

# Unobtrusive Psychological Profiling for Risk Analysis

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**Abstract:** The main objective of this exploratory study is to present how publicly observable variables reflecting individual choice can be used to construct psychological profiles suitable for predicting behavior in the context of risk analysis. For the purpose of demonstration, this study aimed at testing the hypothesis that there is a selection bias among chief executive officers (CEOs), which is manifested in their personal value structures. Values capture motivational forces that serve as guiding principles in people's life when making decisions. From a risk management perspective, it is crucial to understand key decision maker's motivation in order to be able to prepare against potentially undesirable behavior. Therefore the second objective of this study relates to a detailed characterization of the observed value structures among a group of CEOs. To accomplish these goals a non-obtrusive data collection method is utilized that requires no direct access to individuals - the Watson Personality Insights service provided by IBM - which infers value profiles based on written or spoken text by the subjects. Results show that CEO value profiles differ from the general population in several ways. Furthermore, slight differences were identified between the profiles of CEOs associated with moral hazard and CEOs not associated with it. These findings indicate that there is a meaningful selection bias and these results contribute to the real-world applicability of the CIRA method of risk analysis.

## 1 INTRODUCTION

A great amount of evidence suggests that key decision makers can have a major impact (positive or negative) on the safety and security of organizations and information systems spanning across the entire range of the corporate hierarchy (Cohan, 2002; Van Peurse et al., 2007; Soltani, 2014). Within the economics and management literature the tension between management interests and governance objectives is recognized as the principal-agent problem within agency theory. Agency theory addresses the situation where one party (principal) delegates work to another party (agent) who is responsible for performing that work on behalf of the principal. According to Eisenhardt the theory is concerned with resolving two problems that may arise in any agency relationship (Eisenhardt, 1989). The first problem relates to the possibility that the agent's and the principal's desires and goals are in conflict, and it is difficult or expensive for the principal to verify what the agent is actually doing (i.e. it is difficult to verify that the agent's behavior is appropriate). The second problem arises from the difference between the parties' attitude towards risk, where the principal and the agent might prefer different actions

due to different risk preferences.

As more and more critical infrastructures are undergoing a radical change by the introduction of the Internet of Things (IoT), social and economic stability is increasingly dependent upon the decisions that people in key positions make (Fosso et al., 2014). These aspects of risks are often neglected within information security risk analyses, as they mostly focus on the technical aspects, while largely ignoring the crucial human influence. It is suggested by Anderson and Moore that information security problems should be addressed from a broad range of perspectives (e.g. economics, psychology, etc.), since stakeholders might face various misaligned incentives, while various psychological factors can be utilized to reveal the ways in which people pose threat to information systems (Anderson and Moore, 2009).

The Conflicting Incentives Risk Analysis (CIRA) developed by Rajbandhari and Snekkenes aims to bridge the existing gap by focusing on decision makers' motivation when addressing risks (Rajbandhari and Snekkenes, 2012). In order to enhance the existing method and make it applicable to real-world cases it is necessary to update the method with relevant insight about human behavior. To this end this study

focuses on leader characteristics within an organization and its consequences as the CEO role offers the biggest potential to exert influence over the entire organization. However, the principles of the analysis are applicable for the study of any type of stakeholders (i.e. not limited to the CEO role). It is acknowledged that people might be reluctant to be explicitly subjected to risk analysis activities, which poses a major obstacle in conducting the work, therefore in such highly data-sparse environments, the analysis must rely on publicly observable features as much as possible.

## 1.1 Problem Statement

The CIRA method investigates how a misalignment between stakeholders' motivation can result in various forms of risk. For the development of the method, it is necessary to quantify and characterize the strength of an individual's motivation without direct access to the subject, since subjects might be reluctant to reveal their real motivations or would be tempted to mislead an analyst. Therefore for the enhancement of the method the objective is:

- to select a suitable framework that captures a comprehensive set of human motivations,
- to derive the motivational structure without direct access to the individuals,
- to use the knowledge derived from groups of individuals in settings where data about an individual's past choices is scarce.

## 1.2 Research Questions

Based on the aforementioned requirements, the primary research question that is addressed in this study was formulated as: *can publicly observable variables reflecting individual choice be used to construct psychological profiles suitable for predicting behavior in the context of risk analysis?*

The following sub-questions are addressed in order to answer the main research question:

1. Is it feasible to derive motivational characteristics of CEOs using unobtrusive measures?
2. Is there a significant difference between the basic human value structure of CEOs in comparison to the general population?
3. Is there any significant difference between the value profiles of CEOs associated with moral hazard and the profiles who have no association with it?

