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Potential Organizational Behavior Management (OBM) contributions for raising Computer Security awareness and insider threat mitigation

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Computer Security awareness, insider threat mitigation, behavioral technologies.

Abstract

Organizational Behavior Management (OBM) is a research field dedicated for developing processes to modify human behavior in organizational environment. It is derived from Behavior Analysis, a methodology for studying human behavior with three characteristics that enables research to be translated into applied technology: Quantification, variables can be quantified and standardized; Repetition, results are predictable in a degree of trustworthiness; and Verification, processes are described with sufficient details allowing its replication. For OBM, an organization applies Value Based Governance when it enables and reinforces employees to change their environment according to organizational values. Also, for OBM, Verbal Governance is the leadership's capacity to verbally engage and motivate employees to comply with organizational rules and values. The IAEA NSS No. 42-G states that a security culture is an essential aspect of any nuclear security regime and Computer Security should be accounted when promoting security culture in nuclear facilities. In this work we will argue that Value Based Governance would mitigate insider threat, especially from disgruntled employees, and would also raise awareness when Computer Security is an important organizational value for leadership. Finally, we suggest an effective, evidence-based Verbal Governance technique able to promote Computer Security values in nuclear facilities.

1. Functional Behavior Analysis

The Functional Behavior Analysis, or simply Behavior Analysis, is the research methodology derived from Radical Behaviorism, which is a philosophy of behavioral science initially developed by Burrhus Frederic Skinner, having parallels with Ernest Mach's functionalist principles, which replaces the notion of cause and effect with the notion of function, similarly to mathematical functions, where there is an

interdependence between the variables in which, if one of them is changed, it ends up affecting the others. In this way, Radical Behaviorism seeks to understand behavior as a function of environmental variables [1].

Radical Behaviorism understands that behavior consists of the interaction between an organism and its environment and can be understood in terms of both antecedent and consequent variables. These variables are called stimuli, which can be added to or removed from the environment, i.e., manipulated, and the description of behavior in terms of its interaction with the environment is called contingency. When behavior occurs after certain stimuli is added or removed from the environment, regardless of their consequences, the behavior is said to be reflexive. In other cases, when a behavior is repeatedly followed by a consequence, and this repetition either increases or decreases the future frequency of this behavior, it is called operant behavior. Thus, when trying to modify a behavior, it is necessary to carry out a functional analysis to discover which environmental stimuli controls it, and this analysis involves manipulation of stimuli and observation of eventual changes in behavior [1].

The Applied Behavior Analysis (ABA) is the discipline dedicated to developing behavioral technology based on the experimental research of Behavior Analysis, that can be applied in real world problems. The ABA interventions consists of behavioral modification procedures using stimuli manipulation and behavioral observation in applied settings of social relevance, seeking to influence behavior to a desired direction. Study [2] argues that ABA interventions share with Engineering three key useful characteristics: quantification, repetition and verification. Quantification requires that the manipulated variables, or stimuli, be objectively and quantitatively measurable. Repetition demands that intervention results be predictable, having low variability when repeated. Finally, Verification implies that the intervention is described in such a way that it can be faithfully replicated, so that it can be verified in different environments and contexts. These criteria indicates that ABA is suitable for developing trustworthy behavioral technologies. The subspeciality area of ABA dedicated to interventions in organizational settings is the Organizational Behavior Management (OBM).

2. Organizational Behavior Management (OBM) and Culture

The Organizational Behavior Management is subspeciality area derived from ABA, dedicated to applying behavioral techniques to organizational environments [3]. Hence, OBM inherits the three characteristics described by [2] that contributes for developing reliable behavioral technologies for solving organizational problems. A meta-analysis of the results published in its main journal, the Journal of Organizational Behavior Management (JOBM), considering papers published in the period between 1977 and 2011, revealed that most of those interventions were consistently repeatable and led to desired changes in behavior [4].

