SENTIO

MATCHING PEOPLE TO POSSIBILITIES.

SENTIO

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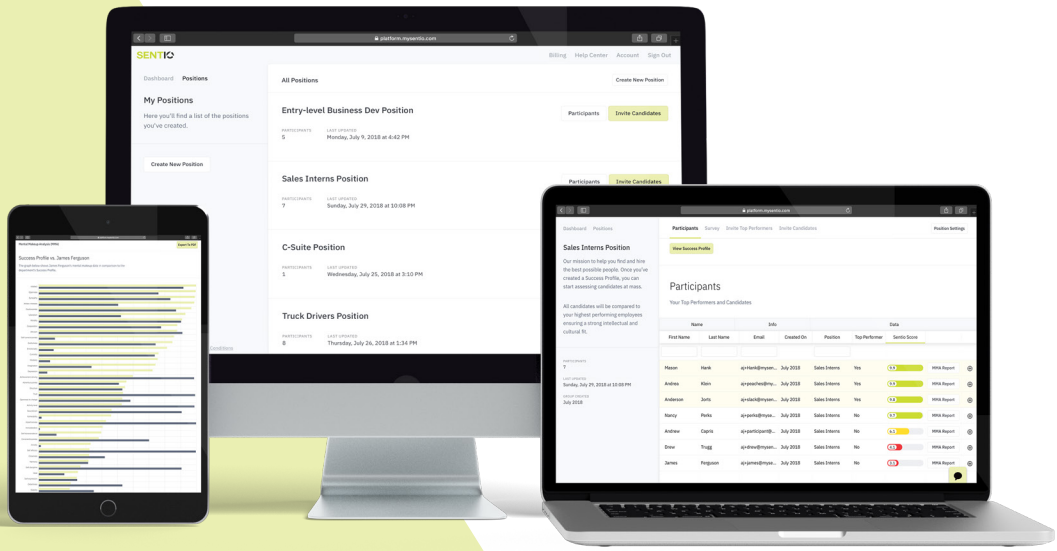
Executive Summary

SENTIO is a self-service, multilingual online hiring platform that offers predictive personality tests for 1/1000th the cost of traditional assessments. What SENTIO does is very simple in principle, but very difficult in practice. Using artificial intelligence and psycholinguistics, SENTIO matches the mental makeup of candidates to your highest performing employees.

The result is better hires, a more engaged workforce, and less turnover.

Companies in the United States spent nearly $430 billion last year on hiring. Despite these resources, thwe average turnover rate surpassed 42% with some industries exceeding 100%. The current hiring process is broken and has remained virtually unchanged for centuries. It is biased, time-intensive, expensive, and ineffective. If your employee is not energized by your company's culture, values and mission, the relationship will be short lived. SENTIO helps you determine who is a strong intellectual and cultural fit, and who is not.

SENTIO's simplicity and low cost brings the well-established power of assessments to every size company and every position. Just as the c-suites of Fortune 500 companies make informed hiring decisions, a local coffee shop can use SENTIO's world-class assessments to hire the best possible baristas.



SENTIO vs. Other Assessments

SENTIO is completely compliant and validated with all governing bodies, offers a service that decreases a company's liability to hiring related lawsuits, and utilizes a science that has been researched for 80+ years.

SENTIO, however, is very different than existing assessment solutions. Aside from the low cost and platform simplicity, the most significant feature is SENTIO's proprietary Success Profile. A "Success Profile" is the aggregate mental makeup data of your organization's top performing employees. In simplest terms, SENTIO determines the collective needs, values, and characteristics of your top performers and uses that as a benchmark to assess all future candidates.

Traditional assessment tools presume to know what it takes to be successful in every organization. They overgeneralize position requirements, and claim that all salespeople, as an example, have the same personality traits from company to company and industry to industry.

What we know to a mathematical certainty is that every culture is different. Every job is different. Every position has different responsibilities with equally different pressures and success requirements. Does a used car salesman have the same mental makeup as someone who sells nonprofit software? No.

Instead of making broad claims, SENTIO understands and supports every unique culture by giving companies the ability to hire the best possible people with tailored reports and Success Profiles.

COST EFFECTIVE.

SENTIO is 1/1000th the cost of traditional assessments. Personality tests typically cost $250. SENTIO costs, on average, just 25 cents per candidate.

SENTIO is 100% self-service. Our tests do not need to be administered, scored, or interpreted by a consultant or authorized dealer. You are in control!

SENTIO is designed for every position. SENTIO is built for every position spanning from the C-Suite to the fast food counter.

SENTIO is designed for every company. SENTIO is currently being used by companies ranging from Fortune 500 to local shops.

> *"Our goal is to augment our hiring and promotion decisions with data that helps us determine someone's propensity to be successful in our company. I look forward to continuing our engagement with SENTIO and watching them grow!"*
>
> – VP of Talent, Security Company

DATA DRIVEN.

SENTIO is unique to your organization. Every company gets tailored reports based on their company's unique culture and success factors.

SENTIO can be used earlier in the hiring process. SENTIO saves companies time by screening candidates earlier and reducing bad interviews.

SENTIO uses cutting edge technology, leveraging artificial intelligence to provide world class reports and analyses.

> *"This data saves our company money in training and turnover costs. I have enjoyed working with the SENTIO team and would highly recommend their services to other companies."*
>
> – Director of Talent Acquisition, Software Company

The SENTIO Process

SENTIO was built to be intuitive and simple for hiring managers. Users can typically create an account and build their first Success Profile in under five minutes. SENTIO is a completely self-service platform, but we offer extensive customer support via the SENTIO knowledge base and in-app chat.

