 1999). Such a presupposition is important for supporting the efficacy of PMA, as it considers that each human being is capable of unlocking authenticity thus one's 'true self' through self-awareness (Rowan, 2016). PMA is also gestalt in nature, as it supports the notion that increasing awareness reciprocates self-understanding by helping others to explore the world in a manner that can amplify choice and enable the utilization of capabilities (Bower, 2015). In terms of daseinanalysis, PMA shares with this approach the recognition of the existential-phenomenological 'gestalt switch', where therapist and client undergo holistic perceptual changes of worldview: clients increase self-awareness and meaning in virtue of reflection on time usage and degrees of life fulfilment, while therapists can learn how to master this for themselves and their practice (Glazier, O'Ryan, & Lemberger, 2014).

The theory behind PMA was developed by the researcher as part of their doctoral dissertation in Philosophy conferred in November 2017 by the University of Sofia's Faculty of Philosophy in Bulgaria and was subsequently developed in the forthcoming book, *Living Within Your Ends: An Approach to a Novel Life*. At its core is the notion that self-awareness in relation to the present moment measured through the usage of the PMA acting as a 'compass' for one's own identity. For this study's purpose, what is of most importance for consideration is the client's orientation to the present moment and its relationship to self-awareness.

The Conceptual Framework: The PMA Model

The PMA is organized into four areas that surround the 'present moment' in an equal fashion (above, below, left, and right), with each of the four areas involving different aspects of the human being in terms of awareness and identity called: hypostases. Exploring where clients find themselves on the model requires them having the diagram visually in front of them either virtually or with a standard sheet of paper. One notion that arises from this aspect of PMA is that with enough experience with its diagram form, clients will be able to explore their orientation on it at any time without any visual cues.The thematic map assisted in how to approach the organization of the presentation of the results. The iterative nature of thematic analysis, especially at the subsequent stages after familiarization with data, shows how the steps are not to be strictly linear but circular and rhizomatic.

The PMA diagram below, Figure 1, serves as the practical manifestation of the theoretical framework for this project. The condition of aphantasia and blindness could affect the interaction with PMA in this sense.

The design of Figure 1 was created specifically for this article with the version of the PMA model provided to research participants during similar research (Stevenson, 2022).
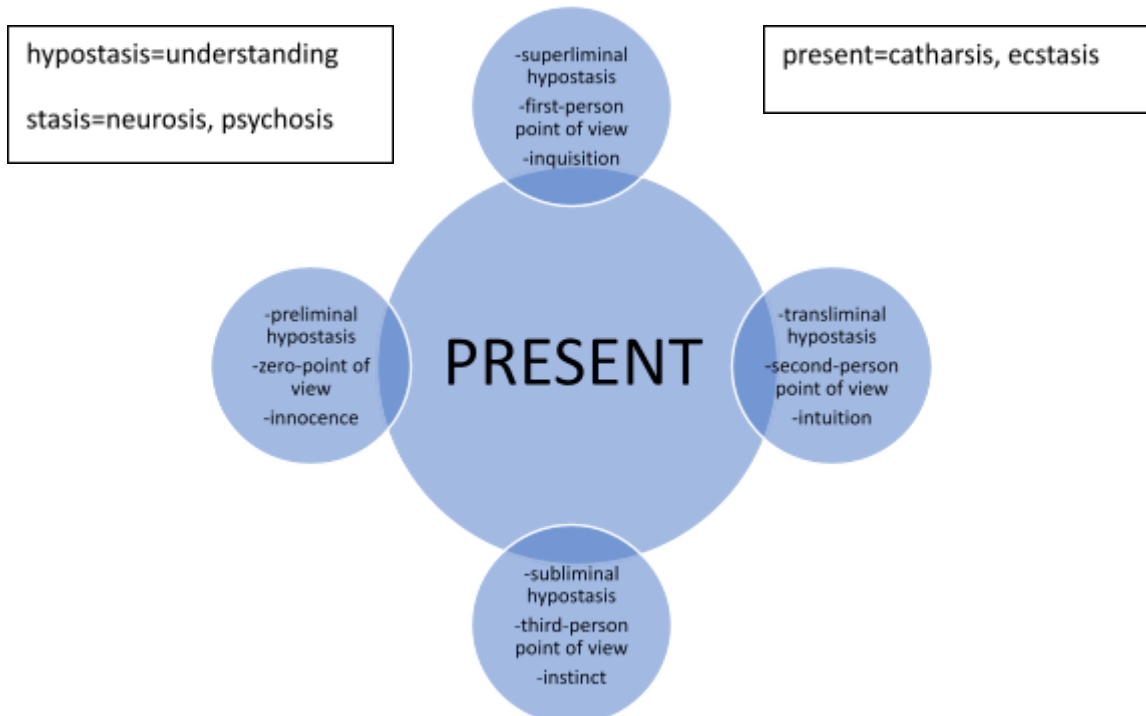

Figure 1: The Propeller Model Approach diagram

The commencement of the sessions to be researched with the clients involved explaining the different areas of PMA and their relevance. The keywords from PMA that needed in-depth explanation were found to be as follows: hypostasis, preliminal, subliminal, superliminal, and transliminal. The other terminology found in PMA could be considered standard lexicon for clients, however, if PMA is to be used with younger clients, a more thorough explanation of the concepts would be considered noteworthy. Hypostasis was informed to be understood as the 'non-reduced' conception of the human being rather than a concrete identification of the self in physical reality as a fixed object. It is a term that was informed to clients to be synonymous with 'understanding' which is a conception that considers the human being as maintaining suspension of judgment on reality and self while remaining authentic (Stevenson, 2021). PMA considers that assisting clients in interpreting themselves as hypostases rather than as reified objects is a potentially healthy conception of self, but also important for interacting with PMA. The concept of 'liminal', as found in the compound nouns preliminal, subliminal, superliminal, and transliminal, was informed to represent the contingency of human identity and served as adjectives for each of the four hypostatic areas of PMA, along with each relative perspective on self (i.e. zero-person, first-person, second-person, and third-person).

One important clarification established with clients was to inform how one theoretically moves between the different areas of PMA. This was informed to be through a phenomenological movement dependent on cathexis. In this sense, cathexis refers to the energy required to move from one of the four hypostatic areas to another. To move from one of the four hypostatic areas to another area was informed to clients to require engagement with the present moment (the centre of the diagram of PMA). It was important to inform of this engagement as being imperative for 'getting out' of one of the four areas on PMA and into another. Being 'stuck' in one area was informed to reflect an unhealthy lack of self-awareness, and so the aim of PMA was informed to provoke clients to reflect on their orientation on the Model as a representation of their life perspectives and awareness in general. The counselling sessions explored how the clients could engage with the present moment via PMA in order to 'propel' themselves and move beyond their static existence that was symbolically 'stuck' in one of the hypostatic areas of PMA. In ethical terms, this provocation of movement was implemented so long as it was relevant to the client's life situation.

The 'propelling' concept was informed therefore to be possible through activities that involve catharsis and ecstasis (i.e. use of creativity, exercise, crying), which were terms that also required explanation at times during the researched sessions. The interaction with PMA therefore, in the session or in the client's own time, was informed to be able to initiate the propelling movement required to alleviate or prevent stasis. The identification with all four hypostatic areas of PMA surrounding the present moment were informed to clients to involve a healthy balance for self-awareness. When self-identification was found to be solely with one of the

areas, it was informed this could involve a 'way of being' that reflects excess or deficiency with regards to that area; hence when a client feels 'stuck' in one of these areas the excess or deficiency of that area can manifest itself. The 'preliminal' area in terms of excess leads to lack of responsibility since one could claim ignorance through innocence, whereas its deficiency leads to lack of adaptative learning. Being 'stuck' in the preliminal area involves 'a way of being' that involves no responsibility for what one does in one's life or for others, whereas its deficiency means being obstinate and closed-minded to alterity. This hypostatic area of innocence is positive in the sense of representing learning and neoteny, but also potentially negative, as representing the area of self that can represent one's lack of responsibility in life and any perspective on oneself.

