Big Five Assessment

PERSONALITY MANUAL

traitify *Life, with personality*

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Introduction

The Traitify Big Five assessment is a new and dynamic visual personality questionnaire. It provides an extremely efficient means of measuring the five main dimensions of personality, while maintaining the accuracy and validity of the results.

It's a fun and interactive way of gathering key personality data. It has applications in any situation where personality drives an aspect of decision making or self-exploration, for example in recruitment, recreation or relationships.

It utilizes Traitify's unique visual format and robust delivery system - a fully scalable system which has to date delivered millions of assessments.

Key Benefits

- The questionnaire is based on over 50 years of international research. It is driven by the most widely recognized and respected model of human personality: the Five Factor Model.
- The Big Five personality domains have been shown to be directly predictive of many aspects of work performance, satisfaction, engagement, leadership potential, motivation, counterproductive work behavior and so on.
- The questionnaire is visual. This means that the 'questions' take less time for the brain to process, and the experience is far more engaging. Typical completion time is 4 minutes, and 90% finish the questionnaire[1].
- The response is a simple "Me/Not Me", a format that makes responding quicker and more decisive. Compared to other questionnaires this also reduces the effects of questionnaire fatigue.
- Unlike traditional questionnaires, Traitify's innovative design means that multiple data points are obtained from each response. Apart from making the questionnaire a highly effective way of gathering information, this also makes it harder to 'game'.
- On-screen results are presented in both a visual and text-based format. Users can drill down into more detail as required, and clear and actionable information is provided. This provides recruiters with the know-how to act, and individuals with powerful personal self-insights.

[1] Completion time is the median time based on a normed sample.

Personality And The Big Five

Overview

Personality is at the heart of how we deal with the world. As individuals our unique personalities are powerful predictors of the way in which we respond across a broad range of different situations.

In short, personality can be seen as the underlying pattern of thoughts and feelings that influence what we are likely to do. For personality to affect our behaviour in this way, it must also be consistent and stable, although obviously it will be influenced by context and culture. That is the situation you find yourself in (at work or home), and what is considered appropriate and acceptable.

At a theoretical level psychologists have studied personality for over 100 years. Comparatively recently, over the last 50 years, a consensus has emerged and there is now agreement that the Five Factor Model (FFM) represents the best structure for human personality. Psychologists agree that these five factors capture the most important and basic personality differences between people; or as some researchers describe them, they are the 'primary colours' of personality (Trickey & Hogan, 1998).

The model is often referred to as the 'Big Five', or OCEAN, and encompasses a set of five broad factors or dimensions, namely: Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism (often labelled as its opposite, Emotional Stability).
Beneath the five dimensions are groups of traits. A person who scores highly on a dimension is more likely to score highly on most of the traits in that dimension, but not necessarily all of them (Crede, Harms, Blacksmith & Wood, 2016). For example a person may score highly on Extraversion and on the social traits (e.g. interactive, friendly) associated with it, but not on the thrill seeking traits (e.g. thrill-seeking, high-energy) which are also associated with it, or vice versa.

The following traits are often associated with, and define, the five dimensions:

Openness to Experience:
Playful, curious, imaginative, creative, open-minded, seeks novelty, forward looking/ visionary.

Conscientiousness:
Orderly, committed, confident (sense of mastery), achievement oriented, reliable, self-disciplined.

Extraversion:
Active, energetic, thrill-seeking, enthusiastic, assertive, interactive, friendly.

Agreeableness:
Accommodating, loyal/trusting, compassionate, altruistic, steady, cooperative, forgiving/tolerant.

Emotional Stability: Calm, even-tempered, positive, resilient/robust, deliberate, easy-going, regulated.

Like many concepts in psychology, there are a number of people who can claim to be the fathers of the FFM, but it's worth mentioning that the original breakthrough came as a result of the re-analysis of work conducted by Raymond Cattell in the late 1940's (Cattell, 1946; Russell & Karol, 1994). He constructed a personality model based on the analysis of natural language. The idea was that a 'lexical' approach would identify an exhaustive list of words used to describe personality, and thus of all the possible personality traits.

The re-analysis was conducted by Tupes & Christal (1961) who found that Cattell's trait data could be summarised as five large and stable factors. Other psychologists, such as Norman (1963), McCrae & Costa (1987), Goldberg (1993), Digman (1990) and Hough (1992) went on to confirm, refine and expand on this finding.

In particular the robustness of the model has been established, and critically it has been replicated across many cultures and languages (De Raad & Perguni, 2002; Costa & McCrae, 2006).

There is also an enormous body of academic and applied research that links personality traits, and the Big Five, with real-world outcomes. For example, there are strong relationships with job performance (Barrick & Mount, 1991; Ones et al, 2007), well-being (Weiss, Bates & Luciano, 2008), health and life expectancy (Friedman & Kern, 2010), and academic achievement (Chamarro-Premuzic & Furnham, 2003).

Personality And Life

To illustrate the richness of the relationship between personality and a range of human attributes, here are some example findings for each of the Big Five factors:

Openness to Experience

Openness is related to a person's in-built values system. People who are 'open to experience' are tolerant and accepting and see everyone as equally deserving of justice and equality (Douglas, Bore & Munro, 2016). It also correlates highly with creativity, originality and introspection, and is found to be very stable over time (Soldz & Vaillant, 1999).

When it comes to the other Big Five factors, openness is weakly related to Extraversion[2]; and is mostly unrelated to Neuroticism, Agreeableness and Conscientiousness (Van der Linden, Te Nijenhuis & Bakker, 2010).

Conscientiousness

Conscientious people respect orderliness, duty, achievement, and self-discipline, and are concerned with increasing their competence. The factor is also related to conformity and tradition (Roccas, Sagiv, Schwartz & Knafo, 2002).

It is highly correlated with learning outcomes (Woods, Patterson, Koczwara, & Sofat, 2016), job performance (Barrick & Mount, 1991), and career success (Judge, Higgins, Thoresen, & Barrick, 1999).

With respect to the rest of the Big Five, Conscientiousness correlates weakly (and negatively) with Neuroticism, and Agreeableness. It does not appear to be related to the other factors (Van der Linden, Te Nijenhuis & Bakker, 2010).

Extraversion

Extroverts are often assertive, active and sociable. They can also be hedonistic, and actively seek excitement and pleasure. Achievement and stimulation are often more important than conforming to particular norms of behaviour or following rules (Roccas, Sagiv, Schwartz, & Knafo, 2002).

Over the course of a life, Extraversion correlates positively with income, being able to adjust to challenges, and having satisfying social relationships. Indeed Extraversion is fairly constant across the years, indicating that Extraversion and introversion are pretty stable, fixed states (Soldz & Vaillant, 1999). Overall, Extraversion is a good predictor of general well-being (Ozer & Benet-Martinez, 2006), a positive attitude to life (Verduyn & Brans, 2012), and confidence in task performance (Schaefer, Williams, Goodie, & Campbell, 2004).

[2] As a 'rule of thumb', a correlation of 0.3 is described as a 'weak' relationship, 0.5 as 'moderate', and 0.7+ as 'strong'. From a predictive perspective, a weak or moderate relationship does not mean that a particular aspect or measure of personality has no utility.

When looked at in relation to the other Big Five factors, Extraversion correlates weakly and negatively with Neuroticism, and weakly and positively with Openness to Experience (Van der Linden, Te Nijenhuis & Bakker, 2010).

Agreeableness

Those with Agreeable personalities place an emphasis on compassion, generosity and trust. They are less concerned with power, achievement or ego-related activities. In reality, the highly agreeable person is motivated by the need to fulfill social obligations, which often comes from a genuine concern with the welfare of others (Roccas, Sagiv, Schwartz, & Knafo, 2002).

Those high in agreeableness are likely to have warm, positive and satisfying relationships, live long lives and give back to their community (Ozer & Benet-Martinez, 2006). Generally high levels of agreeableness are related to good life adjustment (Soldz & Vaillant, 1999).

At the Big Five level, Agreeableness correlates weakly with Extraversion, is negatively related to Neuroticism, and is weakly and positively related to conscientiousness (Van der Linden, Te Nijenhuis & Bakker, 2010).