This work contributes to the literature of risk analysis by presenting how publicly observable decisions from individuals can be utilized for the purpose of information security risk analysis. The presented method builds on an existing application, while the purpose of the analysis differs significantly from current domains of application. In order to illustrate the method's practicality, the study focuses on organizational leaders due to the fact that other classes of stakeholders might not be allowed to interact officially with the public, due to company policies, however the approach can be applicable to any class of key stakeholders (e.g. CFO, COO, CIO, CISO).

## 2 RELATED WORK

This section provides an overview about the psychological theories, constructs and applications that served as the foundations of this study.

### 2.1 Sources of Bias

There are several research perspectives that aim to provide an explanation about how people with certain traits or characteristics are self-selected to leading positions, how these characteristics are desirable on one hand and how they might have a negative impact on the organization's objectives, and can have greater societal impacts. This section introduces two mechanisms that could contribute to a selection bias in executive roles (i.e. personal attraction to a specific role and selection of candidates by relevant stakeholders).

#### 2.1.1 Bias by Personal Motivations

Boddy defines Corporate Psychopaths "as people working in corporations who are self-serving, opportunistic, ego-centric, ruthless and shameless but who can be charming, manipulative and ambitious" who are drawn to corporations as they provide sources of power, prestige and money (Boddy, 2005). There is a distinction between the popular image of criminal psychopaths, and corporate psychopaths. While the former group is pictured as insane, suffering from mental delusions, Corporate Psychopaths are outwardly charming, and engaging, skillful at manipulating others to their own advantage, with a lack of concern for the consequences of their actions, and give a high priority for the pursuit of their own goals and ambitions. The prospects of power, prestige and money are assumed to be the main motivators that draw individuals with psychopathic traits to the corporate world. The ability to demonstrate desirable

traits that the organization values for a certain position is easily exploited by such individuals by presenting a charming facade and appear to be an ideal leader. The risks that such individuals pose to the corporations they work for can take various forms e.g. acting on the basis of pure self-interest, that may hamper organizational goal achievement, when self-interest and greater corporate interests are misaligned. The link between an organization's questionable practices (e.g. exploiting sweatshop labor, environmental pollution, etc.) in pursuit of profit is the decision-maker, who authorizes such activities. According to the argument, these leader characteristics contribute to a less-than desirable social responsibility by the organization.

Babiak, Neumann and Hare empirically investigated a sample of 203 corporate professionals who were selected by their companies to take part in a management development program for indications of psychopathic tendencies (Babiak et al., 2010). According to the authors, the lack of available cooperative subjects is a major obstacle when the aim is to understand how a key decision maker's personal characteristics can negatively influence others. However there is a "growing public and media interest in learning more about the types of person who violate their positions of influence and trust, defraud customers, investors, friends, and family, successfully elude regulators, and appear indifferent to the financial chaos and personal suffering they create". Large-scale Ponzi schemes, embezzlement, insider trading, mortgage fraud, and internet frauds and schemes, are some of the activities where psychopathy was invoked as one explanation for such socially destructive behavior. The study aimed at investigating the prevalence, strategies and consequences of psychopathy in the corporate world. According to the results very high psychopathy scores were obtained from high potential candidates who held senior management positions. An interesting finding of the study had to do with how the corporation viewed individuals with many psychopathic traits. High psychopathy scores were associated with perceptions of good communication skills, strategic thinking, and creative/innovative ability and, at the same time, with poor management style, failure to act as a team player, and poor performance appraisals (as rated by their immediate bosses). The findings shed some light on the complex association between situation-congruent self-presentation and how psychopathic traits (although not classified as Antisocial Personality Disorder) can be adaptive in corporate environments.

An empirical study investigated the link between the Dark Triad personality traits and the Schwartz basic human values (Kajonius et al., 2015). The Dark

Triad (Machiavellianism, Narcissism, and Psychopathy) is a popular grouping of individual differences that represent antisocial personality traits below clinical threshold. The antisocial aspect of the triad comes from the shared underlying attitudes and modes of behavior that characterize these traits. Entitlement, superiority, dominance, manipulateness, lack of remorse, impulsivity are among the key features of the triad. The study found in two different cultures (i.e. Swedish and American) that Hedonism, Stimulation, Achievement and Power values were the most important values held by individuals high on Dark Triad traits. The authors conclude that those characterized by high scores on the Dark Triad traits, hold values that imply the exclusion of others and self-enhancement, viewing others as means toward selfish gains. The connection between Self-enhancement values and the Dark Triad traits is referred to as dark value system that has further moral implications.