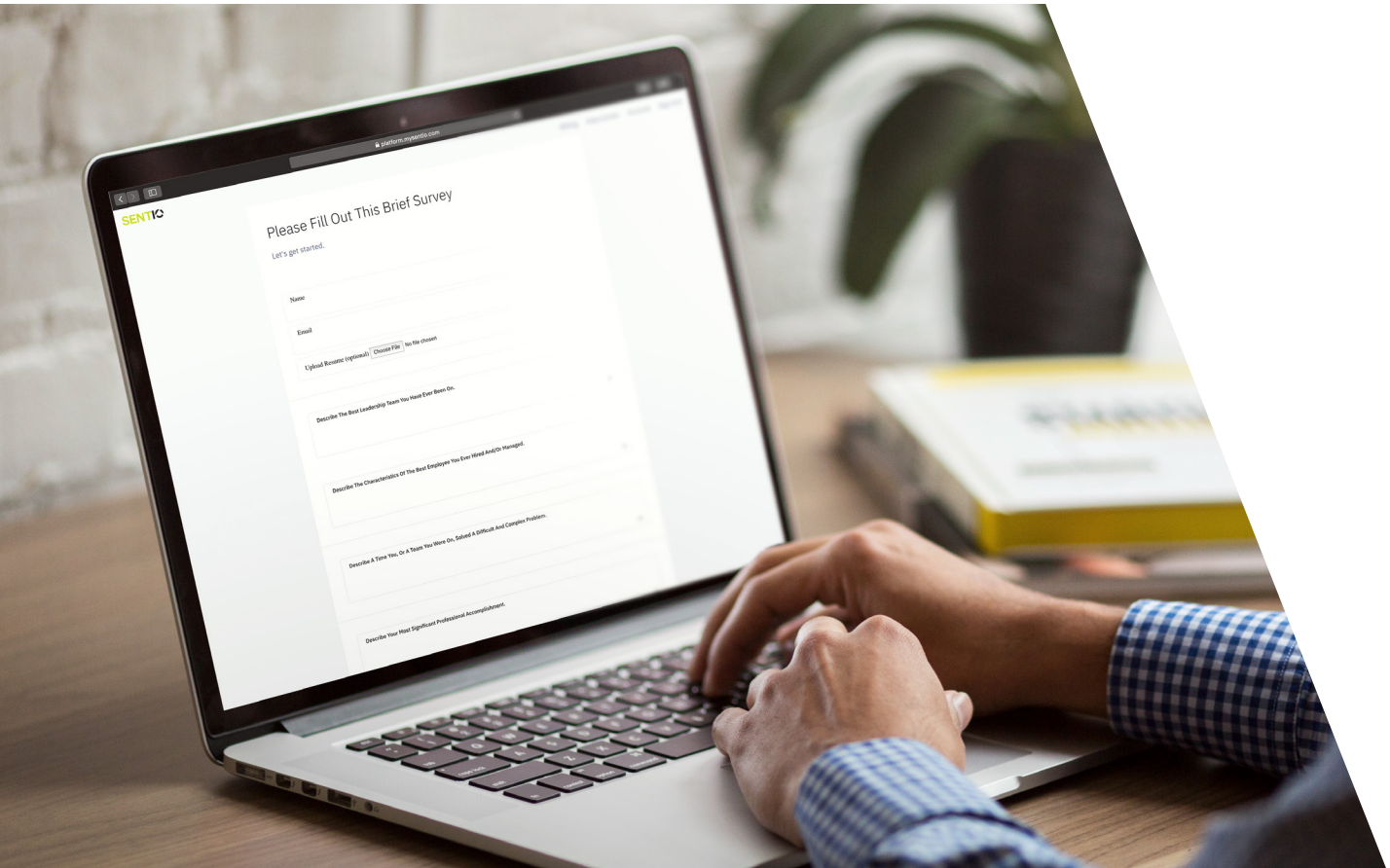
STEP 1: INVITE TOP PERFORMERS TO COMPLETE THE SENTIO SURVEY

You are prompted to send the SENTIO survey to their top performers through the SENTIO platform. You have the option to pick from different SENTIO surveys based on the position type. The surveys are composed on nine thought provoking free form questions designed to illicit natural organic language. It can be administered in 5 different languages.

The survey takes roughly 15 minutes to submit and can be completed on mobile or desktop devices. It collects all the required information to build full mental makeup analyses. Although the average candidate will submit between 300 and 400 words per survey, SENTIO only needs 100 words to run a full report. SENTIO will not allow a user to submit a survey with fewer than 100 words.

English	Korean	Japanese	Arabic	Spanish

**Please note that all SENTIO reports, regardless of the survey language, will be built in English.*



STEP 2: SENTIO AGGREGATES THE DATA AND BUILDS A "SUCCESS PROFILE" FOR THAT POSITION

SENTIO discovers the shared needs, values, and personality characteristics of top performers and uses it as a benchmark to compare all future candidates.

SENTIO's technology breaks down the survey responses into mathematical values using artificial intelligence and the science of psycholinguistics. It then reassembles the data into fifty five (55) independent mental makeup traits per top performer. Using a complex algorithm, SENTIO combines all of this complex data from the top performers to discover which characteristics are shared. The algorithm is trained to weight traits that are the most prominent amongst the top performers and de-emphasize traits that are not common.

Table A is a simplified outline of how SENTIO builds a Success Profile with three top performers.

	CONFIDENCE	EXTRAVERSION	TRUST	ANGER
Top Performer A	.561	.221	.289	.986
Top Performer B	.540	.879	.311	.818
Top Performer C	.574	.578	.115	.857

The most consistent trait, which is defined as having the least variance, is confidence (.56, .54, .57). The least consistent trait is extraversion (.22, .88, .58). SENTIO, therefore, knows that "confidence" is more important than "extraversion" because all top performers have very similar "confidence" data. These top performers are not similar in "extraversion" and therefore "extraversion" is not as important to the Success Profile. It is not shared by all of the top performers. When a candidate is compared to this particular Success Profile, SENTIO will weight the candidate's "confidence" score more heavily the "extraversion" score.

SENTIO knows that extraversion isn't a requirement for a successful employee in this example otherwise the top performers would share similar scores.