Table 1 below provides a summary of the conceptual framework for PMA and can assist in understanding how the participants interacted with it.

AREA ON PMA	EXCESS (leads to)	DEFICIENCY (leads to)	BALANCE (leads to)	OPPOSITE EXTREMITY (leads to)
Preliminal	Lack of responsibility	Lack of learning	Open-mindedness and capacity to learn and be responsible	Transliminal - Blame others Depend on others
Superliminal	Overthinking Over Analyzing Rumination	Lack of self-identity	Reasoning and rationality with healthy self-dialogue	Subliminal – Lack of reflection on action and disinhibition due to self-centredness
Transliminal	Comparing self to others	Lack of empathy	Healthy relationships	Preliminal – Lack of equitable recognition of others

Subliminal	Impulsive fulfillment of pleasures and needs	Lack of attunement with physical needs	Bodily health and instinctual control	Superliminal – over-rationalization of physical wellbeing

Table 1: Summary of conceptual framework for PMA.

Methodology

The approach to the research involved an epistemological interpretivist paradigm as the responses from participants consisted of interpretations of their therapeutic experiences of PMA. The researcher was cognizant of their own interpretations of the participant results with regards to the verbal and textual information retrieved. The interpretivist paradigm sought to gain an understanding of the nature of participant perception based on their experience which highlights its adherence to phenomenology (Al Balushi, 2018). Abductive and inductive reasoning was adhered to in the project to assist in theory creation after the conduction of data analysis.

The Ontology and Epistemology

The phenomenological aspect of the interview questions is apparent in how they aimed to extract an understanding of 'what it was like' to be a client who interacted with PMA. Phenomenology helped in the interview process by providing the means to study the human lived experience of interacting with PMA without judging the participants or including bias in their interpretations (Al Balushi, 2018). Since it is important for any education in the health professions to ensure there is maximum effectiveness from feedback, work-place learning, and clinical reasoning, it was important for the researcher to explore the participants' experiences in detail (Neubauer, 2019). The ontology of the project supported a reality based on a constructivist approach to meaning formation. The experience of the PMA was understood through the construction of the reality that was based on the experience derived from the participants in collaboration with the researcher (Al Balushi, 2018). Adopting an interpretivist phenomenological approach allowed the project to align with the notion that the participants' experience of PMA cannot be separated from their own unique world or history; hence just as PMA as a tool respects this inseparableness, the project also respects the clients as research participants through the hermeneutical phenomenological task of studying their narratives in order to understand their experience with PMA, but also its impact on their life-worlds and daily lives (Neubauer et al., 2019).

The interpretivist epistemological paradigm considers that all interaction between human beings is meaningful, thus an understanding of the meanings that were created through participant interaction between themselves and the researcher was essential for understanding the participants' social worlds at the time of the research study (O'Donoghue, 2007). For this project it was important to understand what meaning was derived from the participants through the interaction they had with PMA as a therapeutic tool, but also with the researcher as a counselling therapist. The participants can be said therefore to have attached their own unique meanings to the events derived from their interactions with PMA and this creative attachment influenced how they acted or responded to the events based on the meanings they had attached to these experiences (Evangelinou-Yiannakis, 2017).

The Role of Abduction and Induction

Abduction is a process that evaluates and generates hypotheses or 'hunches' at collective and individual levels, but also identifies and confirms anomalies in research to make sense of phenomena; hence it can be reduced to the four steps of observing and confirming anomalies, then developing and evaluating hypotheses (Saetre & Van De Ven, 2021). Abduction was utilized in the research in order to promote an exploratory openness to the research results and to theorize how PMA can increase self-awareness. This led to the development of the theory that PMA increases self-awareness; a hypothesis that aims to build on the pre-existing theoretical framework that self-awareness is beneficial to human living (Conaty, 2021).

Abduction allowed for examination, inference drawing, and development of the theoretical framework, but also involved contemplation and consideration of how the therapeutic approach of PMA can be improved, altered, or integrated through reflections between the practitioner, researcher, theory, and data; a dialogue that promoted new themes to be identified from the results, and probing that served as crucial for the gathering of the data and subsequent analysis (Conaty, 2021). In this project there were no known theories to model on for data analysis with regards to the experience of PMA since PMA's use had never been researched prior to the study. The theoretical framework of self-awareness as beneficial to the human condition could only serve as a potential hypothesis to be abducted from the study by being inferred from the results of the client experience of PMA. The use of induction for the coding procedure, in which the codes came after data collection, thus benefitted from the abductive reasoning of the study, as induction would not alone allow for potential new hypotheses to develop from the client experience of PMA to align with the theoretical frame (Baur, 2019). Abduction therefore contributed to the building of the new theories found at the end of this research study. Over time these theories can potentially be tested through deductive construction or inductive testing in future research (Saetre & Van De Ven, 2021).

Although we will see the thematic analysis utilized was reflexive and inductive, as the codes were generated after the research was conducted to align with the theoretical framework rather than use a codebook for a deductive research plan, the project's reasoning overall was abductive in its generation of potential hypotheses after data analysis. These hypotheses derived from the inferences found in the data. Figure 2 below outlines this methical strategy.
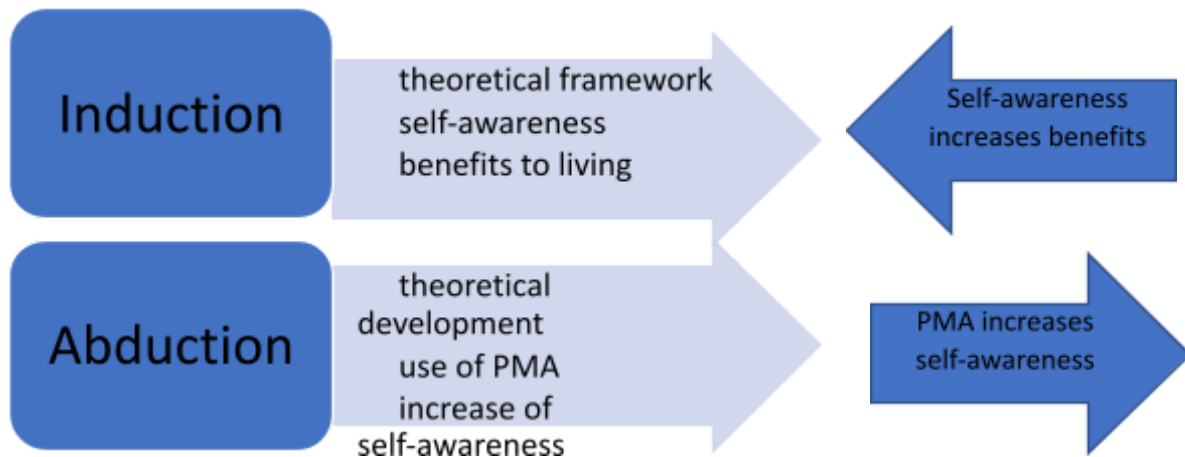

Figure 2: The Abductive and Inductive Methodology. PMA increases self-awareness and benefits of living.