Neuroticism

Neuroticism, or the lack of Emotional Stability over time, is negatively related to self-esteem, self-efficacy and internal locus of control (Judge, Erez, Bono, & Thoresen, 2002). It is also correlated with low motivation and ineffective goal setting (Judge & Ilies, 2002).

The reactive and impulsive aspects of Neuroticism relate positively to hedonism (pleasure without responsibility) and negatively to benevolence and conformity (Roccas, Sagiv, Schwartz, & Knafo, 2002). Long term research has demonstrated that Neuroticism is related to the inability to cease using alcohol or drugs, being unable to adjust to problems, and with mental health issues (Soldz & Vaillant, 1999.) With regard to the other factors, Neuroticism correlates weakly and negatively with Agreeableness and Conscientiousness. It also has a weak negative relationship with Extraversion and Openness (Van der Linden, Te Nijenhuis & Bakker, 2010).

Personality And Work

The relationship between personality and workplace performance is one of the best established. The Big Five are predictive of both job competencies and more specific work behaviours.

There is a great deal of evidence which supports the influence of personality on career choice, training outcomes, job performance, integrity, counterproductive work behaviour, teamwork, work attitudes and motivation, job satisfaction, attendance, worker turnover, management potential, leadership and occupational health.
Overall the research demonstrates that different patterns of the Big Five map onto different performance criteria, and that as composite predictors - where all the Big Five factors are included - they have predictive power. Specifically they have validities in the 0.41 - 0.54 range[3]. This is illustrated in the Table-1[4] on *page 7*.

Other composite validities include impressive correlations with teamwork, (0.47) and training (0.44) - (Barrick, Mount & Judge, 2001); organizational citizenship (0.43) - (Borman, Penner, Allen &

[3] Correlations run from -1.0 (perfect negative) to +1.0 (perfect positive). Not much, especially continuous attributes like human personality, ever gets close to -1.0 or +1.0. And correlations are not probabilities: 0.6 doesn't mean that something works 6/10 times. The useful thing to know is that the square of the correlation is the proportion of variance in Y that can be accounted for by knowing X, or vice versa. As a reference point, correlations that are greater than 0.3 equate to the top third of all psychological 'effect sizes'.

[4] The figures in the table are meta-analytic correlations, except for the Multiple Rs. Adjustments have been made for low criterion reliability and restriction of range. The * indicates the 95% confidence level. The table is based on a presentation by Timothy Judge (2005).

Motowildo, 2001); goal setting (0.58) - (Judge & Ilies, 2002), intention to quit (0.33) - (Zimmerman, 2008), and so on.

Unpacking other composite validities, various combinations of the Big Five are found to be predictive of more specialized criteria. For example, Conscientiousness, Agreeableness and Neuroticism (Emotional Stability) are specifically correlated (0.41) with integrity - (Ones, Viswesvaran & Schmidt, 1993).

The same factors, but with different weights, are also correlated with customer service (0.39) - (Ones & Viswesvaran, 2001). By way of contrast, sales is mostly a question of Conscientiousness and Extraversion - (Ones, Dilchert, Viswevaran & Judge, 2007); and managerial potential a combination of Neuroticism (Emotional Stability), Extraversion and Conscientiousness (0.42) - (Ones, Hough & Viswevaran, 1998).
All these large scale, mostly meta-analytic studies, provide strong evidence that personality is predictive across a wide range of jobs of different complexities, from skilled and semi-skilled, through to the professions and management.

As Deniz Ones, one of the most respected voices in personality research says:

"Hundreds of primary studies and dozens of meta-analyses conducted and published since the mid 1980s indicate strong support for using personality measures in staffing decisions." (Ones et al, 2007.)

Table 1 - Predictive Validities of Big Five Dimensions

	Motivation	Job Satisfaction	Leadership	Job Performace
Openess	0.09	0.02	0.24*	0.06
Conscientiousness	0.20*	0.26*	0.28*	0.20*
Extraversion	0.16*	0.25*	0.31*	0.09
Agreeableness	-0.17*	0.17	0.08	0.11
Neurotocism	-0.24	-0.29*	-0.24*	-0.13
Multiple R	0.54*	0.41*	0.47	0.47*

The * indicates the 95% confidence level.

Building The Traitify Big Five

Overview

The Traitify Big Five questionnaire is a visual personality questionnaire. It is composed of 73 slides[5]. Each slide contains a colour image, a short text caption, and a "Me/Not Me" response option.

Individual slides are keyed to up to 6 personality traits, and subsets of slides relate to the Big Five personality dimensions. This format is unique and allows the questionnaire to be short, while being reliable and valid. The ability to obtain multiple data points from each slide, and the visual format, result in average performance times for the entire questionnaire of 4 minutes.

Such an efficient method of measuring personality has another important benefit. As it only takes a short time to complete the questionnaire - overall completion rates are typically 90% - the vast majority of people finish the entire questionnaire. This suggests that the questionnaire is immune from the effects of boredom and fatigue, something that is a key issue with long and repetitive text-based questionnaires.

Global completion rates are particularly important in those situations where the questionnaire is being used as part of a recruitment process, or in any situation where psychological data is required at scale.

Visual Format

The distinctive visual format provides a rich 'stimulus' for the questionnaire taker. It is linked to the concept of 'free association' as it elicits personality preferences at many levels of consciousness. In this way the response to a slide can be considered to be more automatic than that to a traditional, completely verbal questionnaire. The use of a visual format, and being able to tap into a more authentic reaction to the stimulus, also provides for very quick responding. This is unsurprising because of the dominance of vision as a human sense.

Indeed research at MIT suggests that the brain can process entire visual images in as little as 13 milliseconds; a number that is 60,000 times faster than that for text (MIT, 2014).

Extensive text, as it is used in text-only questionnaires, is also likely to create a 'processing barrier' for some people, especially those who are not psychologically savvy or who have limited self-awareness.

Me/Not Me

The "Me/Not Me" response is also designed to ease responding. The decision making load is light as it invites the individual to move toward or away - identify or not identify - with a particular image. The use of a binary approach also makes the decision decisive; with shades of responding being taken care of by the underlying structure of the questionnaire - especially the fact that each slide relates to more than one trait.

The fact that each slide relates to more than one trait also makes the questionnaire harder to 'game'. Individuals may have a surface impression of what is being measured but will not be able to determine the full list of underlying traits. In this way the response format helps to control for a variety of potential biases including 'social desirability'.

The presence of this design feature means that the questionnaire does not need to contain a scale to detect socially desirable responding - which may, of

[5] As long as it is psychometrically reliable, a short questionnaire is not necessarily less predictive than a long questionnaire. In many cases short questionnaires can outperform their longer counterparts (Thalmayer, Saucier & Eigenhuis, 2011.)

course, include not telling the truth. This is further supported by research that suggests that elaborate 'validity' scales do not in fact work! (Piedmont, McCrae, Riemann & Angleitner, 2000)

Design Process

The design process for the questionnaire mirrored the way in which any other questionnaire would be constructed. It was composed, developed and ultimately refined through a series of iterative data analyses. The process can be briefly summarized in five steps:

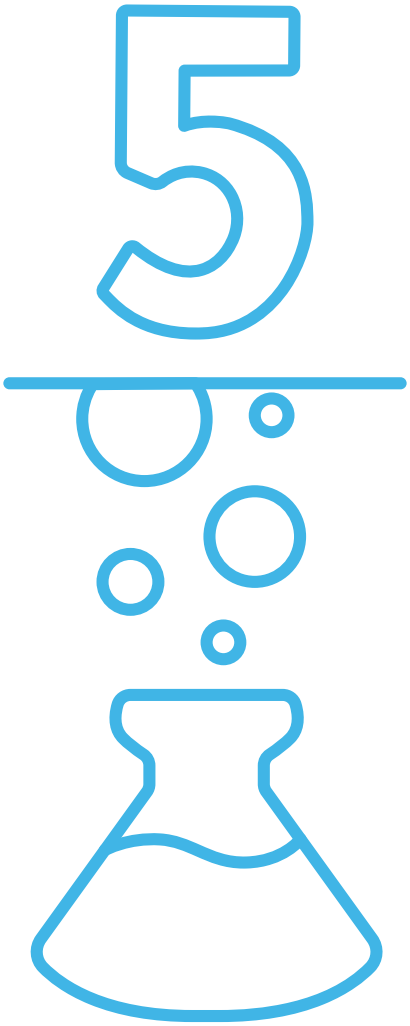
Step 1 - Background Research

The questionnaire is firmly rooted in the Five Factor Model (see ***Personality And The Big Five*** on *page 4*) and so builds on decades of personality research. In refining the trait structure of each of the dimensions, the designers - which included psychologists and psychotherapists - explored a range of current long and short-form text-based questionnaires.