Just as every position and every company is different, no two Success Profiles are the same. For best use, we recommend creating a Success Profile for every role at your company. This will ensure that the company hires the best possible people for every open position since the mental makeup of top performers varies from one position to another. As an example the top engineers at your company are most likely mentally different from the top performers in your marketing department. Every candidate is given a score for every active Success Profile in your company's account.

STEP 3: SENTIO COMPARES CANDIDATES TO THE SUCCESS PROFILE

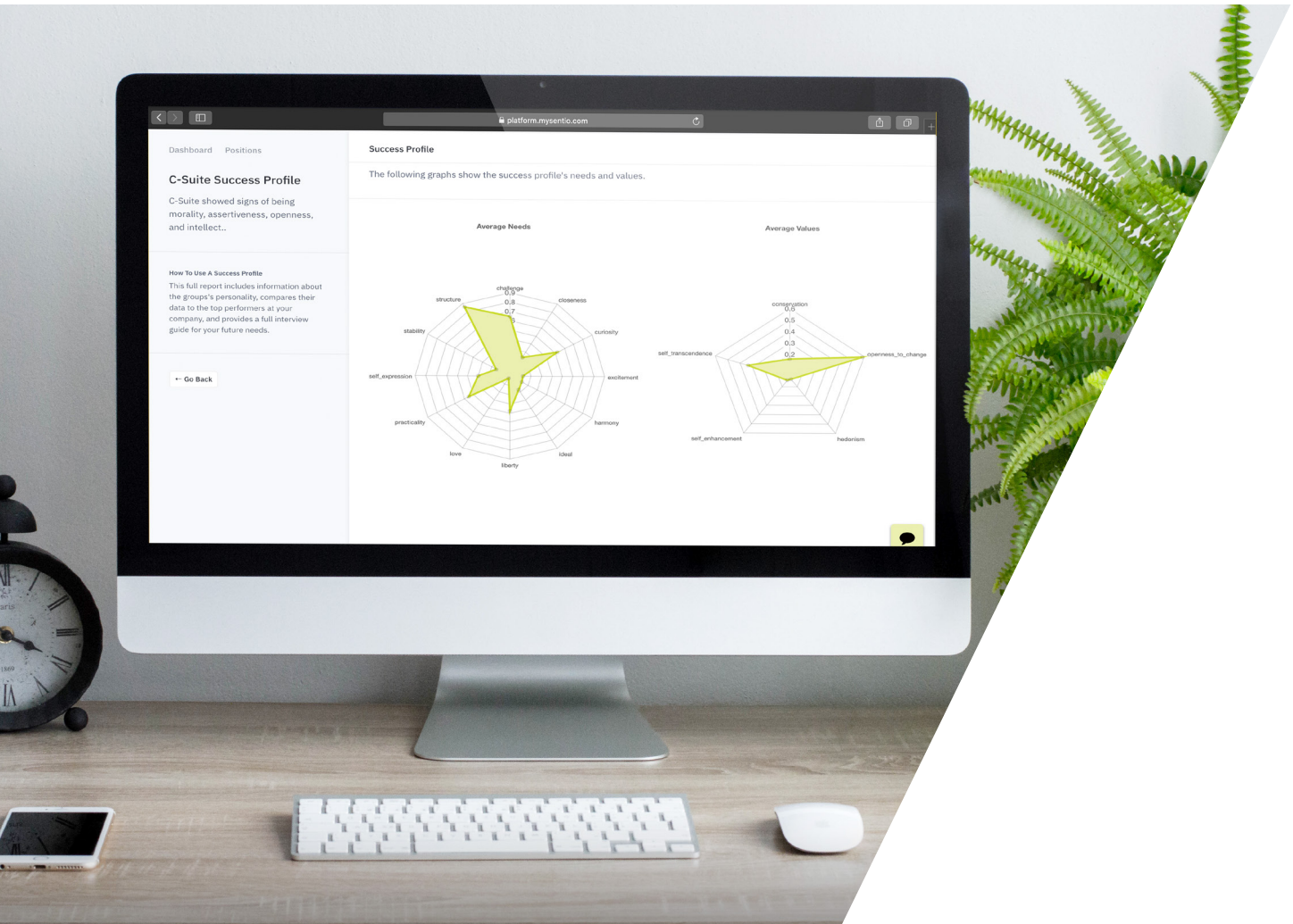
You then send the SENTIO survey to candidates. Surveys can be sent out individually or mass-emailed through uploading a CSV, copying and pasting from a spreadsheet, or an embedded survey on your careers page. Additional distribution instruction can be found at support.mysentio.com.

The surveys that candidates take is identical to those used to create the Success Profile. Additionally, the candidate can upload a resume for your later review. The resumes will appear in the candidate's Mental Makeup Analysis (MMA) once the necessary data has been collected. Once the candidate completes the survey, SENTIO's technology analyzes the candidate and compares their mental makeup data to the Success Profile for that position.

SENTIO's algorithm gives every candidate a score of 1 through 10 based on their comparison to the Success Profile, a designation of either red (poor match), yellow (marginal match), or green (good match), and a comprehensive Mental Makeup Analysis (MMA).

To assist users that analyze candidates enmass, candidate scores are sorted on the position dashboard with a simple color code:

Red = 0 - 4.9 | **Yellow = 5 - 8.9** | **Green = 9.0+**



The higher the SENTIO score of a candidate the higher the statistical probability that the candidate will become a high performer. In addition to the SENTIO score a great deal of information is provided in the Mental Makeup Analysis (MMA):

- A personality assessment
- An interview guide
- A graph that illustrates the difference between the candidate's mental makeup and your Success Profile.
- The SENTIO matrix that compares the candidate to other candidates, and the candidate to the top performers in the department
- An analysis that shows the largest characteristic gaps between the candidate and the Success Profile
- If the company has multiple Success Profiles (sales, marketing, etc), the candidate will be given a SENTIO score for every position

> *"With SENTIO, I now only interview and hire people that have the core values, strengths, and needs of our top performers."*
>
> – Manager, Restaurant Group

Case Studies

SENTIO was fortunate to work alongside companies of different sizes, disciplines, and geographic locations throughout the development of the technology and platform. Case studies show that SENTIO is able to successfully and repeatedly provide accurate and valuable results to its users.