According to [5], the first approaches to the study of Culture through Behavior Analysis were made by [6], in which Culture is defined in terms of all the variables that affect one individual, but that are arranged by other individuals. This definition was further elaborated in [7] stating that Culture is a set of contingencies of reinforcement maintained by a group, which can be formulated as laws or rules. Subsequently, using the model of selection by consequences, Skinner proposes three levels of selection: the phylogenetic, corresponding to the natural selection of characteristics that increase the reproductive success of individuals of a species; the ontogenetic, which corresponds to the selection of behaviors of a particular individual throughout his life; and the cultural, which concerns the selection of cultural practices due to their contribution to the survival of a given group of individuals [8].

Regarding Organizational Culture, the OBM literature understands that the leadership activity is intrinsically linked to cultural changes, as expressed in the studies [9], [10], [11], [12], [13], [14] and [15]. The same is suggested in the specialized IAEA documentation, specifically by IAEA NSS No. 38-T and NSS No. 7 when describing the role of management in promoting Security Culture at nuclear and radiological facilities. Management can benefit from two OBM strategies to promote Security Culture, the Value Based Governance and the Verbal Governance.

3. Value Based Governance

Values-Based Governance is an OBM approach that proposes a management strategy in which organizations allow a certain degree of freedom to its employees in order to modify the organizational environment and, when they do so in accordance with organizational values, they are reinforced using behavioral procedures, in order to increase the probability of repeating such initiatives in the future [16]. This management strategy is aligned with the Human Resource Elements section of IAEA NSS No. 38-T, specifically its paragraphs 3.49, 3.50 and 3.51, which suggests the following programs to promote security culture: the employee suggestion program, in which employees would be encouraged to suggest security improvements; the employee recognition program, which would reward security-friendly behavior; and the assistance program for personal matters, which would provide support for some problems that employees might be facing in their personal lives, in order to avoid disruptive and potentially harmful behavior in the work environment. These security culture programs can be characterized as Value-Based Governance strategies.

The assistance program for personal matters would benefit from Acceptance and Commitment Therapy (ACT), an ABA set of therapeutical techniques addressed to threat human psychological suffering, that are developed in an evidence-based methodology derived from the Relational Frame Theory (RFT). The RFT is a behavioral theory for language and cognition with roots on the behavior analysis investigations of verbal behavior and rules, that will be approached in more details later in this paper. There is also a subspeciality of ACT, the Acceptance and Commitment Training (ACTraining), that is applied in the workplace to prevent burnout, stress and injuries. Burnout is a syndrome resulting from chronic workplace stress and working in highly bureaucratic organizations can contribute for developing it in individuals, and nuclear and radiological facilities can have very bureaucratic organizational arrangements, characterized by rigid hierarchical structures, excessive production of administrative records and many repetitive job assignments, or “clerical work”. There is an additional benefit of applying ACTraining to organizational environments, which it can produce a better work environment by promoting prosocial, or cooperative, behavior [16]. Using ACT to help nuclear and radiological facilities employees with their personal issues and ACTraining to cope with professional matters would mitigate the risks of insider provoked cybersecurity incidents, by preventing or minimizing disgruntled employees.

The other two programs for promoting security culture, i.e., the employee suggestion and the recognition programs, would benefit from OBM interventions focused on Verbal Governance.

4. Verbal Governance

According to [16], organizational governance can be understood as the development of rules and policies that are communicated either verbally or written by managers, whose objective is to guide the behavior of employees in order to perform their tasks in a productive and efficient way. The OBM literature studies human communication using a theoretical and experimental framework derived from ABA called Verbal Governance.

Verbal Governance is a field of behavior analysis that studies the functional characteristics of verbal behavior, seeking to understand the conditions in which this kind of behavior occurs [17]. We call “verbal” the behaviors which consequences are mediated by another organism, i.e., stimuli that are added or withdrawn from the environment by another organism, contingently to that behavior. A classic example is a person asking for a cup of water, using a gesture or speaking (verbal behavior), that results in another person bringing the water (stimuli) and probably increasing the probability of that behavior to repeat (reinforcement). It is worth mentioning that the term “verbal behavior”, as it is used in Verbal Governance, concerns not only vocal behavior (which is commonly referred as “verbal”) but all communicative behavior, including writing and reading. Verbal Governance would, therefore, have an important role in Value-Based Governance. The studies presented by [16] use the term “cultural milieu” referring to the collection of stimuli that influences cultural practices and the behavior of individuals in a group, i.e., the cultural milieu would correspond to the values and beliefs prevalent in the repertoires of members in this cultural group.