### 2.1.2 Selection Bias by Requirements of the Role

Person-organization fit is a specialized area of inquiry within the broader Person-environment fit studies that aims to investigate how certain personality characteristics influence the fit of the individual within organizational settings. Morley (Morley, 2007) discusses a recent shift in the recruitment process where the traditional focus on knowledge, skills, abilities (KSAs), has shifted toward seeking an optimal fit between the candidate's personality, beliefs and values and the organization's espoused culture, norms and values. Furthermore, others suggest that work values are a core means by which individuals judge their fit, and candidates are attracted to organizations that exhibit characteristics similar to their own, and in turn organizations tend to select employees who are similar to the organization, which is a similar idea to Schneider's Attraction-Selection-Attrition (ASA) framework, that identifies a similar fit at the personal level between the candidate and the organization (Schneider et al., 1995). Value congruence has become widely accepted as the defining operationalization of P-O fit (Kristof-Brown et al., 2005).

On a more fine-grained level however the specific roles within an organization pose a variety of specific requirements (e.g. managerial role requirements are very different from the requirements of a production line worker). Using a large sample Lounsbury et al. looked for a distinctive managerial profile that differentiated them from workers in other occupations. The investigation revealed a distinctive managerial personality profile in terms of the Big Five and other measures of personality. In the following 9 personality trait facets managers reached higher scores than

non-managers: Extraversion, Assertiveness, Conscientiousness, Emotional Stability, Agreeableness, Optimism, Work Drive, Customer Service Orientation, Openness. These results have practical implications from the personnel selection perspective to guide the search for candidates who possess the necessary traits to increase the person-organization fit required for specific job types (Lounsbury et al., 2016).

Knafo and Sagiv examined the relationship between several occupations and the value profiles of the individuals working in the respective roles. From the different work environments, the enterprising environment is the one that is mostly characterized by material and concrete goals, and requires one to lead, convince or manipulate others in order to achieve desired organizational and financial goals. According to the hypothesis Power and Achievement values are most compatible with these requirements, while the enterprising environment would inhibit the expression of Benevolence and Universalism values. The occupations that were examined and most closely resembled the enterprising environment were: manager, banker, financial advisor. The results showed a strong positive correlation between the enterprising occupation and both Power and Achievement values, while a negative correlation was observed in relation to Universalism values. The study successfully differentiated occupations based on the dominant values that are required in each particular field, thus providing further evidence about a selection bias in place.

In summary these research results suggest some of the mechanisms by which individuals with certain traits or characteristics are selected for specific jobs, first by their own attraction to these positions, and furthermore by the active involvement of the recruiters.

## 2.2 Conflicting Incentives Risk Analysis

The relevance of focusing on the motivation of stakeholders is recognized in the Conflicting Incentives Risk Analysis (CIRA) method (Rajbhandari and Snekkenes, 2013). The method identifies stakeholders (i.e. individuals), the actions that can be taken by these stakeholders and the consequences of the actions. A stakeholder is always an individual who has interest in taking a certain action within the scope of the analysis. The procedure distinguishes between two types of stakeholders: *Strategy owner* (the person who is capable of executing an action) and the *Risk owner* (whose perspective is taken - the person at risk). At the core of the method is the economic concept of utility, which captures the benefit by implementing a strategy for each stakeholder. The cumulative utility encompasses several utility factors, each

representing valuable aspects for the corresponding stakeholders, thus modelling an individual's motivation. Two types of risks are identified in the method: Threat risk relates to the perceived decrease in the total utility for the risk owner, and Opportunity Risk relates to the lack of potential increase of utility because the strategy owner is not motivated to take actions that would be beneficial for the Risk owner. Therefore risk is conceptualized as a misalignment of incentives between these two classes of stakeholders, and risk identification is concerned with uncovering activities that would be beneficial for the Strategy owner while being potentially harmful for the Risk owner (Snekkenes, 2013). Therefore, threat risk closely resembles the concept of moral hazard as it captures a wide range of behaviors that are beneficial for one party and detrimental for another (i.e. strategy owner inflicting negative externalities on the risk owner - increasing one's utility, while causing a decrease in the utility of someone else) (Dembe and Boden, 2000). This study focuses on Threat risks that can be attributed to the motivation of key decision makers.

## 2.3 Theory of Basic Human Values

The theory of basic human values by Schwartz (Schwartz, 1994) identifies 10 distinct values that are universally recognized across various cultures and provide a unified and comprehensive view on the motivation of individuals. Values both represent desirable end goals and prescribe desirable ways of acting. Schwartz summarizes the six core features that characterize values:

- Values are beliefs linked to affect.
- Values refer to desirable goals that motivate action.
- Values transcend specific actions and situations.
- Values serve as standards or criteria.
- Values are ordered by importance.
- The relative importance of multiple values guide action.