Method

Sample

The PMA in diagram form was provided to participants in email prior to their session and served as a tool to assist the participants (who were also clients) in gauging awareness of themselves and their relationship with the present moment in the sessions researched. The researcher as practitioner explained the concepts and theory behind PMA directly before the sessions in which PMA was implemented in order to help the participants' understanding of the meaning and relevance of the concepts within the therapeutic approach. The application of PMA was undertaken with private clients after receiving ethical approval from the ethics board of a Quality and Qualifications Ireland accredited third-level college in the Republic of Ireland. These sessions took place online in video sessions between December 13, 2021 and January 3, 2022 with four clients based in the United Kingdom and one in Austria, who were between the ages of nineteen and fifty years of age to provide an average of 34.5 years of age. The participants involved were four males and one female, with one of the participants being employed, two in third-level education, and two unemployed. The participants received counselling on a weekly basis and had varying amounts of sessions already completed with the researcher at the time of research along with a variation of problems of living. The researcher was a practicing registered member of the British Association of Counsellors and Psychotherapists at the time of the research and the project was discussed with the practitioner's clinical

supervisor. Consent was provided and received from each of the five participants via email which outlined the debriefing process to be conducted after the research interview with each participant. Careful consideration was maintained at this stage, as the seeking of consent is known to change therapy aims in manners that may enhance or prevent explorations into client development (Bridges, 2010).

Five participants were considered sufficient for the research, as this amount can be argued to be the minimum number required for data saturation in an Urquhartian sense. This form of saturation considers that the threshold was reached with five and no new codes were to be potentially found in the data, as the questions were designed in a manner that allowed saturation to be reached in conjunction with the limitations of the feedback provided (Saunders et al. 2017). There was a semi-structured interview prepared and given to each client and the interview was followed by standard transcription which was then subjected to thematic analysis.

Interview Questions

The participants were provided with the research questions after a 50 minute session utilizing PMA as its focus. The interview was semi-structured and the questions were guided by tools and scales for measuring self-awareness, such as found in Bowers (2015). The questions were provided as follows:

1) Overall, how did you find your participation with this approach?

2) Were there any areas in the diagram where you felt most connected?

3) How did you find the terminology in terms of definitions?

4) Would you consider using the approach again?

5) Would you prefer to use the diagram in-session or on your own time?

6) Would you prefer to use it in a screen-share on Zoom or have a paper sheet?

7) How does the approach function for you for intrapersonal relations?

8) How does the approach function for you for interpersonal relations?

9) How do you find the locations of all the terms in the diagram?

10) Does the diagram remind you of any other approaches or literature?

Researcher Involvement

The method for this project can be classified as 'involved research', as the researcher was a participant within the participants' experience of PMA as the practitioner. Involved researchers are considered a part of the group studied to an

autoethnographic extent and have limitations for being completely objective due to data collection and its subsequent analysis involving the researcher's subjective input (Al Balushi, 2018). The purpose of semi-structured interviews is to understand themes derived from the 'lived world' that are based on a participant's own perspective. Although the interviews were conducted with live video online, the researcher did not deem it necessary to explore the paraverbal or bodily language of the participants that accompanied their responses. The data was then analysed in a thematic fashion, which was more rhizomatic in approach than linear, in the sense that the process of familiarization but also dissemination of the results did not require strict consideration of chronological time frames, but rather iterative interpretational flow.

Data Analysis

Deciding the Themes for Thematic Analysis

The themes that were considered to align most with the purpose of this project and which were subsequently analysed for the interpretations of the results, were Theme B: 'Description of orientation in PMA (intrinsic)' and Sub-Theme B1: 'Description of subjective benefits of orientation in PMA (instrumental)' (See Table 2 below). Themes A: 'Description of PMA itself as metaphor or abstraction' and Sub-Theme A1: 'Description of experience of PMA itself' resulted in serving the purpose of assisting in understanding the manner which participants viewed PMA, giving an idea of their frames of reference and insight into their abstract interpretations. Theme A informed of how the participants might have compared PMA to other tools, whereas A1 reflected results from the data that provided an awareness of how the participants viewed and interpreted the experience of PMA itself. A and A1 can be considered a reflection of the data that provides a meta-analysis on the second-order thoughts and views, opinions, and reactionary interpretations of PMA as a therapeutic tool.

The thematic analysis involved focusing on themes B and B1, the former involving a more general sense of the orientation within PMA and the values this involves 'in itself', and the latter alluding to the benefits of interacting with PMA for useful means beyond mere self-awareness. Whilst analysing B1, it was determined that the data would be best divided into B1a 'in-session benefits' and B1b 'psychoeducational benefits' as components of B1. It should be noted that intrinsic benefits are difficult to measure as the heuristic and subconscious benefits of human activities in themselves can be considered easily missed and unrecognized. For that, the indication of self-awareness itself for theme B was considered sufficient to recognize the purpose of PMA as functional in activating self-awareness linked to the notion that this is beneficial on its own.

The type of thematic analysis conducted was individually reflexive and the manner of approach was latent and inductive. It was reflexive by seeking to explore the experiences of the participants through individual researcher reflexion whilst recognizing both manifest and latent aspects of the data; the latter of which 'honed in' on interpretational assumptions which were scrutinized through Braun and Clarke's six step approach to thematic analysis (Braun & Clarke, 2006). It was inductive by deriving themes from the data post interview rather than using a codebook for theme detection. As shown above, this was theoretically based on the notion that self-awareness is beneficial to human living (Varpio et al. 2020). The induction involved a process of coding and development of themes that was directed by data content and considered a theme in the data as representing a level of response, meaning, or pattern within the data sets, which in social research can be characterized as capturing a significant or interesting aspect (Braun & Clarke, 2006).

Themes should not be research questions but should be distinct and coherent, so it was important to consider if the themes made sense, if the data supported them, if there was too much time spent on a theme, if there was overlap of themes, and if there were themes within themes (subthemes) (Maguire & Delahunt, 2017). The importance or even centrality of the themes was not necessarily reflective of the frequency of its appearance within the data as might be the case with content analysis (Braun & Clarke 2006; Nowell et al. 2017). The themes were thus more abstract entities that involved a greater degree of interpretation and integration of data than other pieces of information (Nowell et al. 2017). The coding conducted to identify themes in this project was an 'open' approach by adhering to the inductive and reflexive nature of the project. The codes identified are found in Table 2.

Theme A: Description of PMA itself as metaphor or abstraction	Sub-Theme A1: Description of experience of PMA itself	Theme B: Description of orientation in PMA (intrinsic)	Sub-Theme B1: Description of subjective benefits of orientation in PMA (instrumental)
CODES:	CODES:	CODES:	CODES:
Split	Engaging	Two areas	Noticing
Spider Diagram	Challenging	One area	Realising

Solid Vehicle	Framing	Extremities	Battling
Spectrum	Fitting	Opposites	Framing
Compass	Pushing and Pulling	Movements	Mapping
Useful tool	Magnifying	Regions	Valuing
Square box	Shaping	Alignment	Amplification
	Moving	Merge	Understanding
	Knitting together	Balance	Awareness
	Coming together		Adjustment

Table 2: The codes identified in themes.

