

Worker Character/Personality classification and Human Error possibilities in procedures execution

Authors: Salvador Ávila⁽¹⁾; Luiz Fernando Pellegrini Pessoa⁽¹⁾; Celso Figueirôa⁽²⁾

Topics: Risk assessment and management – Human Error

Keywords: Human Error, Psychology Profile, Operational and Human Reliability

Human errors happened in procedures execution in any kind of industry. Statistical reports show different possibilities to error by worker. Slips, memory lack, mistakes, cognition processing failure, knowledge, ability, mental connection cause effect, and others, are human errors in procedures planning and execution. In fact, classification of error type is not too important. It became necessary to learn about principal causes of these abnormal chains. Etiology or cause study of human error depends of technical and social aspects. In resume, worker history of life inside and outside of job that, changing energy with technology or environment defines different type of character to work. Theses human characters and personalities have possibilities to induce human and social errors, mixed with technical ones. This paper intends to classify different human characters in relation with manager profile, organizational climate and type of technology and product. This management tool will become human error easier to be analyzed.

(1) Universidade Federal do Rio de Janeiro; (2) CAPACIT

Introduction

The Reliability in Industrial Process is a renewed area based in mathematical models, like analysis of core component and techniques like Neural Nets, to detect the fault causes in the process or in the final product. This analysis is purely technical and do not include variations of social system or even so the environmental.

The operational reliability involves activities that searching efficiency growth of process based inactions in technical, management, organizational and human areas. So, it looks to understand how a process loss is building independently of generate na accident, breakdown of equipments, human stress, product or in the process faults.

The interaction that can generate an anomaly is composed of Technical, Organizational and Individual elements. Related to factory processes we can establish relations that the impact and the modeling of operational failure depends of the kind of process if it has a product continuum or discreet matrix; which level of automation; which kinds of procedures and tasks are involved and; the utilization of big equipments and closed systems.

The tasks that will be doing depend of the kind of technology and this influence in the individual or group failure. Different technologies are influenced in different ways in cases of group or individual failure. So, continuous processes are strongly influenced by team failure. In another way, the process that involves manual action are influenced, in great part, by individuals failures. At equipments and machines, the technical failure or fatigue of material is the biggest influence. The operational

procedures when individually made could result, if memory or attention failure happens, in individual failure. When the procedures involve a great number of operators and the failure is generalized about the understanding of the rule, results in a team failure.

Different about what Lees in articles and books of safety and reliability affirms (1983, 2005), the failure is a dynamic process that changes his behavior dependently of the environment alterations, alterations in the process, in the learning process and in the structures. The static failure rate is reserved for systems that has strongly automation control (technical and human structural stability), the process of learning are not significantly alternated with time (continuous revisions of procedure) and the environment has no effect in the process (the culture of organization, the occupational risks and external temperature that do not change with time).

All events that happen during operation journey indicate the existence of states to be compared with a standard. So, the operational factors can be related and tell us a history of normality. On the other side, environments where the equipments and the operations are inside promote transformations between the relations with the structures (technical and individual) and with management processes. It is necessary to know the relations to maintain the stability of process to minimize operational failure.

It becomes necessary construct pictures that identify what are the risks in the construction of the team using techniques like the Personality Scale.

Operational and Human Reliability

Imagine how many options will have an operator submitted in situation which is new, but with characteristics that remember him to many others situations in which he experienced lately. Certainly the number of options to choose in complexes systems is significantly large, and if we considering the interaction between Human x Technology x Organization amplified moreover the choices.

The approach for this problem follow, generally, a Cognitive Analysis of formation of act in a response for an stimulus, in a sequence of information processing in human mind, like is presented in Rasmussen (1987) and Lees (1984). The simplified model in Figure 1 is a reference of the analysis of Human Errors, of the development of systems an aid to development of classifications for errors.

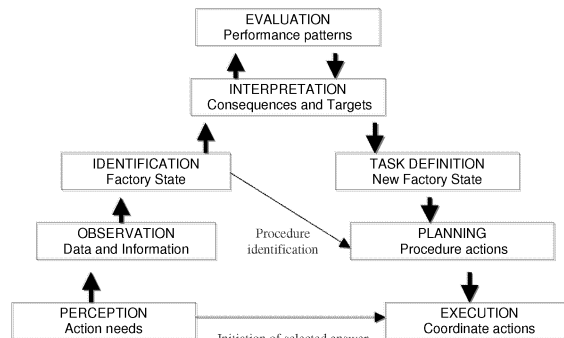


Figure 1 – Cognitive model for information processing in human mind

At the lowest level of processing the control is fundamentally in physical skills, inherent or trained, ins a stage of conditional reflex in a situation which the mind

has minimum processing. The failures in this level are strongly oriented in the areas of knowledge of Ergonomics and Physiology. Because it stays in the short period memory, the mental charge in the moment of the execution has a significant effect in the failures related to this stage. The assessment of mental charge of the work is essential to predict the human reliability in production systems.