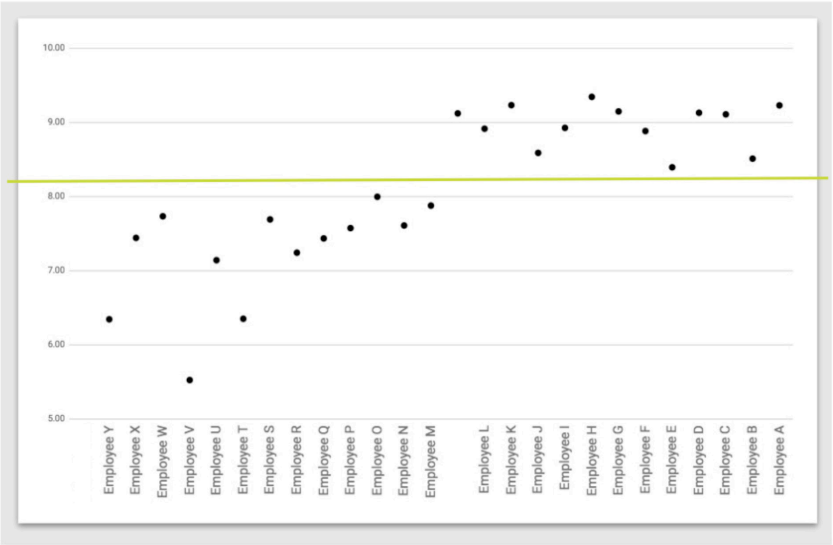
The SENTIO team was meticulous in following both sound and generally accepted procedures when conducting case studies and validation exercises.

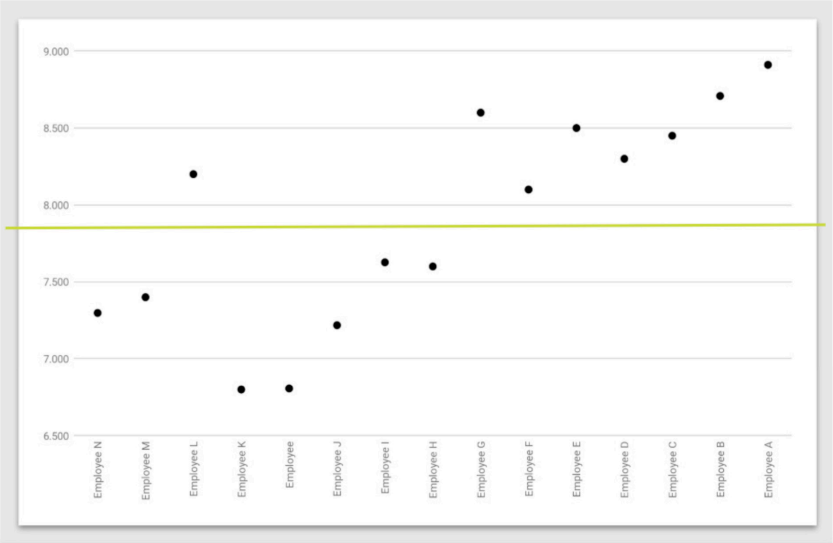
Summary of Methodology

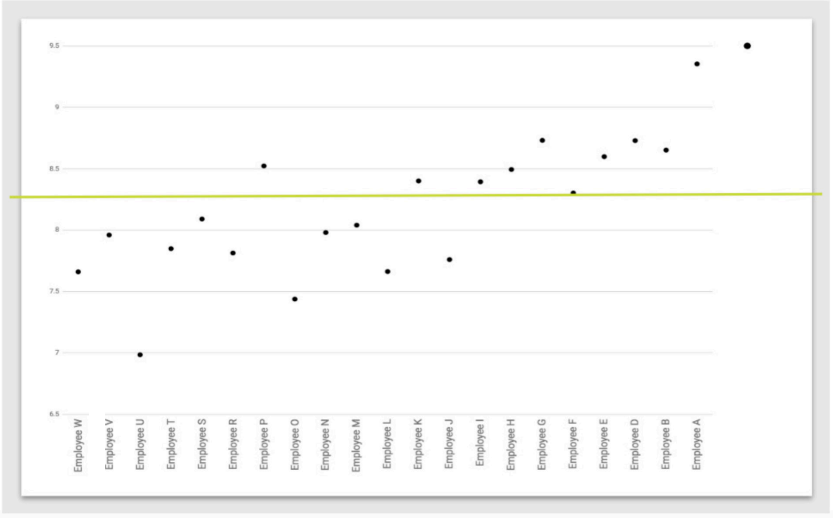
1. Engage with companies with departments between 10 and 25 people
2. Request a stack-rank of employees from the company based on their performance level. We ask companies to rank their employees "from best to worst"
3. Build a Success Profile
4. Score every employee
5. Compare the company's stack-rank with the SENTIO scores

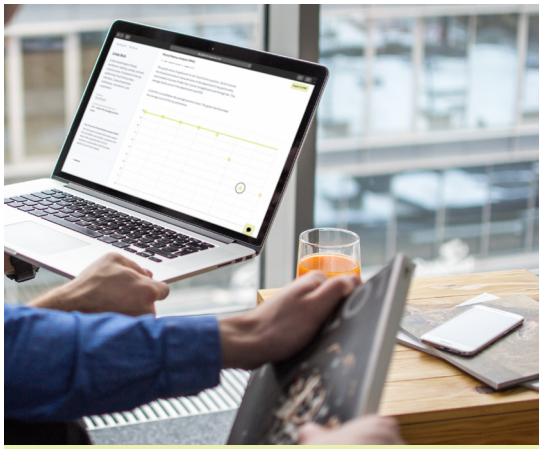
In our case studies, SENTIO found that 90+% of top performing employees at these companies scored above their department's average SENTIO score. Similarly, 90+% of bottom performing employees scored below the department's SENTIO score average.