Thematic Mapping

In order to demonstrate familiarization with the data by the researcher, a thematic map was created. Not only did this mapping allow for an intimate engagement with the data, but it allowed the researcher to stay true to the hermeneutics of the project by considering that the start and end of the research process were connected in a circular manner. This recognized that the beginning, middle, and end of the information that was prepared and collected was interdependent, as the meaning of one (e.g. beginning) in isolation would lose its true meaning if not taken in consideration with the others. Figure 3 below allowed for an organization of the themes for the project and assisted in its direction. The thematic map assisted in how to approach the organization of the presentation of the results. The iterative nature of thematic analysis, especially at the subsequent stages after familiarization

with data, shows how the steps are not to be strictly linear but circular and rhizomatic.
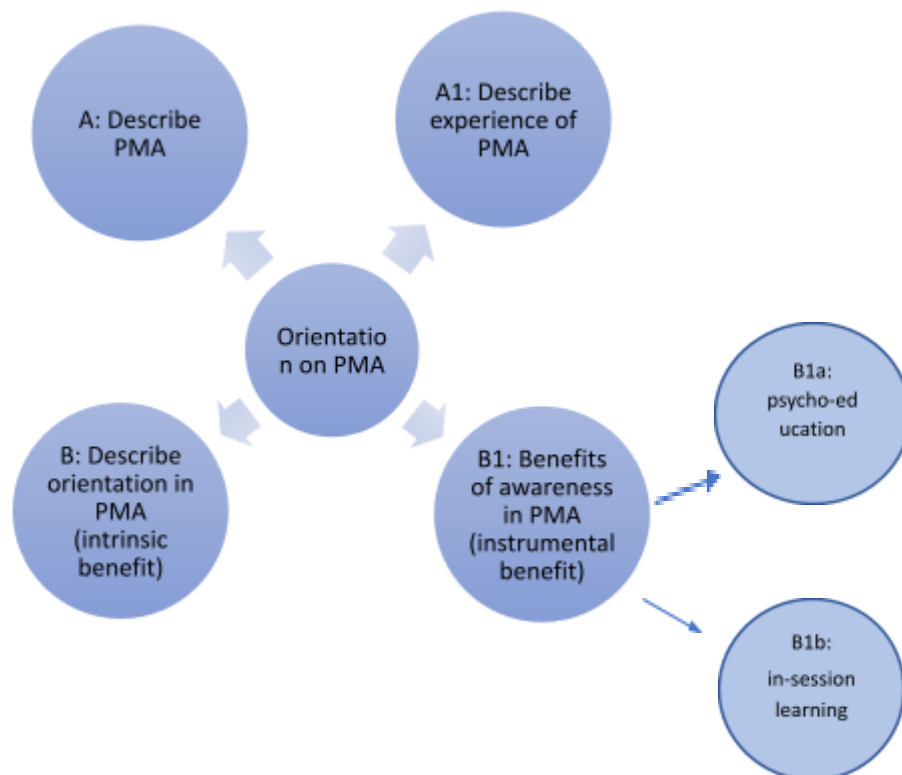

Figure 3: The Thematic Map

Results

To begin the results section, it is important to highlight how the participant experience of PMA was varied. There was an exploration into the data whilst maintaining the notion of each participant increasing awareness of themselves as being the essential aim of PMA. To first look at a piece of the transcript from one of the participants that informs of the intimate connection and contingent area between Theme B: Description of orientation in PMA (intrinsic) and Theme B1: Description of subjective benefits of orientation in PMA (instrumental), we can see the overall benefit of PMA as a therapeutic tool and the role that orientation to the present plays.

Participant TS informed:

"I suppose it is just like good reflection to see where you are and have a look at, I guess what the opposites of what those things are…for example, if you are more in the inquisition part, having a look at what the opposite of that is, I guess reflective on how you can move towards one end of the spectrum."

In this response there appears to be a juxtaposition occurring for where their awareness is based on feeling where they are positioned in a certain area. Such positioning appears to provoke thought on the other areas, in this case the opposite. Such consideration informs that for this participant, identifying with one area of PMA does not limit one's reflection of awareness to that area, rather the other areas are also considered. This reflects the purpose of PMA being successful at moving a client outside of one of the areas in the model with which they are having an affinity. TS appears to consider that their identification with the one area appears to cancel out other areas, however, it appears that such cancellation does not involve stagnation, but reflection on their movement within PMA. Such movement allows the PMA to succeed at increasing TS's relationship with the present moment in their contemplation of where they 'are' on PMA through comparison.

One way we can differentiate between B and B1 as themes, is that the former can involve notions of orientation or self-awareness thereof, as beneficial 'in itself' intrinsically in the 'here and now' relationship and engagement with PMA. B1 on the other hand considers the benefit of self-awareness instrumentally, where what is learnt in-session has a use that can be utilized in the moment. An example is that of serving the use of interpersonally communicating better with the counselling therapist in the session or psycho-educationally outside of sessions, such as communicating or being more congruent with others in one's personal life.

Analysis of Theme B: Describing the Orientation on PMA

The Intrinsic Value of Orientation

The data derived from the PMA experience itself informs the user-experience of PMA. The user-friendliness or conversely user-hostility of the PMA was expressed at times by participants. The participants conveyed the challenges in using the approach, but also the challenges the approach provoked for them to increase awareness of themselves as human beings. Participant BD reflected this, stating:

"With intuition I guess I think it works well by kind of describing where I kind of derive my values from in regards to other people I guess I think of it more of that external locus of evaluation but how much in those sort of interpersonal relationships, how much value I am deriving, how much impact that has on me, you know versus that place of innocence and from that place of innocence, and change where you know none of that can affect you coming from the relationship."

The link between intuition and values informs the participant's interpretation of the intuitive area of PMA, where awareness depends on an ethical recognition of others that activates a second-person point of view for self-awareness. Much like TS above, BD recognized the polar-opposite of an area on PMA whilst engaging with the latter. In this case, the innocence area, which BD described as an area of ignorance where values are not yet created, but open to change. This indication of awareness for BD, in which they were considering how their value system developed through intuition

and relationships with others, also shows the potential power of the ignorance affiliated with the area of innocence.

The user-friendliness of PMA appears to have allowed for insights into the interactions the participants had with PMA and their consequent orientations. Much like TS, BD also had a strong affinity of identity with areas on the PMA, and it appeared that such identification, 'in itself', was beneficial. BD stated:

"I thought the approach was not all too difficult to understand, actually starting to go through it or engage with it, it made a lot of sense, especially the top and bottom parts, you know those other ones that kind of I think I naturally engage with more. I think it made a lot of sense in those two (the top and bottom) especially, they really clicked with me and I think it was very…interesting in the way of kind of framing…those kinds of parts or those kinds of interactions between those kinds of parts or aspects of myself."

BD appeared to consider the intrinsic worth of self-awareness as indicated or provoked from interacting with PMA. The framing aspect of such identification appeared to have BD interpret their identity as 'interesting', in relation to the interaction of the different parts of PMA they identified with. Such a 'compassing' of their identity through PMA appeared to be for BD of value 'in itself'.

The Orientation to the Present

The centre of the model representing the present moment can serve as a point or area for which participants using the PMA can associate with in order to maintain an idea of their orientation on PMA. SE informed of how the present and its antithesis, 'the not present', served as indicators for awareness of time but also for location on PMA, stating:

"I have heard, definitely, the present being a good place to be. I mean I think that is why so many people meditate these days to be in the present, but it was interesting to kind of split. I suppose I have always seen it as you have, the present and then you have 'not the present', past or future, so it is kind of binary, like you are either in the present or you are not. So it is interesting to split 'not the present' into four different sections, kind of see where you are. Ya, it is quite interesting to further divide 'not the present' into four different sections."

SE alluded to the notion that PMA, in its provocation of thought on time and identity through the four different hypostases, can act as a helpful tool 'in itself' for awareness by increasing consideration of one's relationship with the present. SE provided a 'before and after' effect from subsequent engagement with PMA, stating:

"I think a lot about being in the present and meditating, but never (thought of), I sort of always thought of past, present and future, but it is interesting to split it into the 4 different categories and think about which one your kind of in in particular moments, and so ya, I think it is a useful tool."