At high levels of processing others factors are fundamentals in the moments of choice. Hollnagel (1993) presents like a reference the research of Bainbridge (1991, p. 160) to inform that one step and the other of processing many influences occurs, and this steps are not discreet and equal elements for all human beings, nor for all organizations, for all technological solutions and neither for the charging and processing conditions in complexes systems. Hollnagel (1993) indicates that the contextual control for human behavior is based in Cognitive Modules; more than tasks goals in a way like is in the 'ladder' model of Figure 1. The social environment and the organizational culture are factors recognized and treatment in these modules between steps. The individual history is also a understand factor and accept, but is not well treated probably caused by its variability and difficult to control.

The Character, Personality, affective factors and the constructions created in the learning processes have the importance in the definition of the cognitive modules. During the processing more than all externals influences that have the tendencies to molding the behavior of the human inside, the individual create a Mental Map (Ávila) of what is the next step of the situation. The Mental Map, for the fact that it is searching for structures that permit to establish the relation with the situation, is determined by the individual inherent aspects.

The affirmative here is that the same operational situation give to two different persons will have different structures of Mental Maps during the cognitive processing, although they can have the same answer of action or not. This affirmative is also valid for teams in the condition of the formation of decision make, situation when individuals interact creating Maps of the Team that are generate as a consequence of combinations of Individuals Maps.

Features of Character are determinants for the construction of mental maps and the possibility of recognize its standard and how it interact in a team open an approach to control the human failure in complexes systems.

Failure Construction

The Individual and the team failures get their high point when they impact in a negative way in the aspects that involve social inclusion and economic sustain. All failure takes energy of the productive system independently if the impact in the social and economic environment isn't so significant. Depends of the complexity of systems, it can happen lots of small faults and the sum of energies will generate financial and society losses. The foundation of individual failure is in the construction of personality during the phases of childhood development (Freud; Ávila; Winnicott). Individual failure depends of the character features result from the interaction of the individual in the family and in the society. A team failure is constituted by individuals inadequacies behaviors incorporated by social, organizational and management aspects.

Creation of 'Hooks'

During the behavior construction process or the individual failure appears structural 'hooks' where the influence of social aspects cause team failure. These 'hooks' are identified through the methodology of Piggie that presents an etiology of individual failure. For each fixation of the individual in the childhood-teen development phases occurs the possibility to develop a type of character. This typology can be adapt or not in the management style or in the organizational climate.

The 'hooks' are structural characteristics acquired in the emotional livelihood, but can be structural characteristics acquired in the design, commission, start or operation of the process technology, in other words they also appear in the system outside the individual.

Depend of the product and process kind the failure can acquire differentials characteristics. In terms of product, this influence in the criticism of failure impact to the natural and social- economical environment. The product also change the tools used in the organizational and occupational environment. Making an example, depends in the product toxically the organizational norms can be more rigid and the care to develop the tasks can be more complex.

These 'hooks' when inserted in complexes systems with a large charge of processing can be connected to develop the failure process creating the variation of the state till the non equilibrium of organic system, factory or organizational.

Learning Processes

About learning structures, Bion affirms that the thinking, as emotions and knowledge are not dissociate between each other. In terms of thinking, Bion affirms that the attitude making resulting of frustrations depends of affective history, the actual reality of environment and the factors that function like a trigger to action make, so if the conclusion is that these factor turn-on the trigger when appears the failure connection through the personality 'hooks'.

Using the language developing to understand this aspect, we reference Piaget for who the formation of phrases is possible after a completely training and a construction of a dictionary of verbal codes and the respective external and internal (imagination) object pictures. In this case, the codes and images dictionary refers to the associative phase when the child learns to classify objects classification like its own relation with the standard originally learning image of the object.