Furthermore, all 10 distinct values in the theory capture one of the three key motivational aspects that are grounded in universal requirements of human existence: needs of individuals as biological organisms, requisites of coordinated social interaction, and survival and welfare needs of groups. Values serve as an internal compass guiding behavior, given that the decision context or situation activates the relevant values. The values form a circular structure which capture a motivational continuum, where adjacent values

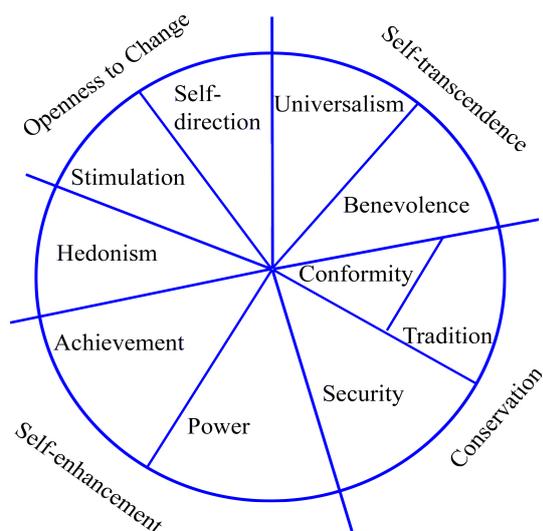


Figure 1: Circular value structure, with 4 higher dimensions comprising of the 10 basic human values.

are compatible with each other, while opposing values are in conflict. The ten values are grouped under 4 higher dimensions as represented by Fig 1 (Schwartz, 2012).

The link between values and specific individual behaviors is a surprisingly neglected area of inquiry, and researchers show little agreement about the strength of the value-behavior relationship. On one end of the spectrum are researchers claiming that values guide behavior (Rokeach, 1973), while others claim that values rarely guide behaviors and not for most people (McClelland, 1987). The behavior guiding aspect of values was investigated by Bardi and Schwartz in order to clarify the role of values in the expression of behaviors (Bardi and Schwartz, 2003). Their results suggest that values guide a range of behaviors, when the frequency of value expressive behaviors are investigated. A detailed analysis showed that Stimulation and Tradition values correlate highly with corresponding behaviors, while Hedonism, Self-direction, Universalism, and Power values showed diminishing associations. Security, Conformity, Benevolence and Achievement values showed only weak correlations with the behaviors that are expressive of them. Based on these findings the predictive utility of values is limited in a few ways: values are useful for predicting the behavior when value-expressive behaviors are clearly defined and a selection is made from a predefined set of options (e.g political party preferences and choosing university courses (Schwartz and Bardi, 2001)). However, it is acknowledged in the theory that most actions are expressive of more than one value, and that the value structure that an individual holds modifies his/her perception giving rise

to ambiguous interpretations of the same situation. Therefore, the correspondence between values and actions is expected to be highest in case of single decisions expressing Tradition and Stimulation values, and lower in other cases.

## 2.4 IBM Watson Personality Insights

Personality Insights (PI) is part of IBM’s artificial intelligence platform called Watson. Previously known for defeating the top human players in Jeopardy, the service these days is a comprehensive set of artificial intelligence solutions available for the consumer market. The service is utilized in a wide range of fields including health care, weather forecast, electric load optimization, etc. The PI utilizes advanced machine learning solutions to uncover an individual’s psychological characteristics based on texts produced by the person. The PI service’s main use cases involve targeted marketing, customer care services, automated personalized interactions, among several others. The service produces profiles based on four different models of individual differences:

1. Big five personality model - one of the most widely investigated and accepted model of personality that captures five major dimensions about one’s personality. These characteristics describe relatively stable behavioral tendencies and modes of experiences.
2. Needs - based on the earliest investigations into human motivation capturing an individual’s high-level desires.
3. Basic human values - values capture both desirable goals that people pursue and standards of acting, thus providing a summary about what are the underlying motivations behind one’s actions.
4. Consumption preferences - optimized for predicting the user’s likelihood for buying a certain product or engaging in different activities.