The Intrapersonal Dimension

BD demonstrated the intrinsic intrapersonal value from interacting with PMA in terms of orientation, stating:

"I think it's useful in the sense of kind of mapping out which kind of parts, if that makes sense, are interacting with the person, where that is stemming from."

SE also informed how their engagement with PMA was beneficial 'in itself', especially in the intrapersonal sense of understanding how they feel about their situation, stating:

"I think it would be helpful because I have never thought of things in this particular way. Like how it splits the non-present into different sections. I feel like it would help me…kind of understand myself a bit better. I feel like it has already kind of helped me realise I am superliminal a lot and ya, kind of other stuff…but ya, I feel like I would like to use it a bit more to kind of see...how it made me change how I feel about things if that makes sense."

The intrapersonal dialogue displayed by SE informs of the psychotherapeutic potential of PMA, in the sense of change. Participants thus appeared to engage with PMA in their own unique ways, and this can be seen with how some appeared to relate more with the 'point of view characterizations' of the respective hypostases over the liminal labels (i.e. super-, trans-, sub-, pre-). Whether or not this reflects or affects participant interaction with PMA is of contention, however it is important to consider how awareness of orientation is taking place for the participants in virtue of interacting with PMA. IH stated that:

"it was interesting to see because I usually always focus on first person view. Maybe a tiny bit of instinct, but the other two intuition and innocence, zero person, second person, I never really actually considered them. So it gave me like two other layers…two other lenses. Two like, if I had a kind of magnification glass, but ya it gave me two magnification glasses, so I can see things I did not before."

The instigation of awareness brought on from PMA appears here to indicate new perspectives brought on in the session. IH appeared to consider this 'in itself' as having intrinsic worth by providing new ways of seeing themselves. Rather than consider how this can have instrumental value, for example, by allowing themselves to interpersonally perform better at work or maintain healthy relationships, this value appeared to be more an end 'in itself'. BD informed of how in their experience with PMA, they found value in how the different areas (hypostases) interacted, and how orienting themselves in that interaction allowed for a reflection on their affinities with the different areas, but also how the functioning of the PMA gave assent to how the areas function for BD subjectively. BD stated:

"I think specifically the inquisition and the instinct that kind of top down works really well because they seem to be the kind of main back and forth and then the other two, the kind of external, transliminal, and then the sort of innocence, they seem to be kind of at least for me especially the more push or pull within that as opposed to the other two (inquisition and

instinct) that I kind of…you know one predominates the other but they are the two sort of dominant ones. So I think that works um really well actually."

It is no doubt apparent that orientation on PMA is necessary for increasing movement and flow on PMA itself, but determining if it suffices is a worthwhile inquiry. We can extrapolate from BD's experience that orientation 'in itself' appears to be beneficial since it alludes to self-awareness as beneficial 'in itself', and we see it also benefited in CE's experience. IH also informed of how interacting with PMA was important for understanding how they communicated with themselves, stating:

"(PMA represents) key areas of one's being, and so tackling each one will, I think, each person has their own regions where they have more issues, and so ya, I think, going through those will definitely help, but you could also discover other regions which you may not have thought about, which were actually causing way more issues."

Movement within PMA

IH appeared above to be aware of the dire consequences of being 'stuck' as a stasis within one of the regions of PMA, and how issues in relation to one of the regions of PMA is descriptive of this. Self-awareness appears for IH to be a solution to this conundrum, as they stated:

"I would like to dissect each one of them, further, and tackle like each issue, like tackle the bad, with each one of them because I think that it will help you a lot as a person if you do."

IH's keen engagement with PMA is reflected in their understanding of the concepts of PMA and how it is meant to function. PMA is designed to increase awareness through a reflection on its different regions, and each region is considered to have its respective 'yin and yang' or 'positive and negative'. The PMA appears to be helpful in recognizing one's relationship with the different regions and their respective counterparts or anti-theses present within each. Such recognition can have intrinsic worth, as IH informed that PMA increased awareness and perspective, as it:

"gives me two different, two more regions I had never really thought about, and which probably shouldn't have gone neglected, so it is almost like being, building a bigger picture of yourself."

IH informed then, of how the different components of PMA, when reflected on and explored show how the whole of the PMA itself, as a representation of the human being, is greater than the sum of its parts. This reflects the inadequacy of living when feeling 'stuck' in one of the regions or hypostases. Therapist connection with the participant is crucial for the effectiveness of PMA, and if a participant is unable to make sense of the concepts within PMA itself, then therapeutic effectiveness is clearly at risk.

Analysis of Theme B1: The Benefits of Awareness on PMA

The Instrumental Value of PMA

Defining one's orientation on the PMA as an end 'in itself' with intrinsic value can be said to depend on how well PMA represents the human being in the first place. BD provided an insight into the user-friendliness of the model, which although dovetails on theme A, is important for understanding how themes B and B1 is even possible in the first place. BD informed that:

"I think it's (the display and layout of PMA) actually really good especially…because…it is that sort of battle or contrast between sort of between this 1st person, 3rd person, inquisition, instinct, I think that works and like frames it really well because it does feel that it does…mimic that sort of communication or I would say battle with those sort of two…reciprocals so I think that's really interesting and I think that function also serves really well in that case."

BD clearly showed an affinity with the hypostases of innocence and intuition, and embracing that affinity informed of a successful engagement with PMA. Such identification serves the purpose of PMA in providing intrapersonal benefits for participants that are intrinsically worthwhile in increasing self-awareness. We cannot deny the fact that self-awareness 'in itself' might serve as a 'good', however, we cannot ignore that we as human beings are social animals, and so considering the instrumental benefits of engaging with PMA should also be under consideration.

Transitioning from the analysis of data that was thematized as representing the orientation of participants within PMA and its intrinsic benefits, to the data that represents the instrumental benefits, we cannot help but recognize potential overlap. The manner therefore in which B and B1 can be differentiated was alluded to above, with B being more intrapersonal and representing subjective benefits, whereas B1 can be considered relating to interpersonal benefits that can be demonstrated either in-session with the practitioner: B1a or psycho-educationally outside of sessions: B1b. Interpersonal in this sense can be defined as how one interacts not only with other human beings but with the world in general.

Analysis of B1a: In-session Instrumental Attributes

The In-Session 'A-ha Moment – Eureka Effect'

Consideration of where one might want to be on PMA is important not only for engagement during a counselling session whilst using PMA, but also beyond the session in day to day living. This section will focus on the in-session demonstrations and to begin, we will look at a revelatory moment for TS, who informed of a somewhat 'a-ha' moment whilst engaging with PMA in-session. TS informed:

"I never thought about the spectrum between the different viewpoints provided in the model. I would like to be more on the other sides of the inquisition and intuition parts, so to be on the instinct and innocence parts."

The satisfaction of the desire 'to be' on the instinct and innocence parts of PMA would require some action on behalf of TS, and this could be considered instrumental in terms of how they engage with the world for motivational purposes. Such contemplation by TS shows how the interaction with PMA provokes thought on one's identity in relation to their orientation on PMA. Where they want to be on PMA could be expressed as an insight that needs to be challenged by practitioners, as the idea behind PMA is to prevent any sort of fixed identity for clients with the present moment acting as a portal to provoke movement. The idea is not to be permanently affiliated with one area of PMA, whether that includes being located between different areas simultaneously or only in one area. Contemplation beyond sessions should be encouraged and TS appears to be considering a goal in relation to PMA that would need psychoeducational effort which is explored further in B1b.