The abstraction is the analysis and synthesis of objects and movements. The word gain importance because form a phrase that reproduces a real or imaginary action. The abstraction makes possible the process of cognition and the creation of complexes structures of knowledge based on simple structures. The synthesis of pseudo concept strengthens the search for knowledge. The dialog will provide the pseudo-concept maturity. New concepts are added to emotional livelihood of the child that now knowing how to speak and construct phrases and thoughts. By Piaget it possible to affirm that the thought non communicable, nor managed, nor articulated becomes to a manage thought.

The formation of concepts is a creative process, and not a mechanical and passive process; a concept appears and configures in the curse of the complex operation, directed for the to the problem solution; and only the presence of external conditions favorable the mechanical link between the word and the object is not enough to the mechanical creation of a concept. The word put a nom for the social desire where is inserted the citizen moral and its relatives habits for the actual situation. Many times the habits or the family heritage is the law to be followed. In another cases no references are present, so the law becomes the social references like the media 'education' to attempt the demands of money.

The learning structures in mind suffer these influences and make to the associations been dynamics and contextualized, even in the case of rationalizes processes where everyone understand that all steps or stages are described in a non doubtfully way the structures association are part of information process.

Analysis Approach

The process between the stimulus and the response walk in many fields, with the individual history nuances superimposed on a rationalized structure, and the technical and organizational aspects contextualizing the events. The search of standards and the classification became possible the construction of methodologies.

There are two ways of analyzing the human failure in the task at this dimension: through the individual failure etiology based in the psychoanalysis view of affective likelihood and though the analysis of human behavior; or psychology view of individual failure.

To connect the ‘fantasy’ (a mental map created) with the social influence, is used the method calling Etiology of Mental Anomalies similarly to that made for the industrial plants using Anomalies Event Maps (MEA).

If by one side is possible to describe the individual failure using the affective likelihood or the psychics instances explain by Freud (.....) resulting in the development of the disease of body and mind, on the other side, in this research is showed how society interact promoting the appearance the defenses and the behaviors in the social actuation, in other words, the superficial human behavior analysis (with the its vectors in Figure 2), that results in the technique of priorities orbits in the decision process for the action.

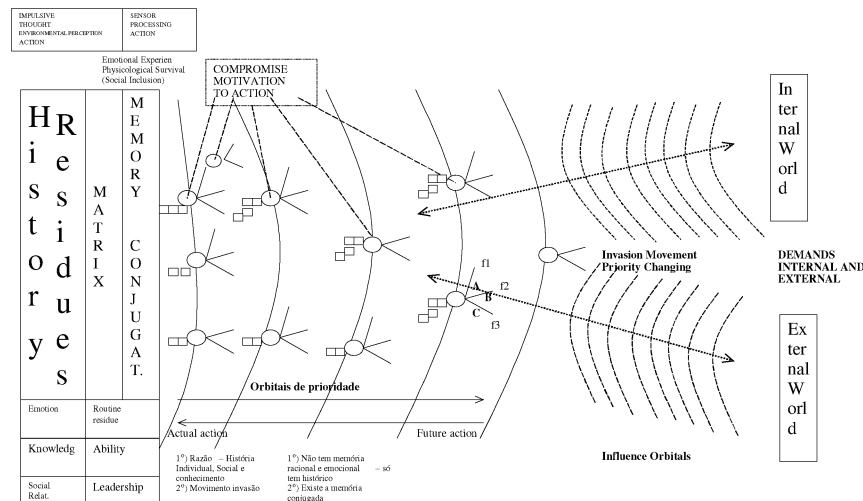


Figure 2 – Priority Orbital in Decision Process

Classification of Character and Personality

Ávila developed a methodology to interpret mental processes starting from the analysis of memories fragments, thoughts and likelihoods presented for patients in the classical case of literature (Piggle – Winnicott). In this methodology register the analytics sessions similarly when apply the methodology in the case of anomalies of ‘factory floor’ using shift registers. From the register are extracted mental processes that indicate the anomalies to identify specifics processes of failure. The Anomalies Event Map are prepared similar when it is applied the methodology in the industry. In this Map is done a work to classification and codification to identify the repeating chain of anomalies and the principal factors in the causal logic.

The complex element is that, the man suffers the influence from the regional culture that is part and from the social economic situation of the moment. Moreover, the mental processes that take the formation of appropriate abilities for the decision and taking of action depend on the technology and the affective life of human being. Thus, worried about a possible project of being inserted to the organizational level, Avila presents two important subjects: the levels of analysis

of the human error considering the ambient influence and the classification of the psychological profile on the basis of the human error in the labor environment.