These included trait-based questionnaires like the NEO-PIR (Costa & McCrae, 2006), 16PF5 (Russell & Karol, 1994), HPI (Hogan & Hogan, 1992) and OPQ32 (SHL, 2000), and type-based questionnaires like the MBTI (Myers & Myers, 1980; Myers & McCaulley, 1985) - all of which are long form questionnaires; and the BFI (John, Donahue & Kentle, 1991), IPIP-NEO (Johnson, 2014), NEO-FFI-3 (Costa & McCrae, 1992) and TIPI (Gosling, Rentfrow & Swann, 2003) - short or very short form questionnaires.

The designers also consulted Traitify's own extensive bank of psychological traits, and brought to bear their extensive knowledge of psychodynamic theory, trait-based psychology and applied behavioural science.

The aim of this step was to identify the traits that best described each of the Big Five dimensions, while ensuring sufficient depth and breadth of coverage.



Step 2 - First Main Trial

A trial questionnaire was constructed using Traitify's proprietary visual format. This involved assigning traits to dimensions in such a way that there could be an overlap of traits between slides, and within a personality dimension; but not between dimensions. In addition, the creative team researched images that would best illustrate the slide concept, in terms of both trait description and text caption. Often this involved balancing image and caption, and if a suitable image could not be found the slide was redesigned.

The prototype questionnaire trialled in December 2016 and early January 2017 on a group of 96 participants and a range of statistics were calculated.

These involved an examination of endorsement rates, and slides with very high or very low rates were flagged for discussion, alteration, and possible negative keying (negative scoring). Score distributions and descriptive statistics were also analyzed to explore the effective range of scores and whether the score distributions were unduly skewed.

At the same time it was possible to calculate the internal consistencies for each of the five factors and to check that these were in excess of 0.7 (the accepted standard).

Likewise the inter-correlations between dimensions were computed, and the data were factor analyzed, to ensure that the factors were distinct from each other; i.e. it was expected that the correlations between dimensions would be low, and that the correlations (and clustering) of traits within dimensions would be high.

The aim of this step was to generate empirical evidence that could be used to refine and focus the questionnaire.

Step 3 - Intermediate Trial & Revision

An intermediate trial was conducted in July 2017 on a national sample of 117 US participants.

The questionnaire was refined once again and a number of slides with poor psychometric properties were removed.

The major changes included adding a number of additional slides that were projected to have endorsement rates in the mid-range, rather than at the extremes. Additionally work was conducted to re-balance the questionnaire in terms of scoring, by ensuring a spread of positive and negatively keyed items. Note that this is also a way of controlling for 'response sets', i.e. of limiting the effects of those who always respond in a particular direction, irrespective of questionnaire content.

The aim of this step was to construct the best possible questionnaire on the basis of the statistical evidence, while adding in some potential redundancy in the form of a number of additional 'research' slides.

Step 4 - Second Main Trial

The data from this trial, on the final selection of slides, are described in the technical sections. Essentially this trial allowed for the standardization of the questionnaire and for a set of representative norms to be calculated. In addition, it was used to generate a final set of internal consistency figures and other meaningful psychometric indicators.

The second trial also yielded test-retest statistics, and evidence of construct validity, i.e. that the questionnaire was effectively measuring the Big Five.

The aim of this step was to finalize questionnaire content.

Step 5 - Ongoing Development

As the design process is an iterative process, and as new sets of data become available, the Traitify team will recalculate all the key statistics and compare the performance of the questionnaire across different groups and populations.

This will also allow ideal job profiles to be constructed when data from sufficient numbers of candidates are available, i.e. to develop cut-off scores for each of the five dimensions for specific work sectors like sales, customer service, hospitality, accounting, administration and so on.

The aim of ongoing development is to 'tune' the questionnaire and maximize its utility, reliability and validity.

Using The Traitify Big Five

Overview

Traitify allows organizations of any size to assess the Traitify Big Five questionnaire immediately via a SaaS model or by a simple API integration.

SaaS

The Traitify SaaS product allows for organizations to get up and running very quickly. Organizations are given a unique URL they can distribute to their users. The product can be configured to collect any information needed before users are given access to the questionnaire. Users can take the Big Five questionnaire as well as the other questionnaires that Traitify offers. The product can be configured to show the user their results or not.

Administrators are given a suite of tools that will help them analyze their users in a number of ways. Users can be searched and grouped from the user list. The questionnaire results can be analyzed on our Insights page in groups or per individual. Administrators can compare users against other users or groups of users. When viewing a user's profile, the administrator is given full insight into the results of the questionnaire and can even be given a fit score that is created against industry or company benchmarks.

API

One of Traitify's advantages over other questionnaires is its API. The Traitify API allows for the assessment to be administered in any way that the organization sees fit. There are Javascript widgets that allow an organization to embed the questionnaire in whatever way they wish - a website, an intranet, a mobile app, part of their recruiting process and many others. The API also allows organizations to collect results and use them for any purpose they wish, some examples would be for guiding cultural direction of their company, analyzing their customers, and guiding candidates during the recruitment process.

The API is simple, intuitive, and packed with intelligent ways to get organizations up and running quickly, while allowing them to present something comfortable and familiar to their brand.

Traitify Big Five Dimensions

Overview

The narrative descriptions for each of the Traitify Big Five dimensions are provided below. Other aspects of the on-screen feedback generated for recruiters/ individuals are described briefly in ***On-Screen Feedback*** on *page 18*.

Narrative Descriptions

The following are the narrative descriptions of each of the Traitify Big Five dimensions. They have been organized under their related competency title, e.g. in a work sense 'Openness' relates to 'Solving Problems'. The 'High' (STEN 8-10), 'Low' (STEN 1-3) and 'Medium' (STEN 4-7) descriptions are provided in each case. The method for converting to STEN scores from raw scores is described in ***Scaling the Traitify Big Five Results*** on *page 21*.

The descriptions are in the third person; a first person version is also available. They also contain a list of 'potential benefits' and 'possible pitfalls' that relate to each dimension. A list of the underlying traits is provided in Appendix-1.

Solving Problems

Solving Problems (Openness) concerns how someone thinks about work problems, projects and challenges, how receptive they are to new or different information or approaches, and the way this influences their decision-making.

{High score description STEN 8-10}

The candidate appears to be very open-minded and to prefer approaching problems in original and creative ways. They are likely to think of many different ways of solving a problem and to enjoy pushing the boundaries of what is possible. This may involve looking at things from a completely original angle, or simply being able to have "fun" with the possibilities. Because they tend to be visionary, they are likely to imagine how a particular decision will play out in the future. Their big-picture capacity leaves them less concerned with the details. They will probably base their decisions on a 'wide-angle' (strategic), future-oriented and intentionally unique view of what is possible.

Potential benefits:

- Creative thinker
- Makes rapid connections
- Develops new approaches
- Sees the big picture
- Looks to the future
- Capacity to be visionary

Possible pitfalls:

- May have 'head in the clouds'
- May not work systematically
- May reinvent the wheel
- May miss some of the detail
- May not learn from the past
- May resist structured approaches

{Low score description STEN 1-3}

The candidate appears to take a very pragmatic approach to solving problems. They are likely to use familiar, tried-and-tested methods and are more comfortable working with established guidelines or principles. This will often involve looking at problems from a practical and grounded perspective, and seeing the value in approaches that are immediately useful. Probably their decisions will be made in the here-and-now and they will prefer to continue with what they know already works, maybe with some fine-tuning. Their emphasis will be on the facts or details, and decisions will probably be made on a finely observed and immediate (tactical) view of what is possible.