In terms of the Value profiles, the service calculates the four higher-level profiles: Conservation, Openness to change, Self-enhancement, Self-transcendence and Hedonism as separate values, whereas the original formulation by Schwartz identifies four major ones, with Hedonism being part of either Openness to change or Self-enhancement. For each personality characteristic the PI computes two scores: percentile scores and raw scores. “To compute the percentile scores, IBM collected a very large data set of Twitter users (one million users for English, 200,000 users for Korean, 100,000 users for each of Arabic and Japanese, and 80,000 users for Spanish) and computed their personality portraits. IBM then

compared the raw scores of each computed profile to the distribution of profiles from those data sets to determine the percentiles. The service computes normalized scores by comparing the raw score for the author's text with results from a sample population" (IBM, 2017). While the percentile scores can provide insights about the value distributions of a sample in relation to the original sample it is not well-suited to characterize an individual's profile for the purpose of choice predictions, because the value structure relative to a sample population does not necessarily correspond to the individual's own value priorities. To allow comparison between different populations and scenarios the service also provides raw scores that reflect a score the person would get when completing a personality test. Therefore, raw scores are more suitable to compare with populations with existing means and standard deviations, and to analyze value priorities within and among individuals.

### 3 METHODS

#### 3.1 Participants

The convenience sampling method produced the final sample that consisted of 116 CEOs (105 male, 11 female), aged between 34-95 years ( $M = 59.41$ ,  $SD = 9.23$ ) with sufficient amount of texts for running accurate analysis by the IBM Watson service. The amount of text available for the individuals ranged between 264-11384 words ( $M = 3830.98$ ,  $SD = 1672.28$ ). The majority of the subjects were born in the USA ( $N = 52.6\%$ ), followed by India ( $N = 12.9\%$ ), United Kingdom ( $N = 6.9\%$ ) and 21 other countries ( $N = 27.6\%$ ). 84.4% of the sample had at least bachelor or equivalent level degrees. The total compensation for the CEOs in year 2016 ranged between \$45,936 - \$46,968,924 ( $M = \$15,988,276.78$ ,  $SD = \$10,600,982.56$ ) according to publicly available sources (Salary.com, 2004).

#### 3.2 Data Collection

In order to answer the Research Questions it was necessary to run an initial pilot study to assess the feasibility of the data collection activity. During the pilot study the first step involved the identification of relevant sources of data. To this end the Wikipedia article on the List of chief executive officers of notable companies was used that contains CEOs with diverse national and industrial backgrounds (Wikipedia, 2004). At the time of the start of the data collection the list consisted of 174 subjects. The second step involved

the identification of suitable sources of information that could be linked to the individual and provided sufficient input to the Watson service for achieving its maximum precision (3000 words/subject is recommended by the service description). In this phase we relied on video interviews, interviews published in online newspapers, news articles, company communications and social media profiles. Although it was possible to collect the necessary amount of data from the individuals, the procedure was not feasible due to high diversity of contexts, the uncertainty related to the actual author of the texts and the time needed to collect the data, so in the final data collection phase this procedure was modified in the following way:

- The search was restricted to videos published on YouTube that (a) were in English, (b) the subject could be clearly identified while providing his thoughts, and (c) were supplemented with captions.
- The search then was executed by using the subject's name with the following additional terms (in the same order): - interview, talk, presentation. In case the first search term did not provide sufficient amount of text the next one was used.
- In order to achieve as high validity as possible for the analysis we aimed at collecting mainly interviews and discussions that are more spontaneous and reflective in content (thus we aimed at minimizing the reliance on well-rehearsed communications or texts written by other parties for presentation purposes).
- Each video was carefully observed in real time to check the accuracy of the captions and to ensure that only the subject's utterances are extracted for analysis, while omitting any noise (interviewer/audience questions, false transcriptions, etc.)
- A fresh install of Google Chrome was utilized in incognito mode, to keep personalized search results to a minimum and to maximize the reproducibility of the search results.

After a sufficient amount of text was collected from the subjects, the texts were submitted to the Watson PI service, that produced a profile for each individual.

For the purpose of a more fine grained analysis, CEOs that have been associated with various decisions leading to moral hazard have been identified in the current sample. To this end extensive web searches were conducted with the name of the individual and the additional search term (e.g. fraud, scandal, corruption). The first 20 search results were screened

for each subject in order to identify possible associations with moral hazard. Using a broad sense of the moral hazard concept, any behavior was eligible for inclusion when it had a negative effect on the reputation of the organization by drawing public attention to the underlying misconduct (irrespective of the nature of the misconduct) and the behaviors were conducted under the administration of the CEO in focus. The included activities covered a wide range of behaviors (e.g. bribery of public officials, tax evasion, accounting fraud, insider deals, ethical misconduct, etc.). The procedure resulted in the identification of 31 CEOs (26.7% of the sample) associated with undesirable behavior, and enabled the value profile comparisons between the two classes of CEOs.