Below are graphs from four departments from three different companies.









The Y axis illustrates the SENTIO score. The X axis illustrates the employees stack ranked from right to left as defined by the company. The employees on the right, therefore, are top performing employees. The employees on the left are bottom performing employees. The green "SENTIO" line represents the department's average SENTIO score.

The conclusion is that there is a direct correlation between an individual's SENTIO score and their performance. If an individual scored high, they are significantly more likely to be a top performing employee.

Other Conclusions From Our Case Studies

SENTIO's Success Profile accurately discovered the important shared mental makeup characteristics of top performers

An employee's SENTIO score was a significant indicator to their overall performance

The bottom performers, on average, did not share those characteristics

SENTIO was able to accurately predict the performance level of employees with 90+% accuracy based on the company's s stack ranking

Psycholinguistics

SENTIO uses the sophisticated and proven science of psycholinguistics to create mental makeup analyses. We didn't invent psycholinguistics. In fact, the theory was first developed in 1936 by a professor at Indiana University, Dr. Jacob Kantor. Since then thousands of scientists have been studying how the human mind develops, comprehends, and uses language. The science has been used to diagnose mental illnesses, create better customer service experiences, and much more.

SENTIO uses a combination of existing and proprietary research to ensure an accurate mental makeup assessment. Using artificial intelligence and complex mathematics, the technology deconstructs language into its primary usage components and assigns personality characteristics to each component. The artificial intelligence is a learning computer; every time the technology is used the process gets better. The technology measures millions of data points to arrive at mathematical scores in the following seven areas:

Agreeableness | **Conscientiousness** | **Extraversion** | **Emotional Range** | **Openness**

The first five are known to psychologist as the "Big Five". They are the most widely accepted measured traits to determine how a human being engages with the world. The technology goes much further breaking down these traits into thirty subcategories for analysis. [*These subcategories are susceptibility to stress, self-consciousness, immoderation, melancholy, prone to worry, fiery, trust, sympathy, uncompromising, modesty, cooperation, altruism, gregariousness, outgoing, excitement seeking, cheerfulness, assertiveness, activity level, self-efficacy, self-discipline, orderliness, dutifulness, cautiousness, achievement striving, authority challenging, intellect, emotionality, artistic interests and adventurousness.*]

Values

The inspiration for the deconstruction of word usage is the Linguistic Inquiry and Word Count (LIWC) psycholinguistic dictionary. To infer Values, the technology uses the coefficients derived between Values and LIWC category scores. Because no prior work existed that reported such coefficients, the technology derived such coefficients by comparing Values scores that were obtained from surveys with LIWC category scores that were obtained from independent research. The technology assigns mathematical values personality preferences for *conservation, openness to change, hedonism, self-enhancement and self-transcendence*.

Needs

To infer Needs, the technology uses a statistical model based on ground-truth scores that were obtained through a Needs survey and are correlated against textual features that were derived from independent research. The technology assigns mathematical values to needs in the following areas: *Challenge, closeness, curiosity, excitement, harmony, ideal, liberty, love, practicality, self-expression, stability, and structure*.

SENTIO is a partner with IBM and uses Watson API technology as part of its technology stack. Watson is among the most powerful computer systems and is pioneering the development and use of artificial intelligence worldwide. Watson is used by companies to perform complex analytics giving structure to enormous data sets and allowing people to use the information to make better decisions, predict the future and improve the lives of millions of people. A great example is The Weather Channel. Watson aggregates and analyzes millions of data sets from across the planet to create complex weather models that help farmers know when to plant and harvest crops as well as helps you to plan the general public's weekend outdoor activities.

SENTIO utilizes the Personality Insights segment of Watson. A well-accepted theory of psychology, marketing, and other fields is that human language reflects personality, thinking style, social connections, and emotional states. The frequency with which people use certain categories of words can provide clues to these characteristics. Several researchers found that variations in word usage in writings such as blogs, essays, and tweets can predict aspects of personality (*Fast and Funder, 2008; Gill and others, 2009; Golbeck and others, 2011; Hirsh and Peterson, 2009; and Yarkoni, 2010*). This science and the associated analytics provides SENTIO with the raw personality data from which the Success Profile and individual analyses are created and compared.

For a more in-depth look at the science behind SENTIO, please see the appendix.

> *"SENTIO was able to measure our core values, needs, and collective traits. I beamed at the results and said "spot on" five or six times during the review. The technology accurately measured the performance level of 29 out of 29 (100%) of my employees. All from a nine question online survey! I immediately integrated SENTIO into our internal hiring process."*
>
> – CEO, HR Consulting Company

SENTIO and Pre-Assessment Validation

Using personality assessments as part of the hiring process is not new. It has been getting utilized for decades and today is a $3 billion market. The use of SENTIO in the hiring process is completely compliant with any and all governing bodies concerned with such matters. In fact, organizations that implement testing programs in accordance with legal guidelines are therefore better prepared to defend these procedures should a legal challenge to their hiring practices ever arise.

Besides helping a company realize improvements in various business outcomes, pre-employment testing can help enhance the objectivity, equitability, and legal defensibility of an organization's hiring process. All organizations should strive to ensure that all of their employee selection methods are equitable and legally compliant. As long as the tests are assessing skills and traits that are job-related and the test is administer equitably, using tests will make hiring decisions more defensible by adding an extra layer of objectivity to the hiring process.