Potential benefits:
- Practical thinker
- Works methodically
- Uses tried-and-tested methods
- Keen eye for detail
- Experience-based approach
- Seen as stable and predictable

Possible pitfalls:
- May not think of a 'better way'
- May not make intuitive leaps
- May not try new approaches
- May not see the bigger picture
- May miss future possibilities
- May seem 'closed-minded'

{Medium score description STEN 4-7}
The candidate appears to take a balanced approach to solving problems. They are likely to be able to think of new and original ways of approaching situations, but not at the expense of ignoring well-established solutions, already known to work. This will often involve investigating problems by taking an open-ended view of what might work, and not being afraid to change things if necessary. Most likely, they will have an eye on whether something will be effective both now and in the future. The emphasis will probably be on juggling the facts and making changes, large or small, in order to make a decision that will stand the test of time.

Potential benefits:
- Pragmatic thinker
- Works to maintain the system
- Flexible problem solver
- Sees detail and bigger picture
- Brings experience to strategy
- Tends to be cautious

Possible pitfalls:
- May over rely on middle way
- May work too slowly
- May be too quick to change style
- May find it hard to focus
- May confuse knowledge with foresight
- Can err on the side of caution

Delivering Results

Delivering Results (Conscientiousness) concerns work style and how someone directs their efforts and attention toward completing tasks. The level of discipline, dedication, perseverance, organization and reliability are hallmark factors of this dimension.

{High score description STEN 8-10}
The candidate seems to be the sort of person who likes a clear structure organizing what they do. This helps them to focus on what is important. In many ways their concern is with 'how' they approach tasks, and in their case this is likely to be with a strong sense of self-discipline and the ability to work towards longer term goals. Their results indicate they are able to work steadily towards something and appreciate that sometimes it can take a considerable amount of time to achieve a meaningful objective. They are likely to pay as much attention to the end of the project as to the beginning. Their view of how things should be done is likely to be reinforced by their confidence in their own abilities, and a wish to do their best for themselves and for other people.

Potential benefits:
- Structured work style
- Identifies key goals
- Focuses on task at hand
- Wants to achieve
- Sense of commitment
- Tolerant of tedious details

Possible pitfalls:
- May use an overly rigid approach
- May settle on goals too early
- May not re-prioritize tasks
- May set impossibly high standards
- May commit to the wrong objective
- May not know when to stop

{Low score description STEN 1-3}
The candidate seems to be the sort of person who prefers to approach tasks in a flexible and often swift manner. This helps them to change things as they go along and to react to events as they occur. They are not particularly driven by systems and convention and are likely to have their own view of what constitutes a job well done. Their spontaneous nature probably means they want to see rapid results from their work, and are eager to see how things turn out. They may prefer short-term projects to longer term ones. This also suggests they may postpone tasks they consider unnecessary or unpleasant. This view of how work should be done is reinforced by the fact that they may well feel restricted if they have no scope to change tasks. Additionally, they are likely to be more confident when they can just 'do it their own way'.

Potential benefits:
- Flexible work style
- Quick to pivot goals
- Focuses on process
- Wants to see results
- Critical of purpose
- Values the end goal

Possible pitfalls:
- May not follow a plan
- May change course too soon
- May not focus on the task
- May sacrifice quality for speed
- May over-complicate purpose
- Intolerant of tedious details

{Medium score description STEN 4-7}
The candidate seems to be the sort of person who prefers to weigh the extent to which tasks need to be structured, organized and planned. They are likely to be aware of the fact that there are things that need to be approached in a highly methodical manner, and equally, that there are occasions when action is more important than following a pre-planned approach. Based on their results, they seem to be the sort of person who can measure out the energy they invest in tasks, ramping up more when they have to do things they would normally avoid. This view of how work should be done is reinforced by the fact that they are likely to commit to tasks when they feel fully invested in the outcome, and it's this sense of ownership that gives them the confidence to do their best work.

Potential benefits:
- Balanced work style
- Continually prioritizes goals
- Focuses on process and task
- Wants to achieve
- Committed to shared outcome
- Flexible work style

Possible pitfalls:
- May be slow to select suitable style
- May tend to leave things too open
- May not leave space for change
- May confound achievement with delivery
- May not commit without ownership
- May not prioritize end goal consistently

Engaging With People

Engaging with people (Extraversion) concerns someone's interest, investment and comfort in developing relationships with others - customers, clients, work groups or colleagues.

{High score description STEN 8-10}
The candidate seems to be the sort of person who seeks out and enjoys being with other people. Typically, they find it stimulating to have lively discussions with others, and may even enjoy getting a reaction by saying or doing entertaining things. When it comes to the energy they put into life, they're probably at the front of the line when there is an exciting challenge up for grabs. As such they are a 'do-think-do' kind of person who has plenty of enthusiasm and stamina, and a real thirst for getting out there and making their mark.

Potential benefits:
- People oriented
- Approachable
- Fun loving
- Energetic
- Fast to act
- Intense

Possible pitfalls:
- May find it hard to work alone
- May get too close too quickly
- May misjudge what is appropriate
- May not channel energy efficiently
- May not reflect before acting
- May be easily bored

{Low score description STEN 1-3}
The candidate seems to be someone who would prefer to operate alone or with limited interaction with others. They like to keep their own counsel and do not have a strong need to express their views or opinions. When it comes to the energy they put into life, being both self-contained and reflective, they are generally quite happy in their own world. That is not to say they are disinterested in other people - rather that they are likely to prefer one-on-one or small group interactions that feel more manageable. Larger groups can be draining for them and, therefore, they need time alone to recharge. Overall they may show a low level of visible energy because they have a reflective 'think-do-think' approach to getting things done.

Potential benefits:
- Independent worker
- Dispassionate
- Thoughtful
- Measured
- Thinks before acting
- Contemplative

Possible pitfalls:
- May find it hard to work in large teams
- May appear rather cool
- May find it difficult to act instinctively
- May not ramp up energy, when needed
- May over-think before acting
- May be too 'inside' their own head

{Medium score description STEN 4-7}
The candidate comes across as someone who is comfortable in social situations, but who also knows when to withdraw for periods of quiet reflection. Their results indicate that they are likely to be able to adapt their interpersonal approach, depending on the situation, with the result that they are able to connect easily with different types of people. However, they are just as likely to be found lost in thought as they are lost in conversation! When it comes to the energy they put into life, they're content being where the action is, but are also able to vary their level of enthusiasm so that they don't come across as being too attention-grabbing. Generally, they're the kind of person who has a good idea of the amount of excitement they would like - however, they can find too much 'down-time' demotivating.

Potential benefits:
- Socially skilled
- Quick to connect
- Fun oriented
- Energetic
- Thinks and acts
- Enthusiastic

Possible pitfalls:
- May be a bit of a Chameleon
- May crowd more reserved people
- May tip too far towards the limelight
- May get bored with low energy situations
- May think and forget to act, or vice versa
- May get bored with 'down-time'

Influencing People

Influencing people (Agreeableness) concerns the way someone balances their emotional understanding of other people, and their respect for differing

viewpoints, with the style in which they try to influence or negotiate with them.

{High score description STEN 8-10}
The candidate's view is that they are someone who is accommodating and open to the opinions of other people. This suggests that they tend to trust other people, and can be depended on to have a consistent and forgiving viewpoint. Their results indicate that they are very loyal, and build relationships with other people based on mutual respect. Other people's needs are likely to influence their dealings with them, and they will often be the person who is striving for a harmonious outcome. They are tuned in to those around them and are motivated by the ultimate welfare of other people. This will guide the way in which they negotiate, and as a rule they are likely to avoid confrontation and promote good feeling.

Potential benefits:
- Accommodating
- Trusts other people
- Looks for 'win-win' result
- Non-confrontational
- Negotiates through harmony
- Attuned to others

Possible pitfalls:
- May be too eager to comply
- May be naïve about others' motives
- May not drive a hard enough bargain
- May avoid what needs to be said
- May accept a below standard outcome
- May be over-influenced by others' feelings

{Low score description STEN 1-3}
The candidate's view is that they are someone who is questioning of other people and their opinions. This suggests they can be quite skeptical, and need to be convinced of a person's integrity before building a relationship with them. In their book, it would seem that loyalty has to be earned. Their results indicate that they are independent-minded and quite willing to pursue their own agenda. When it comes to their dealings with other people, they are likely to push for what they want and tend to be competitive and at times impersonal. This means they will probably come across as being firm-minded and not easily swayed by feelings of sympathy for others. They are likely to be quite happy to confront things head on, and can cope with criticism.