## 4 RESULTS

### 4.1 A Note on the Concept of Difference

It is important to note that the term ‘difference’ can have several meanings. In order to characterize the differences we utilized several approaches. In the first approach the percentile scores derived from the Watson PI service were used, that inherently contains a comparison between the subject’s results and the original sample’s distribution, on which the service was validated (N = 1 million users) (IBM, 2017). This view provides an understanding about the CEO sample’s overall position for each value dimension. Due to the meaning of percentile scores certain, expectations can be calculated on the number of value profiles that are expected to fall within 1 SD from the means. These assumptions were tested in the first procedure.

A second approach utilizes the raw scores derived from the PI service, which are suggested to be equivalent to the scores one would get when completing an actual psychometric test (in this case any variant of the several existing Schwartz value surveys (Schwartz et al., 2001)). These scores can be compared to results established in different populations, therefore are more suitable for comparing results obtained by other researchers. The second procedure followed this line of reasoning, and was mainly concerned in identifying a difference in the rank ordering of values between CEOs and the general population. In this sense, any difference in the ordering of the values (to most important to least important) would be indicative of a marked difference between the group of CEOs and the general population.

However, rank orders in isolation do not provide all the necessary information about and individual’s trade-off decisions, since a preference reversal (i.e.

choice of different strategies with the same value orders among individuals) is possible, while maintaining the same value order. In light of this fact and in accordance with the theory’s concepts it is the relative importance of values that should be analyzed when certain decisions are weighed against each other. Furthermore, since many studies use different instruments and methodologies for assessing value profiles or use different levels of analysis, it was necessary to enhance the compatibility and comparability of research findings (Lindeman and Verkasalo, 2005). To this end, in the third procedure the raw scores were summed across all values, and each score was multiplied by the  $\text{Sum}^{-1}$ , to quantify each value’s contribution to the overall utility (=1). The same procedure was carried out for research results that served as reference for the comparisons. This approach provides the assessment of an individual’s value structure independent of the instrument used for conducting the profiling.

### 4.2 Comparison with Watson PI Sample

The first procedures aimed at detecting the existence of a bias among the percentile scores among the five higher level values. The percentile scores were transformed by mapping them to a standard normal distribution, then for each value Kolmogorov-Smirnov tests were conducted with a reference standard normal distribution (M = 0, SD = 1) to assess whether the value score would be drawn from the same distributions. The results indicate that all distributions are significantly different from the reference normal distribution. All five, one-sample Kolmogorov-Smirnov tests rejected the null hypothesis that the data followed the normal distribution for variables: Conservation (D = .741), Openness to change (D = .194), Hedonism (D = .916), Self-enhancement (D = .657) and Self-transcendence (D = .534), N = 116 each, and  $p > .05$  each). Fig 2 shows the distribution of all the values based on the transformed percentile scores.

### 4.3 Comparison with National Representative Samples

In the following procedure the raw scores have been transformed to match with the original scale’s scoring system used in the studies conducted by Schwartz and Bardi (Schwartz and Bardi, 2001). The representative or near-representative samples provide the necessary comparison that allows for a more detailed description of the value profiles. Fig 3 shows the general population’s value priorities compared with the CEO value priorities based on the raw scores.

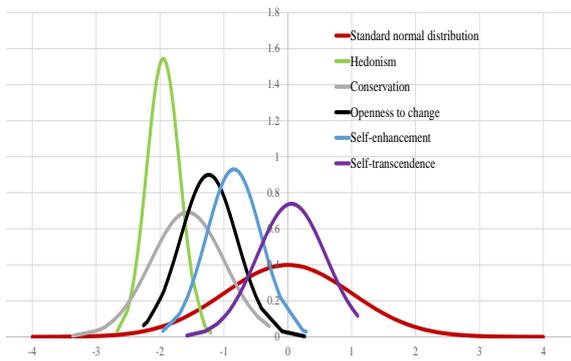


Figure 2: Distribution of CEO value percentiles relative to reference standard distribution.

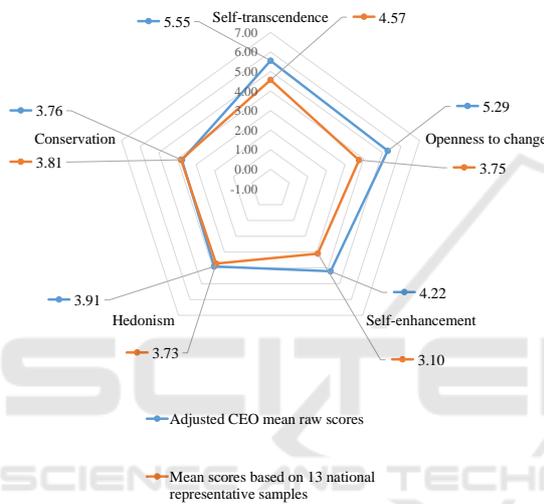


Figure 3: Value profile comparison between sample of CEOs and representative samples covering 13 nations.