Like all the other elements of a company's hiring process, pre-employment testing is subject to a series of federal laws governing hiring practices. The most important legal standards related to testing are contained in the Uniform Guidelines on Employee Selection Procedures (UGESP), which explicitly recognizes the right of employers to use pre-employment tests to make hiring decisions as long as those tests are job-related. The UGESP provides interpretive guidelines for federal agencies charged with enforcing the Civil Rights Act, and is designed to ensure equitability and prevent unfair discrimination in hiring. These guidelines inform the decisions made by the Equal Employment Opportunity Commission (EEOC), the federal agency that enforces federal employment discrimination laws. It is important to note that the ultimate responsibility to use SENTIO or any other assessment tool properly falls to the company. With that said, using SENTIO as it is designed and as one is prompted to via the SaaS platform is 100% compliant.

PRE-EMPLOYMENT TESTS INCREASE THE DEFENSIBILITY OF THE HIRING PROCESS

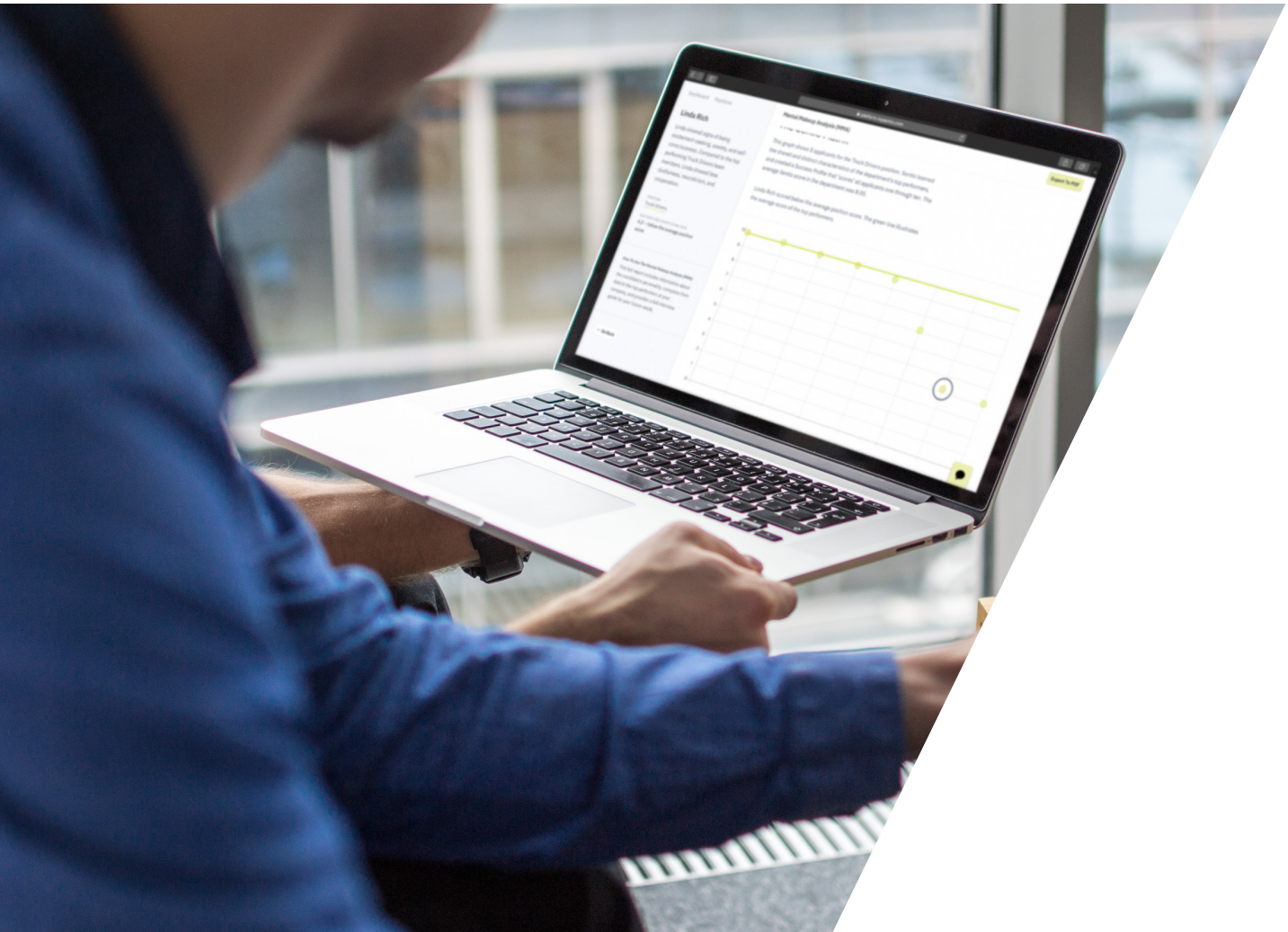
One common misconception with pre-employment testing is that utilizing tests as part of the hiring process increases a company's legal exposure or somehow leads to additional legal risk. For companies that use professionally-developed tests, the opposite is in fact true. Pre-employment tests, like other selection methodologies used by an employer, are governed by the same federal guidelines intended to ensure equitable and non-discriminatory hiring practices. This means that the same laws that apply to the use of pre-employment tests also apply to all other selection methods, which may include screening candidates by experience and education, conducting interviews, checking references, and more. Using relevant employment tests exposes companies to no greater risk than using any other hiring criteria. Instead, the proper use of testing as a selection tool should actually reduce the likelihood of being sued. This is because testing makes the selection process more objective for all candidates. Tests are less subjective than interviews, where the personal biases of interviewers are much more likely to lead to discrimination claims.

In fact, a recently published study shows that companies are over three times more likely to be sued because of interviews than for their use of aptitude, personality, or skills tests. (criteria corp) Pre-employment tests, like SENTIO, also help minimize liability risk by enabling companies to more closely follow the guidelines of the EEOC, which stipulate that companies use reasonable efforts to remove biases from their hiring processes. Using validated tests that do not discriminate according to age, sex, race, or other factors can reduce subjective biases and insert an objective, reliable data point into each hiring decision. Additionally, tests may help minimize the risk of hiring employees who may expose the company to even greater liability, SENTIO's process does just that.