Potential benefits:
- Questioning
- Skeptical
- Wants to win
- Speaks honestly
- Negotiates impersonally
- Confronts comfortably

Possible pitfalls:
- May over-prioritize logic over feeling
- May not give the benefit of the doubt
- May not value cooperation
- May damage relationships
- May miss what people really want
- May hurt or anger others

{Medium score description STEN 4-7}
The candidate's view is that they are someone who has a mature and streetwise view of other people and their views. Their first instinct is likely to be to trust other people, but they do know that others can let them down. Thus, while they are a loyal friend and colleague, they do not take everything on trust. Their results indicate that they tend to have an attitude towards others that is built on openness, and a view that people are imperfect and sometimes need help. Therefore, when they deal with other people, they will search for a mutually acceptable outcome, because they know ultimately that we all need to work together. In this way, they are probably able to be direct, but are also able to temper their approach with sensitivity for what will keep relationships healthy and intact.

Potential benefits:
- Realistic view of others

- Recognizes imperfection
- Looks for win-win outcome
- Relational style
- Negotiates with sensitivity
- Forgiving style

Possible pitfalls:
- May appear too open-minded (to others)
- May let sympathy get in the way
- May not go for the optimal personal win
- May not always be objective enough
- May lose out to very assertive colleagues
- May be viewed as a 'pushover' by others'

Managing Pressure

Managing pressure (Emotional Stability) concerns the manner in which someone deals with pressure and the way in which they control their emotions and underlying tension, in order to stay on task and cope with everyday challenges.

{High score description STEN 8-10}
The candidate appears to respond to pressure by taking everything in their stride. The little irritating things in life do not seem to worry them. Perhaps they are best described as being relaxed and easy-going, and not as someone who feels discouraged by the comments of others. Their results indicate that when it comes to managing their feelings they are likely to be able to contain them, and to react to situations in a supremely calm manner. They probably let things flow over them that would make many people feel anxious. In fact, their friends and colleagues might well describe them as extremely 'unflappable'. By and large, they feel well able to deal with most of what life hands them.

Potential benefits:
- Very calm style
- Low level of tension
- Quickly lets go of criticism
- Keeps feelings in check
- Copes with everything
- Understated about emotions

Possible pitfalls:
- May not respond quickly enough
- May lack motivation to act
- May not learn from mistakes
- May be difficult to read by others
- May not ask for help when it's needed
- May be viewed as indifferent

{Low score description STEN 1-3}
The candidate appears to respond to pressure by letting things get to them - both large and small. Perhaps they are best described as a bit of a worrier, and may often feel discouraged and be overly sensitive to comments from other people. That being said, a degree of tension is useful in order to get things done. However, it's important to be consistent and to actively manage feelings. Their results indicate that they are sensitive, have a lot of nervous energy and may act impulsively at times. They may also feel indecisive, something that other people may interpret as them having a very changeable mind. They often feel swamped by the challenges they have to contend with each day, maybe as a result of having a very highly tuned sense of the world around them.

Potential benefits:
- Highly tuned to the world
- Uses tension to prime action
- Takes onboard criticism
- Wears feelings on sleeve
- Understands when cannot cope
- Highly aware of others' emotional states

Possible pitfalls:
- May not screen out irrelevant information
- May be frozen by excessive tension
- May take criticism far too personally
- May over-share feelings with others
- May be an inconsistent colleague
- May be swamped by others' emotions

{Medium score description STEN 4-7}
The candidate appears to respond to pressure in a relaxed way but also knows when to take things seriously. They seem to be able to let minor irritations

go. Their results indicate that they are someone who is generally calm, and not the sort to dwell on things, but who is also 'on guard' at times. They listen to other people and take note of what they say, but are not prone to letting criticism interfere with what they do. When it comes to managing their feelings, they tend to respond to situations in a measured manner, as they have a good understanding of their ability to cope. Indeed their friends and colleagues might well describe them as even-tempered and positive. By and large they probably feel well able to deal with most of what life hands them.

Potential benefits:

- Even tempered
- Low level of tension
- Takes onboard criticism
- Manages feelings
- Copes with most things
- Aware of others' emotional states

Possible pitfalls:

- May not show real feelings
- May lack energy to act quickly
- May not take criticism seriously enough
- May appear too unresponsive
- May be slow to ask for help
- May be distracted by others' emotions

On-Screen Feedback

The individual or hiring manager can access personality results at a number of different levels of detail.

The standard screen contains a radar plot (based on STEN scores) of each of the five dimensions. The results for each of the five dimensions are then provided as a short text description. The user can then drill down to an extended description if desired. The extended description also contains 'Potential benefits' and 'Possible pitfalls' for that individual; the results for each of the underlying traits presented as percentages; possible 'complements' and 'conflicts' with other personalities; and preferences with regard to work environment.

If individual results are being used to compare an individual with a particular job/career, a percentage match is provided at the top of the page. This is based on a customized algorithm developed by Traitify.

Experienced users can also access an administration page which provides additional information and functionality.

Standardization

Overview

In most contexts users of questionnaires want to know how people compare to the general population, or with each other, on a standard scale of measurement. To provide this sort of information it is necessary to standardize the questionnaire against a large and representative sample of the general population.

The process of standardization establishes that the results obtained from a questionnaire can be interpreted against a relevant and meaningful distribution of scores.

Standardizing The Traitify Big Five

The questionnaire was standardized in August 2017 on 942 members of the US general population. The sample was identified by the online sampling and data collection company, Research Now, and participants were invited to complete the questionnaire online.

As part of the same project participants were also invited to complete the Big Five Inventory (BFI) (John, 1991) and the IPIP-NEO (Johnson, 2014), as part of the validation process for the questionnaire - see *Validity* on *page 24*.

The standardization statistics relating to gender, ethnic origin, age and education are described in the tables below. Additionally 168 participants (17.8%) identify as Hispanic.

Table 2 - Gender

	Number	Percentage
Male	465	49.4%
Female	473	50.2%
Not Stated	4	0.4%
Total	**942**	**100%**

Table 3 - Ethnic Origin

	Number	Percentage
American Indian or Alaska Native	8	0.8%
Asian	41	4.4%
Black or African American	164	17.4%
Two or More Race	34	3.6%
White	649	68.9%
Other	38	4%
Not Stated	8	0.8%
Total	**942**	**100%**

Table 4 - Age

	Number	Percentage
18 - 30 years	260	27.6%
31 - 40 years	206	21.9%
41 - 50 years	166	17.6%
51 - 60 years	130	13.6%
60+ years	180	19.1%
Total	**942**	**100%**

Table 5 - Education

	Number	Percentage
Advanced Professional Degree	49	5.2%
Associate's Degrees	126	13.4%
Bachelor's Degree	351	37.3
Elementary or High School (only)	9	1.0%
High School Diploma	197	20.9%
Master's Degree	152	16.1%
Trade School	46	4.9%
Not Stated	12	1.3%
Total	**942**	**100%**

The mean and standard deviations of raw scores for the standardization sample are as follows:

Table 6 - Means and Standard Deviations (SD) for sample

Dimension	Mean	SD
Openness	53.19	18.62
Conscientiousness	61.45	19.33
Extraversion	50.08	26.13
Agreeableness	60.10	18.45
Emotional Stability	54.55	21.21

Scaling The Traitify Big Five Results

The standard scale of measurement adopted by Traitify is the Standard Ten Scale (STEN). This is used to convert raw scores to scale scores in many mainstream personality questionnaires. It allows results to be reported on a 10 point scale - a ten point scale being in tune with the granularity of the personality attributes being measured.

Mathematically it involves transforming a raw score into a z-score, and then converting the z-score to a STEN score.

The equation for calculating a z-score is: z = (raw score - population mean) / population standard deviation

For example, if the population mean is 50 and the standard deviation is 5, and a person scores 60, the z-score is: (60-50) / 5 = 2. Thus a raw score of 60 is 2 standard deviations above the mean.

To discover where this number lies on a 10-point STEN scale, the following equation is used:

STEN score = (z x standard deviation of STEN scale) + mean of STEN scale.