#### 4.4 Analysis of CEO Value Profile

For the purpose of individual level choice prediction it is the relative importance among the values guiding the actions, therefore for each behavior the relation of all the values has to be considered. To this end the CEO group’s average profile is analyzed in terms of the relative importances among values based on the procedure previously described. Additionally, based on the previous classification of individuals with their association with moral hazard, five independent samples t-tests were conducted on the raw scores to compare the importance of each value for the two classes of CEOs to detect any difference that might be indicative of negative organizational outcomes. Table 1 shows the results of the performed t-tests. Openness to change and Conservation values were significantly different between the two groups. Specifically, a slight decrease in both of these two values is associated with a value profile corresponding to undesirable

behaviors. Fig 4 illustrates the relative importance scores among the CEO sample, the CEO sub-sample associated with moral hazards and the general population. Rank order of the values is marked above the bars where the CEO sample’s ranking is followed by the general population’s rank for each value. The \* symbol marks the values which have been identified to be significantly different among the CEO groups, based on the previous analysis.

## 5 DISCUSSION

This study aimed at exploring the basic human value structure of CEOs by using text-based personality inferences using the IBM Watson PI service. Our results suggest that there is a selection bias that manifests itself through the individual value profiles. According to the results there are clearly identifiable differences among the universally established value structures in the general population and the sample of CEOs. This marked difference is interpreted as an evidence of the selection bias within leading positions and the consequences of this distinct value structure are discussed in this section, additionally identifying further research directions.

The first remarkable difference among the value profiles is manifested in the difference between the rank order of values among CEOs and the general population. While Self-transcendence values (i.e. care for the welfare of closely related others, as well as care for all the people and for nature) are most important for both groups the similarities between CEOs and non-CEOs end at this point.

Openness to change (i.e. self-direction, independence, creating, stimulation and seeking out challenges) ranks as the second most important value in case of corporate leaders, while it is the second least important motivational factor for the population. Openness to change and Conservation values can be found at opposing sides of the motivational circumplex, which reflects that decisions that promote the obtaining of a particular value inhibit the simultaneous fulfillment of the competing value. Therefore a high priority given to Openness to change values would result in choices increasing novelty and chances for expressions of independent action at the expense of maintaining stability and stability. Self-enhancement values (i.e. expression of competence, achievement of status and control over others) rank at the third position for CEOs, while it is the least important motivational force in the general population. Although one might expect that leaders of world-leading organizations (express-

Table 1: Results of the independent samples t-tests among two CEO groups.

Values	CEO raw scores associated with moral hazard (n = 31)		CEO raw scores not associated with moral hazard (n = 85)		t-test
	M	SD	M	SD	
Self-transcendence	0.82	0.01	0.82	0.01	ns
Openness to change	0.78	0.02	0.79	0.02	2.20*
Self-enhancement	0.65	0.02	0.65	0.02	ns
Hedonism	0.61	0.01	0.61	0.02	ns
Conservation	0.59	0.02	0.60	0.03	2.07*

\*p < .05; two-tailed.