JOB-RELATEDNESS

Pre-employment tests can only reduce a company's legal exposure if the tests measure skills and traits that are related to performance for that particular position. This concept is known as the rule of "job-relatedness." In this instance, the EEOC's guidelines surrounding the use of tests are the same as their rules for any selection procedures: the tests must measure job-related traits, skills and abilities. As a result, test selection is critical to legal defensibility. No matter how valid a test is, it won't be legally defensible if it is used in an invalid way. For example, a bank teller's daily work requirements might include adding and subtracting numbers, looking up customer activity, and filling out paperwork. Therefore, using an employment test that measures an applicant's fluency with basic mathematical concepts and ability to read and write would clearly be testing job-related capabilities. On the other hand, using a typing test for a forklift driver who won't be required to type is NOT a job-related selection measure. Using well validated tests and making sure that the tests, as well as all other selection methods, are job-related, is the best way to ensure legal compliance.

SENTO's technology fulfills the "job relatedness" criteria by establishing that those elements identified in the Success Profile for a position represents job related characteristics. This concept is the basis for the legality of any assessment tool and has been accepted for decades as complaint with EEOC and the DOL.



ADVERSE IMPACT

Legal challenges to hiring practices are rare, but when they do occur, they are often connected to the issue of "adverse impact," also known as "disparate impact." Understanding the concept of adverse impact is central to understanding many of the issues surrounding legal defensibility in testing. Adverse impact is said to occur when members of a protected group or minority (e.g., a particular race, gender, etc.) receive unfavorable employment decisions (e.g., not being hired) more often than another non-minority group. Aptitude testing is an example of a selection procedure that can have adverse impact, because different population groups tend to have different average scores on aptitude tests. Personality tests, on the other hand, do not generally result in adverse impact. One common misconception, however, is that adverse impact is an issue that is somehow uniquely associated with personality testing. In fact, almost every selection methodology used by employers produces a degree of adverse impact, because each disproportionately excludes members of a protected subgroup. It is also important to note that using a test that results in adverse impact is legal as long as it is job-related and consistent with business necessity.

SUMMARY

SENTIO is compliant with all appropriate legislation, guidelines and rules put forth by authorities concerned with such things. The process measures job related personality traits, needs and values, and arrives at them in an unbiased, objective manner as described in our Statement of Validation. The use of SENTIO in the hiring process actually decreases a company's liability to hiring related lawsuits.

USEFUL LINKS

EEOC Fact Sheet on Employment Testing
Uniform Guidelines on Employee Selection Procedures (UGESP)

Implementing Employment Testing (SIOP)

https://www.onetcenter.org/dl_files/empTestAsse.pdf

https://www.criteriacorp.com/resources/definitive_guide_legal_issues_of_preemployment_testing.php

Appendix

ADDITIONAL VALIDATION INFORMATION

SENTIO uses a combination of machine learning, artificial intelligence and proprietary algorithms to conduct mental make-up analyses. The technology used by SENTIO has been extensively tested and validated. The following paragraphs will outline the validation methodology as well as indicate the supporting studies considered. The methodology is in compliance with the document issued by The Society for Industrial and Organizational Psychology (SIOP) entitled Principles for the Validation and Use of Personnel Section Procedures 4th Edition.

A well-accepted theory of psychology, marketing, and other fields is that human language reflects personality, thinking style, social connections, and emotional states. The frequency with which we use certain categories of words can provide clues to these characteristics. Several researchers found that variations in word usage in writings such as blogs, essays, and tweets can predict aspects of personality (Fast & Funder, 2008; Gill et al., 2009; Golbeck et al., 2011; Hirsh & Peterson, 2009; and Yarkoni, 2010).

UNDERSTANDING THE PERSONALITY MODELS

Models were developed to infer scores for Big Five dimensions and facets, Needs, and Values from textual information. The models reported by the service are based on research in the fields of psychology, psycholinguistics, and marketing:

Big Five is one of the best studied of the personality models developed by psychologists (Costa & McCrae, 1992, and Norman, 1963). It is the most widely used personality model to describe how a person generally engages with the world. The service computes the five dimensions and thirty facets of the model. The dimensions are often referred to by the mnemonic OCEAN, where O stands for Openness, C for Conscientiousness, E for Extraversion, A for Agreeableness, and N for Neuroticism. (Because the term Neuroticism can have a specific clinical meaning, the service presents such insights under the more generally applicable heading Emotional range.)

Needs are an important aspect of human behavior. Research literature suggests that several types of human needs are universal and directly influence consumer behavior (Kotler & Armstrong, 2013, and Ford, 2005). The twelve categories of needs that are reported by the service are described in marketing literature as desires that a person hopes to fulfill when considering a product or service.

Values convey what is most important to an individual. They are “desirable, trans-situational goals, varying in importance, that serve as guiding principles in people’s lives” (Schwartz, 2006). Schwartz summarizes five features that are common to all values: (1) values are beliefs; (2) values are a motivational construct; (3) values transcend specific actions and situations; (4) values guide the selection or evaluation of actions, policies, people, and events; and (5) values vary by relative importance and can be ranked accordingly. The service computes the five basic human values proposed by Schwartz and validated in more than twenty countries (Schwartz, 1992).

HOW PERSONALITY CHARACTERISTICS ARE INFERRED

The technology infers personality characteristics from textual information based on an open-vocabulary approach. This method reflects the latest trend in the research about personality inference (Arnoux et al., 2017,Schwartz et al., 2013, and Plank & Hovy, 2015).

The technology first tokenizes the input text to develop a representation in an n-dimensional space. It uses an open-source word-embedding technique called GloVe to obtain a vector representation for the words in the input text (Pennington et al., 2014). It then feeds this representation to a machine-learning algorithm that infers a personality profile with Big Five, Needs, and Values characteristics. To train the algorithm, the service uses scores obtained from surveys conducted among thousands of users along with data from their Twitter feeds.