Some Verbal Governance studies focuses on understanding how to influence human behavior using contingency specifying verbal statements, that are called “rules”. The study of verbal behavior, and particularly rules, resulted in the Relational Frames Theory (RFT) which focuses on the study of a particular class of responses (behavior) called Arbitrarily Applicable Relational Responding (AARR). This class of responses has been successfully used to explain a wide range of cognitive phenomena related to language [18].

For RFT, the influence of one organism over another, through relational responding procedures, is called Instructional Control. This control can be assessed through several behavioral variables, like the complexity in which the AARRs are combined within an instruction, how familiar these AARRs sound for those addressed, or whether these AARRs produces reinforcing or punishing consequences [19]. The Instructional Control, when performed in organizational settings and utilizing only verbal stimuli, can be understood as persuasive behavior.

Instructional Control can be exerted by procedures of Relational Coherence, as defined in [20]: “the extent to which a given pattern of AARRing overlaps functionally with previous patterns of AARRing that were reinforced (or at least not punished) by the verbal community” (p. 17). Here, a “pattern of relational responses” regards rules, or statements. As an example, there are two recent Relational Coherence studies [21] and [22], that explored the effects in Instructional Control of pairing the AARRs used by the speaker with the AARRs learned by its listeners. Explained in terms analog to organizational environment, it explored the effects in rule compliance of a manager using a discourse coherent with the listeners’ (employees’) knowledges and beliefs. The authors performed an experiment where the listeners were exposed to two speakers, one having a coherent discourse, and another using an incoherent discourse regarding listeners beliefs. The results showed that the great majority of listeners were influenced to follow the rules of the coherent speaker after the procedure. Considering that the procedure used in the experiment involved nothing more than the tailoring of the speaker’s discourse to listener’s beliefs, it’s application in organizations would demand only a management training in Relational Coherence and their posterior application in their daily routines, resulting in persuasive managers that could potentialize the promotion of cybersecurity related rules and values, contributing to promoting Computer Security awareness.

Conclusion

Computer Security is dependent on Security Culture, that must be consistently promoted in nuclear facilities. The IAEA NSS No. 38-T outlines key aspects of a programme for the enhancement of Nuclear

Security Culture and draws suggestions of how to implement it through corporate programs and management techniques. It would be beneficial for this implementation to utilize trustworthy and effective behavioral technologies.

The behavioral technologies derived from behavior analysis, as defined in this paper, have three characteristics that make them trustworthy for real world applications: quantification, repetition and verification. The behavior analysis field that develops behavioral technologies applied to organizational environments is the Organizational Behavioral Management. OBM suggests that Value Based Governance and Verbal Governance are important and useful frameworks to approach Organizational Culture, including Security Culture.

Value Based Governance is aligned with the three human resources programs suggested in IAEA NSS No. 38-T and recommends ACT and ACTraining for managing employees' emotional issues. We argue that it would contribute to insider threat mitigation and to reinforcing Computer Security awareness. Verbal Governance literature describes procedures to help increasing the effectiveness of communication skills that can be used by managers to improve compliance with Computer Security rules and procedures, and we suggest the use of Relational Coherence by managers in their daily interactions with team members for this purpose.

The adoption of Acceptance and Commitment Therapy and Relational Coherence in nuclear and radiological facilities would contribute to promote Nuclear Security Culture and, hence, Computer Security values, resulting in a greater adherence to rules and procedures by employees, mitigating insider threat. Both technologies are evidence-based, i.e., their implementation procedures and results can be objectively described and measured. We hope to have contributed to nuclear and radiological facility leaderships by presenting these two behavioral technologies applicable to their organizations.

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