We can take the information from TS as a reflection of not being content with such an affinity with only the intuition area. Throughout the sessions with the client this could be considered due to the fact that there was much worry of what others thought about the client, but also a sense of over-empathy reminiscent of compassion fatigue in taking on the role in daily life as a 'helper'. As a practitioner, it is not the role to diagnose a client in this sense or telling the client they have a 'Messiah Complex', rather through use of PMA, the role was to increase the client's awareness to help them not necessarily abandon the intuition area, but to not be limited or 'stuck' to that area in their day to day living.

The Interpersonal Dimension with Practitioner

Promoting a healthy balance and movement in PMA is the aim of its therapeutic effectiveness, and it is seen with TS that sometimes getting that movement to commence requires an awareness of where one is on PMA and where one might want to be. Creating goals and encouraging actions to get to where one wants to be on PMA should entail a movement that does not involve a 'reaching' in terms of destination, but rather, a movement of awareness through the present moment. Such awareness aims to prevent inertia and promotes a flow between the different areas of the PMA; a flow that is feasible and congruent with identifications on PMA and in one's actualized real life. BD informed of how PMA could increase their interpersonal communicative strengths, but with the practitioner during the actual session. This was reflective of the gestalt approach with the use of PMA, as the notion of challenging was mentioned by BD as beneficial for increasing communication from themselves to the practitioner and how this could increase their inter-personality. BD informed that:

"you can kind of you know go from one side to the other or once I said something you kind of pushed me to thinking about it from…in regards to intuition or instinct and just…going from one to another and then changing kind of looking at it from different points of view and having…someone kind of beside myself to not push but guide me from one to another I think is really good or like I think that one that came to mind was like a challenge, not in an

aggressive way but to look at it in respect to this part or that part is really good but I think it wouldn't be bad…even after session to have a prompt or a reminder or something to…frame things. I guess that would be good too, but I think especially in session."

Analysis of B1b: Psycho-educational Instrumental Attributes

The Motivational Dimension

Recognizing one's limitations in terms of flow and movement within PMA can be considered instrumental to preventing inertia. Such a feeling of being 'stuck' or in a 'rut' can be detrimental to not only one's self, but also one's relationships. CE communicated how they wanted a healthy relationship between the hypostases of PMA through an orientation to the present moment, and this can be seen in instrumental terms. In order to be more 'useful' for others in virtue of establishing an orientation on PMA that was meant to bring about themselves as an 'end product', CE stated:

"the top one was all about all my intellectual analysing, procrastinating about it, mind. And the bottom one again, subliminal, learned behaviours…It (PMA) brought awareness of these sections and showing me kind of which ones I am using more, in awareness, brought awareness to that…tell me then trying to align these from what I am viewing as potential to get balance with these equal amounts and then to merge and join them together as an end product…To observe my part in it in the intrapersonal, and then to take from that and try and use that as in become aware of what one (realm of the four realms) I am in, and then to try and adjust that…in that present time, in the moment, now, and being in awareness. Bring good to others as it would bring to me."

CE also tended to use metaphors to describe their experience with PMA, and such analogies appeared to reveal connotations that went beyond intrinsic value. 'Moving forward' is a powerful analogy for those who might feel they are 'stuck' in life, in which their choices are limited and their progression toward any sort of purposeful meaning is prevented. CE appears to consider their experience with PMA as a way to provide instrumental value in 'moving forward' and 'propel' themselves forward. This can be interpreted as not just metaphorically speaking, but also literally speaking. The division between mind and body is diminished in this example, as moving the body forward often is required to move the mind forward as well, but also life in general. The PMA appears to be a fruitful catalyst for initiating this movement as CE stated:

"I am liking the organization now that I actually understand because I see it is only just now, is how them four parts (hypostases) of how I was trying to explain, this then has a coming together being in the four being aware of these four elements and as I see in the diagram it shows they knit together to make a square box of a solid…like end…Not a result but a solid vehicle to move forward."

Considering PMA as a form of vehicle to help us 'move forward' informs of its motivational value, and this could be said to manifest itself in lifestyle changes and in

interpersonal relationships. Psycho-educationally, we see PMA is designed to be utilized as a compass that does not need to be merely used and valued in the session, but can be reflected on in everyday life situations.

The Practical Use of PMA in Everyday Life

Whether the actual PMA diagram needs to be referred to from time to time to refresh one's visualization of it for instructional or reflective purposes is needed or if it can be visually summoned when needed subjectively, is a worthy question for further PMA development, but can also reflect one's success with the program of PMA. The latter, considering those who might be able to visualize PMA subjectively without the need of a visual aid, could be said to be those who might have established a greater affinity with it, and could perhaps be said to be more successful with using it as a tool for intra- and interpersonal improvement beyond sessions. SE informs of how they would find PMA to be a tool to be used outside of sessions, as they stated:

"I definitely think it would be handy anytime really, to kind of…notice when you are not in the present and then think ok then which…am I superliminal or transliminal, I think that it is just good to be able to use any in time."

The utility of PMA is seen here to be versatile, in the sense that at any moment in time, we could be confronted with situations where we could benefit from interacting with PMA to increase awareness of self and to consequently reflect or act in accordance with how we truly want to. Such congruence can be considered crucial for the genuineness of the relationships we engage in.

Discussion

The aim of this project was to explore the counselling experiences clients had with PMA and how self-awareness for the clients/participants appeared to be interpreted in different ways through this interaction. One of the ways that PMA can help develop or evolve the theoretical framework of self-awareness as beneficial to human living, is in its capacity to expand the notion of such awareness beyond the superliminal or intellectual realm which much scientific and philosophical literature could be said to support. The abductive reasoning within the research study allowed for the generation of new potential hypotheses deriving from the results which in turn can allow the new potential theories derived from the study to be considered for future research on PMA. Perhaps the most important of these being the specific sort of self-awareness that derives from the usage of PMA itself. Although there was evidence of PMA usage outside of sessions by the participants, more virtual connections with clients (i.e. smartphone applications, websites, and additional research) for psychoeducational engagement could be beneficial for the evolution of PMA. However PMA is not the only approach to include both directive and non-directive strategies in counselling and psychotherapy, it has been shown in this study to have demonstrated a therapeutic versatility with the participants.

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Considerations for running and interpreting a binary logistic regression analysis – A research note

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Abstract

This research note discusses key considerations for analysis of categorical data using a Pearson's chi-square and binary logistic regression. It draws on experience from analysis of a country-level household survey (Northern Ireland Health Survey 2014/15), using SPSSv25, that examined the relationship between household food insecurity status and identified demographic predictors, using Pearson's Chi-Square test to check associations and binary logistic regressions to derive the predictive models. This note presents an overview of the assumptions for both tests which must be satisfied to ensure the tests are appropriate, discusses the usefulness of using Pearson's Chi-Square test as a preliminary test before using binary logistic regression, and presents an overview of how to interpret the output from a binary logistic regression model.

Keywords: Pearson's chi square analysis, binary logistical regression; categorical data; SPSS

Introduction

Binary logistic regression is a useful statistical method which examines and quantifies the predictive association between a range of independent variables and a binary outcome variable. However, if results are to be reliable and applicable, it is important that all assumptions for this test are met before it is applied to the data. This research note provides researchers with a clear overview of how to determine if a binary logistic regression is an appropriate statistical test for your chosen sample (according to satisfied assumptions) and how to interpret the findings from this test. Further, this note considers the use of a preliminary assessment of associations between variables using a Pearson's chi-square test prior to a binary logistic

regression, and provides an overview of the relevant assumptions that must be satisfied to produce reliable results from a Pearson's chi-square test.