The mean of a STEN scale is always 5.5 and the standard deviation is always 2. So to continue the example, a z-score of 2 would be a STEN score of 9.5 (or 10, rounded up). That's (2 x 2) + 5.5.

Practically this tells us that a standard score of 10 puts the person in question at the 'high' end of the scale, compared to other people, for this particular aspect of personality. This is based on the convention that a STEN score of 1-3 is described as 'low', 4-7 as 'medium', and 8-10 as 'high'.

In terms of the normal distribution a 'medium' result is +/- one standard deviation from the mean. A 'low' result is below one standard deviation from the mean, and a 'high' result above one standard deviation from the mean.

Reliability

Overview

The concept of reliability refers to the internal consistency of the items (questions) that form each of the scales in a questionnaire, and also the stability of the questionnaire over time. This can be thought of as 'accuracy' but only in this sense of the likelihood of getting a consistent result from a questionnaire each time it is completed, not whether it actually measures what it is intended to measure - that's a question of validity.

The most common way of measuring the internal consistency of the items in a questionnaire is to calculate a statistic called Cronbach's Alpha. This looks at whether the items that comprise a scale have high inter-correlations with each other, and with the total score for the scale. In this way a high coefficient alpha indicates that the items are likely to be measuring the same attribute, whereas a low scores indicates that they are measuring different attributes.

Stability statistics, on the other hand, provide evidence that a questionnaire is measuring attributes that are stable over time. In this case a low number (coefficient) indicates that the attributes being measured are themselves changeable or specific to particular situations; or that people respond - for whatever reason - in different ways when they are asked to complete a questionnaire more than once. In this case the statistic to note is the test-retest coefficient.

The reliability statistics for the Traitify Big Five questionnaire are based on the standardization sample (Details are provided in ***Standardization*** on *page 19*).

Internal Consistency

Table 7 on *page 23* presents the internal consistency results for each of the five dimensions. All the dimensions demonstrate high levels of internal consistency (alpha > 0.7).

Test-Retest Reliability

Tables 8 and 9 on *page 23* show the test-retest results for each of the dimensions. In both cases all the dimensions show acceptable levels of reliability when the number of items in each dimension is taken into account (EFPA, 2013). In the first case the test-retest was six to eight weeks, in the second retesting was within one week.

The second set of figures are based on a random sample of data gathered during 2018. These were calculated because it was observed that many people complete the questionnaire more than once, often within a short time period, in order to confirm their results. As the figures provide relatively modest increments over the six to eight week figures, and are not excessively high, it is reasonable to assume there are no significant memory effects influencing the results.

Table 7: Alpha coefficients for each dimension (N=942)

Dimension	Alpha Coefficient
Openness	0.90
Conscientiousness	0.90
Extraversion	0.94
Agreeableness	0.90
Emotional Stability	0.92

Table 8: Test-retest coefficients for each dimension (N=505)

Dimension	Test-retest Correlation
Openness	r = .69**
Conscientiousness	r = .71**
Extraversion	r = .77**
Agreeableness	r = .68**
Emotional Stability	r = .66**

** p<.01.

Table 9: Test-retest coefficients for each dimension (N=801)

Dimension	Test-retest Correlation
Openness	r = .73**
Conscientiousness	r = .77**
Extraversion	r = .78**
Agreeableness	r = .71**
Emotional Stability	r = .73**

** p<.01.

Validity

Overview

The concept of validity concerns whether or not a questionnaire measures what it is intended to measure. From an academic point of view there are a number of different types of validity, but the two that are of most interest are construct and criterion-related validity.

Construct-related validity is about whether a questionnaire is measuring aspects of personality that are consistent with the definition of a particular dimension or scale, for that questionnaire. For example, if a questionnaire has a scale designed to measure Extraversion, its validity addresses whether or not it is measuring Extraversion rather than something else!

To establish construct-related validity, which is also sometimes known as convergent validity, it is usual to compare a questionnaire with a number of other 'reference' questionnaires, i.e. reputable questionnaires that are already known to measure one or all of the Big Five personality dimensions.

In contrast, criterion-related validity looks at whether the scores on a questionnaire are predictive of some form of external criteria. In a work context this would be whether there is a relationship between the scores on the Big Five personality dimensions and work performance. This is usually explored by asking people, in employment, to complete a questionnaire, and then to correlate the results from the questionnaire with performance criteria that are available at the same time, i.e. concurrently.

Construct Validity

In August 2017 the Traitify Big Five research questionnaire was completed online by a representative sample of the US general population. The sample was balanced in terms of gender, ethnic origin, age and education.

The same people also completed the Big Five Inventory or BFI (John, Donahue & Kentle, 1991) and the IPIP-NEO (Johnson, 2014). These two Big Five measures are often used to validate new questionnaires.

In total, useable data was received from 942 people who completed the Traitify Big Five. Of these, 921 completed the Traitify Big Five and the BFI, and 915 the Traitify Big Five and the IPIP-NEO.

The data gathered from the study allowed the designers to explore the performance of each of the questionnaire 'slides'. In particular:

- The relationship between each of the individual core traits and the slides designed to measure that trait, within a dimension.
- The summative relationship across all the slides relating to each of the Big Five dimensions, for various combinations of slides.

Examining this data, and as appropriate, the raw endorsement rates for each slide (percentages for those responding "me/not me"), meant that the content of the questionnaire could be refined. In particular, a small number of 'low performing' slides were removed (O -1; C -4; E -1; A -2; ES -1).

This means that the final validity figures are based on a rationalization of the questionnaire in terms of content, with regard to its performance against the US general population.

Table 10 - Correlations of Traitify Big Five with BFI and IPIP-NEO

Traitify Dimension	Number of Core Traits	Number of Slides Per Dimension	BFI	IPI-NEO
Openness	6	16	0.52**	0.57**
Conscientiousness	6	16	0.56**	0.57**
Extraversion	6	13	0.70**	0.75**
Agreeableness	6	16	0.54**	0.56**
Emotional Stability*	6	12	-0.63**	-0.63**
Total Slides/Items	-	73	44	120

*The Traitify B5 questionnaire measures Emotional Stability. The BFI and IPIP-NEO measure Neuroticism. This is the opposite of Emotional Stability, hence the negative relationship.

** p<.01.

Five Key Points

- *The correlations between the Traitify Big Five and the BFI and IPIP-NEO, which are both traditional 'verbal' questionnaires, are remarkably consistent.* This is encouraging because the BFI is an example of a 'short' questionnaire, like the Traitify Big Five; and the IPIP-NEO of a 'long' questionnaire, of the sort that is typically used in recruitment and development activities.

- *The strength of the correlations compare favourably to validity studies for other 'short' questionnaires.* For example, the 60-item NEO FFI (a potential competitor to the Traitify Big Five), produces the following correlations with the 15FQ+ (a highly reputable 200-item personality questionnaire): O (0.55), C (0.69), E (0.66), A (0.59), N (0.57) - Psytech International, 2002.

- *The strength of the correlations is also comparable to ultra-short 'verbal' questionnaires.* For example, correlations between the Ten Item Personality Inventory (TIPI) and the 240-item NEO PI-R are: O (0.56), C (0.68), E (0.65), A (0.59), N (-0.66) - Gosling, Rentfrow & Swann, 2003.

- *Any variations in the strength of relationships between the Traitify Big Five and the BFI and IPIP-NEO reflect slight differences in the definitions of the five dimensions.* For example, the strength of the correlations is as expected for questionnaires that are measuring similar trait definitions of O, E, A and N (ES). That for C is slightly lower.

- *However, the Traitify Big Five is not simply designed to mimic other questionnaires.* This is reflected in the way in which dimensions are defined. A good example is Conscientiousness (C). The Traitify definition includes 'orderliness', like other questionnaires, but greater emphasis is given to sustained effort and wanting to do something well (quality). This means that lower correlations would be expected with questionnaires that give more weight to the self-organization aspect of conscientiousness.

Traitify Big Five Inter-correlations

Table 11 presents the inter-correlations for the five personality dimensions. The correlations are based on trait summation scores.