Note. M = Mean. SD = Standard Deviation

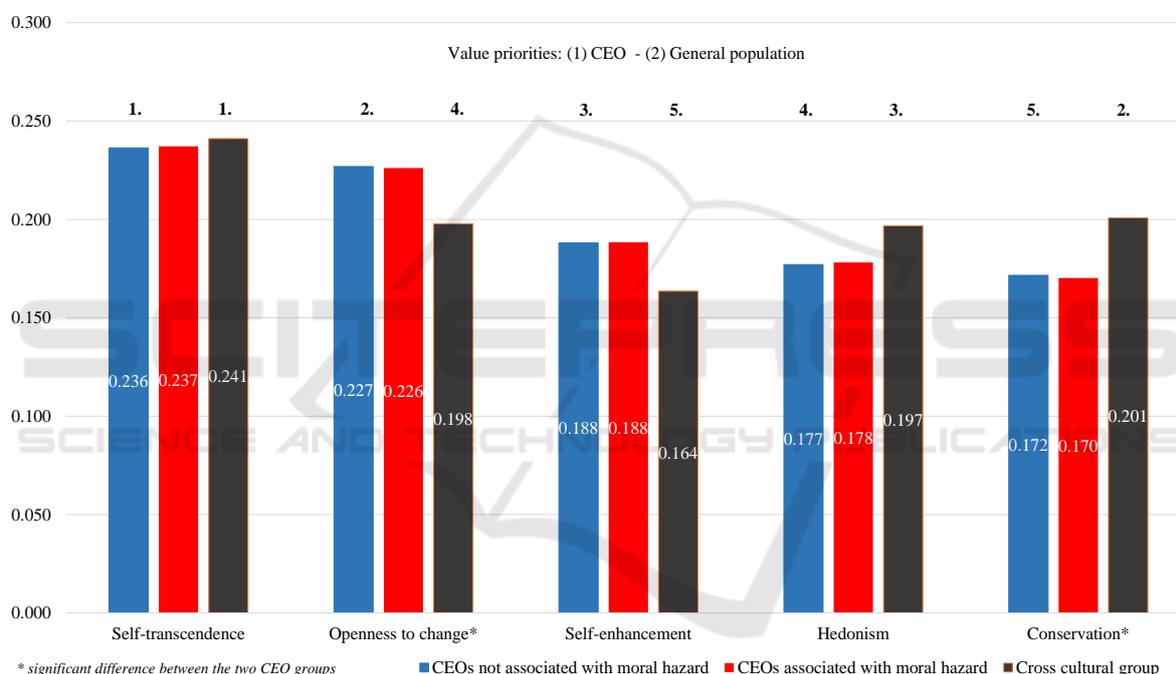


Figure 4: Comparison between the relative importance of values among two groups of CEOs and general population.

ing power and achievement values) would be mainly motivated by Self-enhancement values at the expense of Self-transcendence values, these results contradict this expectation. The rank order difference of Self-enhancement values between non-CEOs (5.) and CEOs (3.) however clearly expresses their preference for high social status and prestige.

While for non-CEOs, the second most important motivational tendencies relate to Conservation values (i.e. security, safety of self and of society, restraint of actions likely to harm others, respect for customs), these aspects of behavior seem much less important to leaders, as it ranks the lowest on their motivational hierarchy, indicating that actions promot-

ing Conservation values have a much lower intrinsic motivational effect (e.g. in order to make an action appear at least as rewarding as an action expressing Openness to change values it has to be incentivized much more externally).

The relative importance of values matches closely with the various Enterprising value profiles identified by Knafo and Sagiv, placing CEOs close to other occupations characterized by material and concrete goals, leading and manipulating people (occupations within the category that have similar value profiles: financial advisor, banker, manager) (Knafo and Sagiv, 2004).

The final analysis uncovered differences in the

value profiles of two CEO groups when their association with moral hazard is taken into account. Specifically, a slight, but significantly lower relative importance attributed to Openness to change and Conservation values was associated with various undesirable behaviors that can be detrimental to the reputation of the organization lead by the particular CEOs.

A limitation of the present study is the small sample size, which can be extended in further studies, since the method of analyzing value profiles by using the Watson PI service is a feasible method for gathering information about the motivation of decision makers for the purpose of risk analysis.

Furthermore, a more detailed description and classification of the various forms of moral hazard would have the potential to elaborate on the connection between the particular value profile displayed by a strategy owner and the level of impact that was inflicted upon the organization, to have a better assessment of the risks relating to particular individuals.

Future work will focus on the issue of how other observable features (e.g. gender, age, occupational choice (Dohmen et al., 2011), consumer preferences (Kassarjian, 1971) or various forms of online behavior with digital footprints (Kosinski et al., 2013), etc.) can be utilized for the construction of psychological profiles suitable for predicting behavior in the context of risk analysis. In particular, it is crucial to identify observable features that can significantly reduce the uncertainty associated with an observable's ability to convey information about a specific motivational trait.

## 6 CONCLUSION

In summary, this exploratory study is the first one presenting how publicly observable traces of individuals can be used for constructing a psychological profile suitable for risk analysis. The study presented a detailed description of the procedures necessary for uncovering the motivational structure of leaders of various organizations utilizing an unobtrusive psychological profiling method. The procedure was conducted by means of textual analysis based on publicly available written or spoken statements by the subject, and the results supported the hypothesis that key decision makers' motivation is significantly different from that of the general population that is interpreted as evidence of a meaningful selection bias. Presenting the motivational structure in terms of basic human values in a form that is independent of the instruments utilized provides a useful input for comparing different stakeholder's motivation, and for analyzing a potential candidate's similarity with the profiles established

here. Finally, the distinct value profile associated with undesirable behaviors can be helpful during the selection of candidates for a leading position by the board of directors in determining the potential risks resulting from the employment of a specific individual.

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