Preliminary Pearson's-chi square analysis prior to running a binary logistic regression

Studies in various fields, such as medicine and the built environment, have used the approach of checking associations between predictor variables and the dependent variable using preliminary univariate statistical analysis such as a chi-square test, followed by a logistic regression (Wilcox et al., 2016; Chen and Zhang, 2016; Antwi et al., 2017; Gross et al., 2019). This research note draws upon the example of analysing 2231 cases in a health survey data set (Northern Ireland Health Survey 2014/15) (Department of Health, 2018), using SPSSv25, with the purpose of investigating the predictors of food insecurity. This dataset included fifteen demographic variables which had been linked (to varying degrees) to the dependent variable (food insecurity) in the literature, and through prior data collection with stakeholders in an earlier stage of the study. The author conducted a Pearson's chi square test in the first instance to examine which of the independent variables (predictors) were significantly associated with the dependent variable, with the intention to insert only those significantly associated into the binary logistic regression model. Although it is acknowledged that this preliminary analysis approach is not necessary as the binary logistic regression analysis will ultimately indicate significance, it can be useful as a first point to indicate associations, particularly if there has been little prior confirmed association between variables, as it rationalises their inclusion in the regression model. Furthermore, in cases where there are a large number of variables to begin with, or similar variables, it can aid the researcher in choosing which variables should proceed for further analysis.

Pearson's chi-square test assumptions

The ability of the Pearson's Chi-Square test to properly examine associations, and of logistic regression to efficiently assess the contributions of the predictor variables to the dependent variable depends not only on selecting appropriate predictor variables, but also on ensuring assumptions for these tests are satisfied (Stoltzfus, 2011; Rana and Singhal, 2015). Therefore, before the methods for analysis were confirmed it was checked that the assumptions for the Pearson's Chi-Square and for binary logistic regression using all categorical independent variables were met. Assumptions for Pearson's chi-square test relate to (i) the data being collected at random rather than a convenience sample; (ii) the data in the cells being recorded as frequencies as opposed to percentages; (iii) categories within variables being mutually exclusive, i.e. each respondent was only recorded in one category per variable; (v) independence of study groups; (vi) sufficient sample size (at least 20);

and (vii) no cells with expected count of less than five (McHugh, 2013; Rana and Singhal, 2015). Both the dataset itself, as well as the survey methodology (NISRA, 2019) were examined to confirm these assumptions were satisfied.

Logistic regression assumptions

Assumptions for this test include (i) that the dependent variable is binary in nature, (ii) independence of errors, (iii) absence of multicollinearity, (v) no outliers in the data, and (vi) an adequate number of observations per variable (Stoltzfus, 2011; Pallant, 2016). The dependent variable had previously been recoded to ensure it was binary in nature, thus appropriate for this analysis (Ranganathan et al., 2017). The assumption of independence of errors dictates that there should be no duplicate responses in the dataset (Stoltzfus, 2011). The survey methodology (NISRA, 2019) states responses to be independent of each other and not duplicated, thereby meeting this assumption. An important assumption for logistic regression is the absence of multicollinearity (a high correlation between predictor variables) (Midi et al., 2010; Stoltzfus, 2011; Starkweather and Moske, 2011). Multicollinearity (or collinearity) is a problem because if two variables are highly correlated, the values of one can be predicted by the other, and this will therefore impact upon the regression coefficients and confidence intervals associated with these variables, and subsequently on how they are interpreted (Midi et al., 2010; Johnston et al., 2018). To check this assumption a linear regression was run on the independent variables and the correlation coefficient table (collinearity statistics) (Table 1) was examined to detect any presence of multicollinearity between variables. Collinearity was diagnosed using the Variance Inflation Factors (VIF) test (Miles and Shevlin, 2001; Midi et al., 2010; Thompson et al., 2017). VIF test estimates how much the variance is inflated, and although there is no firm consensus as to the most appropriate cut off point for VIF values (Thompson et al., 2017), generally values above ten are considered to indicate multicollinearity, and this is a common cut off point recommended by statisticians and used in the literature (Lee et al., 2016; Ngema et al., 2018; Johnston et al., 2018). VIF values detected multicollinearity between the Economic Activity and the ILO Employment variable (values of 73 and 135, respectively), therefore the Economic Activity variable was removed from further analysis, and the ILO Employment variable remained as employment status was a more commonly used terminology in the related literature and by relevant stakeholders. The VIF test was then run again without the Economic Activity variable and no multicollinearity was detected. VIF values of lower than three are considered a conservative estimate of VIF values (Thompson et al., 2017; Johnston et al., 2018), which was the case for all values. Tolerance is a related measure of multicollinearity, and smaller values indicate increased likeliness of multicollinearity (Thompson et al., 2017). Tolerance values were checked, and all met the recommended criteria of being greater than 0.20 (Midi et al., 2010; Chen et al., 2018). There should not be any strongly influential outliers as these would bias

predicted outcomes and the overall model (Stoltzfus, 2011; Pallant, 2016). Residual plots were checked, and no influential outliers were detected. A general rule regarding the number of observations per variable is that for every independent variable, there should be no less than ten cases for each binary category (Agresti, 2007; Stoltzfus, 2011). This was checked and it was confirmed that there was an adequate number of observations to avoid problems of an overfit model.

Table 1: Collinearity statistics

	Collinearity Statistics	
	Tolerance	**VIF**
Number of adults in household	0.827	1.209
Number of children in household	0.758	1.319
Gender of respondent	0.954	1.048
Age group of respondent	0.339	2.949
Marital status	0.723	1.382
Tenure (own/rent accommodation)	0.9	1.111
Car/ van available for use by household	0.813	1.229
Highest Qualification level attained	0.528	1.894
General health	0.4	2.502
Carer responsibility for sick/ disabled/ elderly (non-professional)	0.996	1.004
Anxiety/ Depression	0.952	1.05
Employment status	0.007	134.665
Economic Activity	0.014	72.921
Receipt of state benefits	0.885	1.131
Urban/rural location	0.945	1.058