Human Error Level Evaluation and Environment Influence

The Human Error is analyzed in three levels that suffer the ambient influence from the organization, the economy and the society. In the first level, or primary level, occurs the formation of the structure of personality and socialization processes. The individual profile in contact with the society has as resulted the behavior with peculiar characteristics, call traces of character. Still at this moment the learning processes occur that make possible the construction of abilities. In as the level if it finds the inquiry on the reasons of the human error as: lack of memory and difficulties in focuses attention, performance with authorities, acceptance of the rules, construction of the inventory of knowledge and abilities, processes of taking of decision for the execution of the task. In the third level if they find organizational measurements related with: the level of allegiance (psychological contract) and functionality, the resultant in the productivity in the task that is influenced by social relations e, the behavior of the employee under stress.

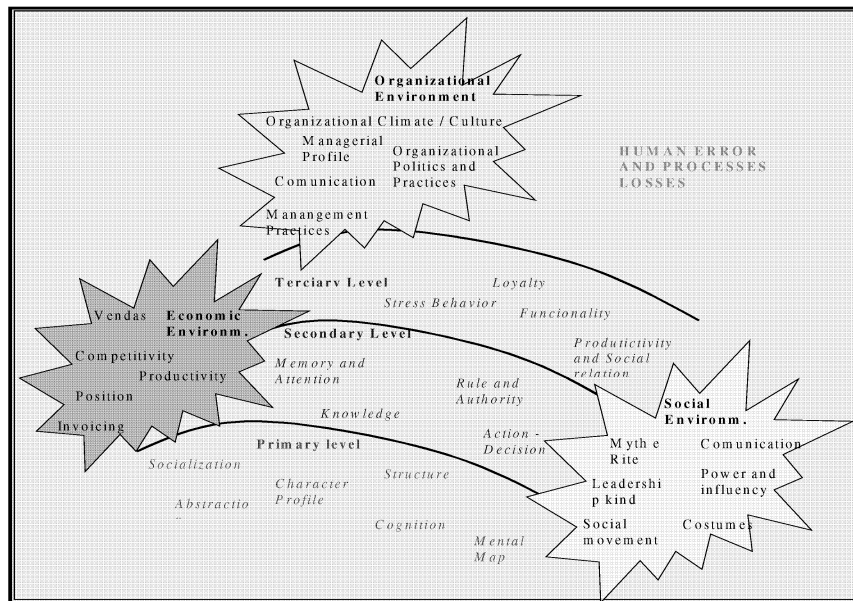


Figure 3 – Human Error Level Evaluation and Environments

Psychological Profile Classification and Human Error

The classification of the psychological profile besides taking in account the levels of analysis in the horizontal form (as presented in figure 3) takes in account the sequence of personality formation and learning processes in vertical form (figure 4 below). Thus, the state of emotional stability, the type of structure with the related basic mood modifies the perception and affects the learning processes indicating possible imperfections in the motivational level (internal and external environment influence - figure 1). These imperfections in the motivacional level are described through psychological profiles or character related with the work. The profiles below when inserted in the planning, execution and analysis of the task they can carry through below of not efficient form generating low the productivity as resultant of described the human error as in the red part of the figure. Each type of character with its specific motivacional level has as resultant imperfection in the

decision for action or execution of the task. The character is influenced by the organizational climate and the regional culture in the process of birth of the human error.