These results compare favourably with those from other short-form questionnaires. For example, in the BFI and IPIP-NEO, C is relatively highly correlated with A (0.49; 0.55) and the inverse of ES (N) (-0.48; -0.61); and N with E (-0.41; -0.54) and A (-0.48; -0.35). In all cases the Traitify Big Five intercorrelations are lower for C (with A, 0.22; with ES, 0.43) and ES (with E, 0.32; with A, 0.17.)

In addition, those Traitify Big Five dimensions with sizeable correlations are in the direction that would be expected. To take two examples, it is usual for Emotional Stability (-N) to be significantly correlated with Conscientiousness and Extraversion.

Finally, given the size of the sample it is unsurprising that all of the correlations show statistical significance.

Criterion-Related Validity

The Big Five criterion-related validity results, which have been obtained from a broad range of customers, indicate predictivity across a number of business sectors. Naturally figures vary as they are a product of the predictor (the questionnaire) and the quality and extent of the criterion data.

At a practical level Traitify aims to gather performance data from all new customers. This data is obtained directly from customers in the form of performance ratings or via a survey provided by Traitify. In the latter case, managers or supervisors are asked to rate employees against a number of work performance scales.

Traitify's customers include food service businesses as well as those in hospitality, grocery, retail, warehousing, and customer support, spanning multiple job categories from line worker to manager. Clearly there is a range of performance criteria across these roles. However, in the period 2017-2018, multiple statistically significant correlations have been obtained. These range from 0.164 to 0.581, across different types of performance ratings such as customer satisfaction, manager ratings of overall performance, customer engagement, work quality and reliability. See ***Appendix-2*** for further information.

In addition, and when it is available, Traitify uses termination data as a criterion. For instance, using a 2018 sample of 4,381 retail workers, we were able to use logistic regression to significantly predict likelihood of being terminated (R^2=0.016, $p<0.01$). In this case employees who were very high in Extraversion and lower in Openness were more likely to be terminated.

It's important to note that third party studies have also produced significant results. A 2018 study using call center workers, and a range of independent ratings, provided a predictive validity figure of 0.236*, using overall performance as the criteria. This was supported with figures for ratings of customer service of 0.246*, professionalism of 0.368**, and against the employer's own internal employee rating of 0.227* (Note: *$p<0.05$, **$p<0.01$).

Table 11 - Intercorrelations Between Traitify Big Five personality dimensions

	Openness	Conscien-tiousness	Extraversion	Agreeableness	Emotional Stability
Openness		0.20*	0.37*	0.17*	0.14*
Conscientiousness			0.36*	0.22*	0.43*
Extraversion				0.22*	0.32*
Agreeableness					0.17*
Emotional Stability					

N=942. *Significant at the 0.01 level.

Structure

Overview

An additional way of exploring the underlying structure of a questionnaire is to conduct a factor analysis. In the case of a Big Five questionnaire this is a method for understanding whether it is best described by five distinct factors (dimensions), and whether the traits that constitute each dimension appear logically associated with that dimension.

A Principal Component Analysis (PCA) with Varimax rotation was conducted using the data from the standardization sample. In the first instance, an analysis was conducted in which Eigenvalues of greater than 1 were permitted. (The Eigenvalue being a scalar property - a magnitude - associated with a set or matrix of linear equations.)

The first iteration produced a six factor solution. However on examination the sixth factor did not make sense given the allocation of traits.

A second iteration forced a five factor solution. This solution was far more parsimonious with all the traits loading on the expected dimension. (See Table-12)

There was only a small overlap between some of the C traits (Ambitious: 0.35; Confident: 0.42; and Can Delay Gratification: 0.32) and the ES dimension. (See *Appendix-3: Rotated Component Matrix* for the Traits on *page 38*) However given the relationship between C and ES (-N), especially with reference to other short-form questionnaires, this makes intuitive sense.

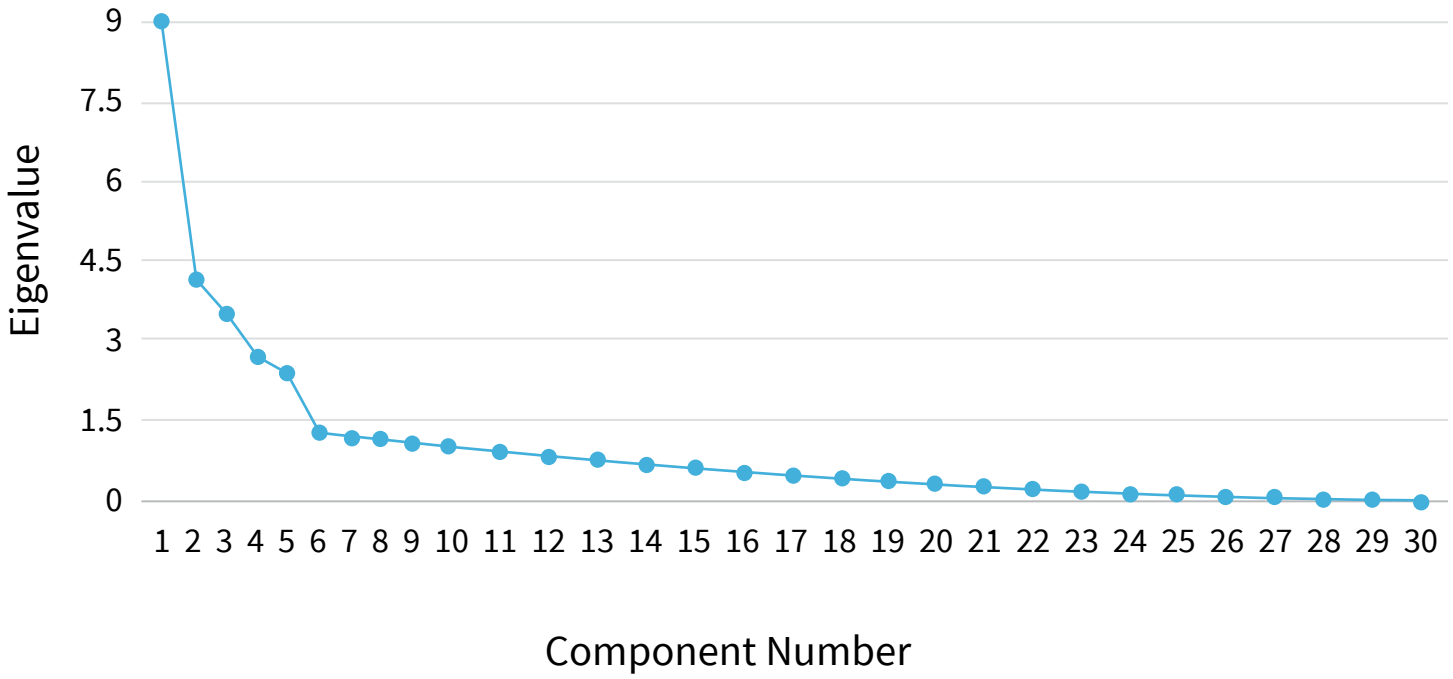
In addition, the Scree Plot Table-13 on *page 29* shows that the first five factors have variances (Eigenvalues) greater than 1. Indeed they are all above 2. This strongly suggests that five factors explains most of the consistent variability in the data.

To summarize, the data relating to the intercorrelations between the five dimensions, and the PCA, confirm that the Traitify Big Five questionnaire is composed of five distinct personality dimensions.

Table 12 - Rotation Sums Of Squared Loadings For Five Factor Solution

Component	Total	% of Variance	Cumulative %
1 (E)	4.81	16.0	16.0
2 (ES)	4.62	15.4	31.4
3 (O)	4.31	14.4	45.8
4 (A)	4.17	13.9	59.7
5 (C)	3.99	13.3	73.0

Table 13: Scree Plot



Fairness

Overview

Our goal is to use carefully designed 'ideal' profiles to aid in the selection of candidates for jobs by setting cut-offs within a profile without adversely affecting members of protected groups. The assessment is designed to be used conservatively to select out only those with the poorest fit to the 'ideal' profile and is therefore unlikely to be used in a way that could lead to adverse impact.

The representative US sample of 942 participants taking the Traitify Big Five questionnaire was used to look for significant differences in each of the five dimensions based on gender, ethnic origin, and age.