Pearson's Chi-square test of association

Pearson's chi-square tests were used to assess the association between food security status and the predictors identified in the literature and by stakeholders. Pearson's chi-square test is applied to categorical data in order to assess if any observed difference between variables is statistically significant or due to chance (McHugh, 2013; Rana and Singhal, 2015), and has been used in the literature as a first step method of checking associations between predictor variables and the dependent variable before further analysis in a logistic regression model (Chen and Zhang, 2016; Antwi et al., 2017; Gross et al., 2019). This test therefore identified the significance or otherwise of any observed differences between the characteristics of those who were food secure and those who were food insecure. A significance level of p≤0.25 was chosen for this test, as a more relaxed Type 1 error rate is recommended when determining variables to include in a logistic regression model in order to avoid eliminating potentially important variables (Stoltzfus, 2011; Sperandei, 2013; Antwi et al., 2017). Predictors which were not statistically significant were eliminated and not included in the proceeding logistic regression (Figure 1).
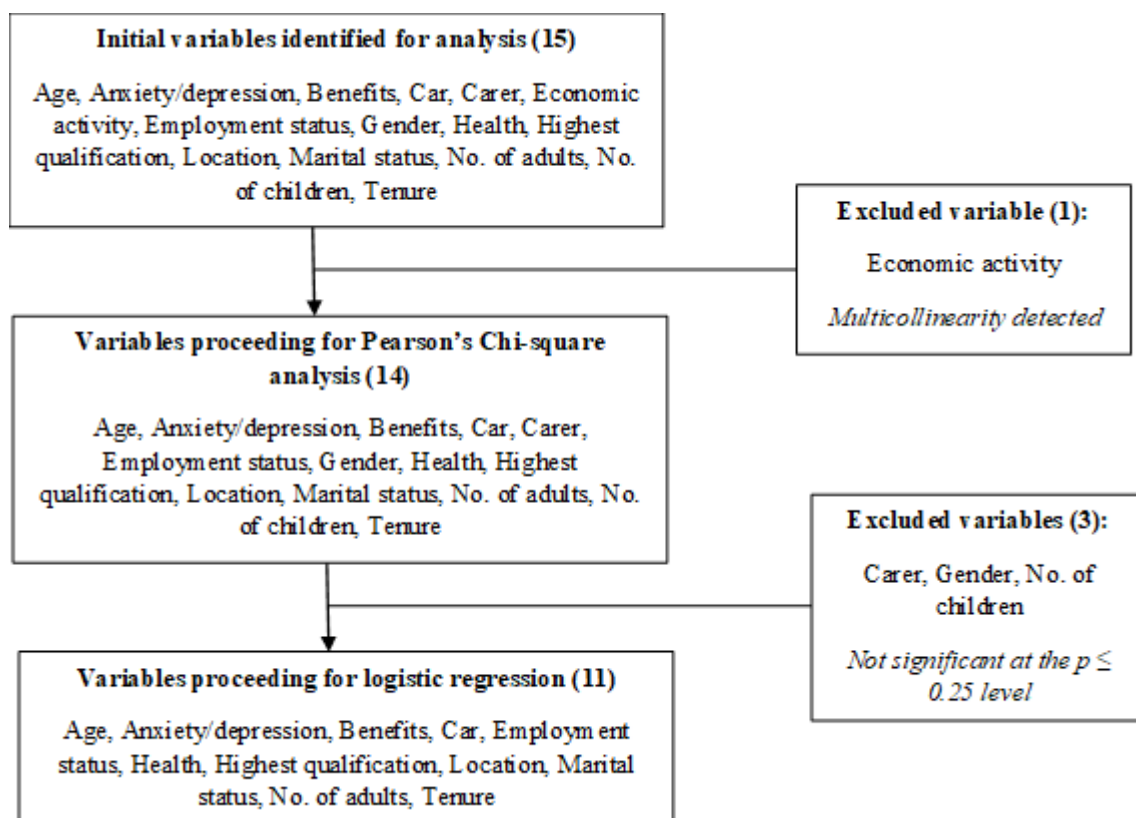

Figure 1: Verification process of the variables for inclusion in regression analysis

Binary logistic regression

Binary logistic regression was carried out to assess significant associations between food security status and the predictors previously identified (Ranganathan et al., 2017). A logistic regression rather than a linear regression was used, as a logistic regression is the appropriate method for analysis of categorical data such as that in this study, while a linear regression is used for continuous data, so was therefore not the appropriate method for this study (Tranmer and Elliot, 2008). Logistic regression is used to produce an 'odds ratio' of a single explanatory variable's (predictor's) effect on the dependent variable in the presence of more than one explanatory variable (Sperandei, 2013), thus creating a framework of a household's odds of being food insecure (or otherwise) according to the predictor variables (Ngema et al., 2018). Although the terms 'odds' and 'probability' are often used interchangeably, odds values are not the same as probabilities, as odds values are not restricted to 0-1, as probability values are (Peng and So, 2002; Tranmer and Elliot, 2008; Sperandei, 2013). Prior to running the analysis, a reference variable for each categorical variable was chosen. This reference variable was either the first or last categorical response in the variable, and was usually the response of null state (e.g. 'no children', 'not in receipt of benefits'), or the response negatively associated with food insecurity in the literature (e.g. own home, good health), to assess how change in variable response affected the dependent variable. Certain variables (number of adults in the household, age group), were recoded prior to analysis to facilitate a certain category in the variable being used as the reference group, in accordance with similar studies in the literature.

Interpreting model output

Results were considered in terms of overall model fit, as well as considering individual variable results. Various inferential tests and descriptive measures were considered when assessing model fit (classification table, likelihood ratio test, Nagelkerke R square, Hosmer and Lemeshow chi-square test, odds ratios).

Whether a case is classified into one or the other binary outcome categories is predicted using estimated probabilities and pre-determined cut-off points (Stoltzfus, 2011). The classification table shows the difference in observed and predicted model values, with better model fit being characterised by a smaller difference between observed and predicted model values (Pallant, 2016). This table displays the percentage of correctly predicted outcomes using the model (Peng and So, 2002), and therefore can be used to evaluate the ability of the model to distinguish between groups (Stoltzfus, 2011).

The likelihood ratio test shows whether the model provides a significant improvement to the null model (Peng and So, 2002), i.e. whether the inclusion of explanatory

variables contributes significantly to model fit. A p-value less than 0.05 shows that the Block 1 model is a significant improvement to the Block 0 (null) model.

The Nagelkerke R Square value assesses the variation in the dependent variable and assesses the proportion of the variance explained by the regression model. It is therefore used to measure the success of predicting the dependent variable using the independent variable (Nagelkerke, 1991). A low Nagelkerke R square value suggests that the model may not be a good fit (Ngema *et al*., 2018).

Better model fit is characterised by a p-value greater than 0.05 resulting from the Hosmer and Lemeshow chi-square test. This test assumes that the model is an adequate fit for the data, therefore this null hypothesis is only rejected if $p < 0.05$ (Ngema *et al*., 2018).

Individual variable results Exp (β) (odds ratio), Exp (β) confidence intervals, and significance values were also considered. Odds ratios (ORs) and their significance were examined to determine the effect of the independent variables on the outcome variable. When using multiple independent variables in a binary logistic regression, the subsequent OR values represent the odds or likeliness of a change in the binary variable related to the independent variable after controlling for the effects of all other independent variables in the model (Stoltzfus, 2011). An OR value of one would indicate that the odds remain unchanged, an OR value greater than one indicates greater odds, and an OR value of less than one represents a decrease in the odds. Therefore if, for example, one variable had a significant OR value of 1.5, this would mean that for those with this variable characteristic, the odds of being food insecure increase 1.5 times, or by 50% (Stoltzfus, 2011). The confidence level for Exp (β) values (OR values) was set at 95%, therefore there is only a probability of 0.05 or less ($p \leq 0.05$) that the value for the OR lies outside of the calculated range. Odds ratio values with a significance level of ≤0.05 were therefore considered significant.

Conclusions

Pearson's chi square test can be used as a preliminary test prior to running a binary logistic regression to check the significance of associations between the dependent and independent variables before they are entered into the predictive model. This preliminary test approach is particularly useful if one is starting off with a large number of independent variables. Before running a Pearson's chi-square test certain assumptions must be satisfied, namely (i) the data being collected at random rather than a convenience sample; (ii) the data in the cells being recorded as frequencies as opposed to percentages; (iii) categories within variables being mutually exclusive, i.e. each respondent was only recorded in one category per variable; (v) independence of study groups; (vi) sufficient sample size (at least 20); and (vii) no cells with expected count of less than five. Before running a binary logistic regression, assumptions which must be satisfied relate to (i) that the dependent

variable is binary in nature, (ii) independence of errors, (iii) absence of multicollinearity, (v) no outliers in the data, and (vi) an adequate number of observations per variable. Logistic regression results can be considered in terms of overall model fit (classification table, likelihood ratio test, Nagelkerke R square, Hosmer and Lemeshow chi-square test), as well as considering individual variable results (odds ratios).

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