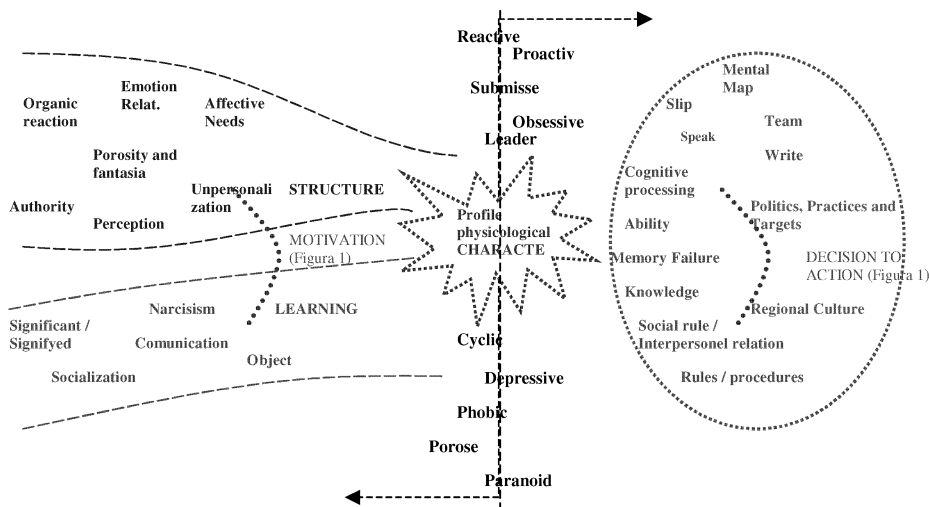


Figure 4 – Construction of Psychological Profile and the Human Error

Psychological profiles for human Error evaluation:

Reactive. It functions when provoked not having proper initiative for innovations. It follows what the rule defines and possesses low motivation energy. The goal also is low and the action is carried through when motivated for the external environment.

Proactive. It has good capacity to perceive ambient alterations. With this perception and comparing with the personal values and registered history, the individual takes initiative before the events occur.

Submissive. Dominated for internal factors that they reflect in situations of the external reality. One says that submissive has setting in the anal phase of development of the personality. This possesses low motivation energy and functions under authority.

Obsessive. It always functions of rational form and it does not attribute value to the emotional questions. It is fed with the work of unhealthy form without valuing social environments it is of the organization. It has setting in the anal phase. They can create rituals to substitute last memories.

Cyclical. With changeable basic mood it possesses voluble behavior. Being able to feel moments of high and low motivation. The energy motivation goal also is changeable, having reflected on the unconscious parcel of this energy. This profile is appropriate for activities in the commercial area.

Gotten depressed. It has basic mood in low. This personality tends for the depression and possesses low astral any professional activity to be developed. The energy goal to initiate the action is changeable and it always is above of the energy of motivation, this form, the passivity state is constant.

Leader. With easiness to put into motion people around organizational objectives (when they possess identity of values), this profile is prepared to act in organizational changes. The energy goal to activate the action always is below of the energy of motivation and ascendant. The leader always is made use to act.

Fóbico. The impact of last events involving humiliations and aspects of the external environment leave the scared individual and harm certain functions in its performance. The fear is constant and confuses the rational action provoking inadequate behaviors for the work, for example, fear of height.

Porous. The individual possesses a fantasies behavior in result of the memory and sensations with gaps or dysfunction. The memory and attention lacks are constant in this profile. The aspects of creativity and innovation in the organization can demand some porous profiles.

Paranoid. All possess fancies in the mind and that; they can until putting into motion the action through the unconscious factors. The problem occurs when the fancies gain life and invade through the persecution the routine of the individual in the society and the work.

Results

An evaluation to classify the type of character in the work, or either, in the execution of the task, brings as benefit to prevent the occurrence of human error. It is not appropriated that professional with porous character carry activities that demands task execution with rigid form without lack of memory, or still, if it does not have to place operator who possesses obsessive character in activities that demands creativity at all moment. Being thus, the classification of the psychological profile of the operator and the classification of the type of task to be carried through allow adequate allocation of the operator in job. The results to be reached are, in the biggest part, intangible and are intended to increase the motivation for the action improving the processes of decision in the execution of the routine tasks and emergencies. The results are measured in the third level indicated for Figure 3, where, each one of the terms possesses indicating index. Being thus, it is intended to analyze: (a) Loyalty; (b) Functionality; (c) Behavior under stress; (d) Social relation and (e) Productivity in the execution of the task. Therefore, it is intended to reach: (a) Loyalty - In the critical questions for the company, the employee defended and in accordance with followed the procedures the management systems preventing problems of reduction in the profit, in above of 75% of the time. (b) Functionality - the demand for ability is married offers for the team, or the individual, in 80% of the time, measured through individual and group tests and as resulted of the adequate allocation of staff. (c) Behavior under stress - Good performance of the operator in 3 of 4 situations due to the comfort how much the accomplishment of its task inside of the team. (d) Social relation - the communication on decisions is equivalent 85% of rightness in relation to the original indicating good reproduction and respect to the fellow workers. (e) Productivity in the execution of the task - the goal established for the monthly program exists use of 90% of the hour worked in the task resulting in control of the production reaching.

Conclusion

The use rate of the ability/ competence inventoried in the job is great when the operator places itself of correct form in the task. Thus, one sends regards that groups of operators are evaluated and if it compares with the technology of the industry.