Earlier versions of the service used the Linguistic Inquiry and Word Count (LIWC) psycholinguistic dictionary with its machine-learning model. However, the open-vocabulary approach just described outperforms the LIWC-based model. For more information about the service's precision for each language in terms of average Mean Absolute Error (MAE) and correlation, see How precise is the service. For guidance about providing input text to achieve the most accurate results, see Providing sufficient input.

HOW PRECISE IS THE SERVICE

A validation study was conducted to understand the accuracy of the service's approach to inferring a personality profile. Survey responses were collected and Twitter feeds from between 1500 and 2000 participants for all characteristics and languages. To establish ground truth, participants took four sets of standard psychometric tests:

50-item Big Five derived from the International Personality Item Pool (IPIP)
120-item Facet derived from the IPIP Neuroticism, Extraversion & Openness (IPIP-NEO)
52-item fundamental Needs developed
26-item basic Values developed by Schwartz

The scores were then compared to those that were derived by its models with the survey-based scores for the Twitter users. Based on these results, It was determined that average Mean Absolute Error and average correlation between the inferred and actual scores for the different categories of personality characteristics. Per-language average MAE and correlation provides the statistical values for each supported language.

AVERAGE MEAN ABSOLUTE ERROR

Mean Absolute Error (MAE) is a metric that is used to measure the difference between actual and predicted values. For the Personality Insights service, the actual value, or ground truth, is the personality score that was obtained by administering a personality survey. The predicted value is the score that the service's models produce.

The MAE was compared by taking the average of the absolute value of the difference between the actual and predicted scores. Absolute value was used because predicting more or less of the actual value is irrelevant; as long as there is a difference, the model is penalized by the magnitude of the error. The lower the MAE, the better the performance of the model. A scale of 0 to 1 is used for MAE, where 0 means no error (the predicted value is the exact same as the actual value), and 1 means maximum error.

AVERAGE CORRELATION

Average correlation is a statistical term that measures the interdependence of two variables. With this metric, the correlation between inferred and actual scores was measured for the different categories of personality characteristics. If the predicted score closely tracks the actual results, the correlation score is high; otherwise, the score is low.

Correlation is measured on A scale of -1 to 1: 1 indicates a perfect direct (increasing) linear relationship, and -1 indicates a perfect inverse (decreasing) linear relationship. In all other cases, the value lies between these extremes. If the variables are independent (they have no relationship at all), the correlation is 0.

Numbers closer to 1 are best for predictions. But personalities are difficult to predict based solely on text, and it is rare to see correlations exceed 0.4 for these types of psychological models. In research literature for this domain, correlations above 0.2 are considered acceptable.

UNDERSTANDING CONSUMPTION PREFERENCES

The relationship between personality and purchasing behavior has been studied across a variety of products and services:

Chen (2007), while testing preferences concerning organic foods, indicated that an individual's personality characteristics play an important role in establishing personal food-choice criteria.

Schlegelmilch at al. (1996) explored the relationship between personality variables and pro-environmental purchasing behavior. The authors showed that consumers' overall environmental consciousness has a positive impact on green purchasing decisions.

Hymbaugh and Garrett (2007) investigated the relationship between personality and skydiving and found that people who score high in adventurousness and excitement-seeking generally indulge in skydiving. (For more information, see Risk profiling.)

HOW CONSUMPTION PREFERENCES ARE INFERRED

The Personality Insights service infers consumption preferences based on the results of its personality profile for the author of the input text. From existing literature, 104 consumption preferences were identified that have proved to be correlated with personality. These include preferences related to shopping, movies, music, and other categories. A psychometric survey was created to assess an individual's inclination for each consumption behavior.

Responses to its survey from about 600 individuals for whom it also had Twitter data (more than 200 self-authored tweets for each user) were obtained. The tweets were submitted to the technology to gather a personality profile for each individual. It then built a classifier for each consumption preference, where the input feature set was the personality information.

For inclusion with the service, only those consumption preferences for which personality-based classification performed at least 9 percent better than random classification were selected. Of the original 104 preferences, 42 satisfied this criterion and are exposed as consumption preferences by the service.

NOTES ABOUT PERSONALITY SURVEYS

Personality surveys were relied on to establish ground-truth data for personality inference. Ground truth refers to the factual data obtained through direct observation rather than through inference. A typical measure of accuracy for any machine-learning model is to compare the scores inferred by the model with ground-truth data; the previous sections describe how the technology used surveys to validate the accuracy of the service.

The following notes clarify the use of personality surveys and survey-based personality estimation: Personality surveys are long and time-consuming to complete. The results are therefore constrained by the number of Twitter users who were willing and available to participate in the study. Plans exist to conduct validation studies with more users, as well as with users of other online media such as email, blogs, and forums.

Survey-based personality estimation is based on self-reporting, which might not always be a true reflection of one's personality: Some users might give noisy answers to such surveys. Survey responses were filtered by including attention-checking questions and by discarding surveys that were completed too quickly. While the correlation between inferred and survey-based scores is both positive and significant, the results imply that inferred scores might not always correlate with survey-based results.

Researchers from outside of SENTIO have also done experiments to compare how well inferred scores match those obtained from surveys, and none reported a fully consistent match:

Golbeck et al. (2011) reported an error rate of 10 to 18 percent when matching inferred scores with survey-based scores.

Sumner et al. (2012) reported approximately 65-percent accuracy for personality prediction.

Mairesse and Walker (2006) reported 60- to 70-percent accuracy for Big Five personality prediction.

In general, it is widely accepted in research literature that self-reported scores from personality surveys do not always fully match scores that are inferred from text. What is more important, however, is that it was found that characteristics inferred from text can reliably predict a variety of real-world behavior.

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