Gender Differences In The Big Five Dimensions

The table below shows the mean and standard deviations for each of the five dimensions broken down for men and women. Cross cultural research on the Big Five finds that women typically score higher than men on Conscientiousness, Extraversion and Agreeableness and lower on Emotional Stability (Schmitt and colleagues, 2008). In our sample, there were no significant gender differences for Openness, Conscientiousness or Extraversion. However, as expected on average women scored higher than men on Agreeableness and lower than men on Emotional Stability.

Table 14: Means and Standard Deviations for Each Traitify Big Five Dimension for Males and Females

	Females		Males	
Traitify Dimension	Mean	SD	Mean	SD
Openness	53.12	19.43	53.29	17.82
Conscientiousness	61.41	18.45	61.56	20.26
Extraversion	50.99	25.94	49.26	26.34
Agreeableness**	63.34	17.83	56.93	18.56
Emotional Stability**	51.31	21.70	57.88	20.26

**The mean difference is statistically significant; p<.01.

Age Differences In The Big Five Dimensions

The following table shows the correlations between each of the Big Five dimensions and age. There was a small but significant negative correlation between Openness and age, so Openness to new experiences decreases slightly with age. Additionally, there were small but significant positive correlations between both Conscientiousness and age and Emotional Stability and age, so both Conscientiousness and Emotional Stability increase slightly with age. Extraversion, on the other hand, was uncorrelated with age.

Table 15: Correlations of Traitify Big Five With Age

Traitify Dimension	Age
Openness	r = .18**
Conscientiousness	r = .17**
Extraversion	r = -.02
Agreeableness	r = .12**
Emotional Stability	r = .18**

**p<.01

Ethnicity Differences In The Big Five Dimensions

Four of the ethnic groups (Asian, Black or African American, White, Two or More Races) had a large enough sample sizes ($n \geq 10$) to make valid comparisons. One-way ANOVAs with post hoc tests were used to compare means on each of the Big Five dimensions for these four ethnicity groups. Analyses revealed no significant differences of Ethnicity for Conscientiousness ($F3.884 = 1.23$, $p > .05$), Agreeableness ($F3,884 = 1.35$, $p > .05$), or Emotional Stability ($F3,884 = 0.49$, $p > .05$). For Extraversion, even though the ANOVA was significant ($F3,884 = 2.99$, $p < .05$), Tukey HSD post hoc tests revealed no significant differences between any of the ethnicity groups. For Openness the ANOVA was significant ($F3,884 = 4.12$, $p < .01$) and both the Tukey HSD and the Tamhane (used when variances are unequal between groups) post hoc tests revealed that those who identified as Two or More Races scored significantly higher on Openness than those who identified as White. No other groups were significantly different from one another. The following table reports the means and standard deviations for each ethnicity group for each Big Five Dimension.

Table 16: Means and Standard Deviations for Openness by Ethnicity

	Asian		Black or African American		White		Two or More Races	
Traitify Dimension	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Openness	55.59	14.62	54.35	17.72	52.12+	19.18	62.74+	16.34
Conscientio-usness	64.72	15.55	61.58	19.64	61.11	19.72	66.54	16.24
Extraversion	54.24	24.15	53.60	25.72	48.74	26.02	58.11	28.88
Agreeableness	59.30	13.18	61.53	18.45	59.77	18.42	65.44	22.15
Emotional Stability	58.48	18.06	55.16	21.30	54.31	21.47	58.15	20.80

+Means are statistically significantly different from one another.

Finally, we compared those who consider themselves as being from Hispanic origin with those who did not. There were no significant differences in means for these two groups across any of the Big Five dimensions

Table 17: Means and Standard Deviations for Each Traitify Big Five Dimension for Those of Hispanic Origin and Those Not of Hispanic Origin

	Hispanic Origin		Not Hispanic Origin	
Traitify Dimension	Mean	SD	Mean	SD
Openness	53.43	17.62	53.05	18.94
Conscientiousness	63.70	19.17	61.22	19.47
Extraversion	53.31	26.77	49.78	25.93
Agreeableness	61.69	19.73	60.06	18.16
Emotional Stability	55.53	20.42	54.67	21.33

Note: For all five dimensions $p > .05$.

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Appendix-1: Traitify Big Five Trait Descriptions

O

Creative: original, artistic and imaginative.
Open-minded: having a mind receptive to new ideas or ideas contrary to one's own beliefs.
Playful: free thinking and fun-loving.
Visionary: can imagine how actions and ideas pursued in the present will affect the future.
Whimsical: values the capricious aspects of an activity.
Imaginative: able to think symbolically and play with ideas.

C

Ambitious: having a strong desire to achieve.
Can delay gratification: can manage and delay one's appetites and desires.
Committed: to pledge oneself to a position on an issue or to another person.
Confident: having a sense of one's worth (a sense of mastery/competence).
Self-discipline: the ability to make yourself do things that you think should be done.
Orderliness: valuing organization and logic.

E

Friendly: warm and easily approachable and engaging.
Attention-seeking: provoking a response from others.
Interactive: prefers the company of other people.
Enthusiastic: experiencing a lively interest in something.
Thrill-seeking: craving excitement.
High-energy: possessing high stamina and motivation.

A

Altruistic: devoted to the welfare of others or the greater good.
Compassionate: feeling deep sympathy and sorrow for others who are misfortunate.
Forgiving: allowing room for error or weakness in others.
Accommodating: willing to do what someone else wants.
Loyal: devoted to 'friendships' with important others.
Steady: dependable, even and consistent.

ES (N-)

Calm: an internal sense of peacefulness.
Positive: thinking that a good result will happen.
Easygoing: can 'go with the flow' and adjust preferences when needed.
Robust: strong, resilient and healthy.
Deliberate: careful and measured in deciding and acting.
Regulated: able to modulate and cope with one's changing emotional state.

Appendix-2: Example Predictive Validity Coefficients

Industry	Criterion	Sample Size	Multiple R	Significant Dimensions
Customer service (Recruiter Call Center)	Voice and Chat (online) ratings	965	0.396** (Position and B5 as variables)	O* E**
Food service (Restaurant)	Front of House mean performance	653	0.164**	C* E**
Food service (Restaurant)	Front of House mean performance	229	0.230**	O (p=0.067) E**
Food service (Restaurant)	Back of House mean performance	90	0.321 (p=0.099)	O* A (p=0.089)
Food service (Restaurant)	Overall manager rating	408	0.173*	C**
Food service (Restaurant)	Back of House performance rating	125	0.303*	O (p=0.077) C** A*
Hospitality (Hotel Management)	Customer online reviews	188	0.247*	C (p=0.06) ES*
Storage (Call Center)	Sales	35	0.581*	O* E (p=0.103)

Appendix-3: Rotated Component Matrix for the Traits

	Extraversion	Emotional Stabiliy	Openess	Agreeableness	Conscien-tiousness
creative	.114	.024	.865	.034	-.017
openminded	.163	.071	.790	.097	.152
playful	.239	-.038	.829	.074	.036
visionary	.019	.214	.751	.020	.067
whimsical	.044	.074	.855	-.005	-.068
imaginative	.290	-.098	.738	.121	.163
ambitious	.071	.352	.092	.143	.762
committed	.073	.122	.167	.081	.841
confident	.173	.423	.163	.126	.651
selfdisiplined	.172	.021	.011	.019	.864
orderliness	.198	.024	-.151	.049	.679
delaygrtification	.083	.319	.140	.087	.847
attentionseeking	.881	.153	.168	.132	.137
thrillseeking	.644	-.024	.323	-.086	.188
enthusiastic	.892	.140	.169	.043	.154
friendly	.842	.263	.042	.175	.098
highenergy	.906	.053	.208	.038	.154
interactive	.832	.260	.062	.153	.078
accommodating	.033	.130	.073	.858	.109
altruistic	-.110	.128	-.029	.814	-.001
compassionate	.179	.013	.063	.643	.057
forgiving	.249	.027	.168	.783	.100
loyal	-.116	.065	-.056	.821	.070
steady	.272	-.047	.123	.744	.087
calm	.159	.841	.052	-.027	.095
positive	.038	.839	.001	.007	.149
robust	.071	.886	-.034	.011	.073
deliberate	.160	.709	.102	.064	.247
easygoing	.089	.831	.007	.207	.132
regulated	.196	.721	.134	.080	.167

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.*
*Rotation converged in 6 iteration.