HUMAN ERROR REVISITED

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ABSTRACT: It is often reported that a majority of avalanche accidents, as well as accidents in other fields, are caused by human error. In these accident analyses, the accidents are attributed to the "human factor". This factor is usually described as a list of different cognitive biases that affect decision making. In general, the attribution of human error in accident reports as the root cause may be rather subjective.

This paper raises the question of going a step further than just categorizing causes as "human errors" in accident analyses and in risk management. Since humans by their very nature make mistakes, it is unreasonable to expect continuous error free performance. By using the mindset of human reliability analysis (HRA), an incidence of human errors is often predictable. Further, human error is also a consequence of unfavorable external conditions, rather than the cause itself. In conclusion it is argued that accident investigation and mitigation should be an acknowledgement of this fact. In a systems approach, resilience that take human performance variability into account should preferably be introduced into the systems.

KEYWORDS: Human error, avalanche risk, education, human reliability

1. INTRODUCTION

Many accidents and system failures are attributed to “human error”. “Human error” is often used when an alternative explanation which refers to technology or “unforeseen” environmental conditions cannot be found.

Avalanche accidents are no exception, using the standard approach of attributing causes resulting from either technology, environment or the faulty actions of humans, human error seems to account for about the same percentage, about 80%, as in many other (skill based) activities, for instance in the airline industry (Atkins, 2001). As the technical prevention methods improve it is reasonable to expect that this percentage will increase.

However, it seems that the attribution of human error in accident reports as a root cause, is to some degree based on a qualitative and rather subjective assessment. An alternative view is that while “human error” can be defined as the immediate and direct cause, other factors, such as organizational practices or system design are important in facilitating or provoking these errors (Fujita & Hollnagel, 2004). This is to say that errors in reality may be both a cause and a consequence.

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2. HUMAN ERRORS SEEN AS PERFORMANCE VARIATION

Some errors appear to be stochastic, but many have proven to be systematic; that is features in the system design or the task structure make certain error types more likely occur than pure chance. (Back et al., 2007)

As a consequence of this, some researchers (e.g. Hollnagel 1983) argue that the dichotomy of human activities as "correct" or "incorrect" is a harmful oversimplification. A focus on the variability of human performance and how systems manage that variability can be a more rewarding practice.

Approaches such as Human Reliability Analysis (HRA) recognize that successes and failures are seen as having the same basis. A central view within this approach is that human errors are outcomes of normal performance variability, rather than a consequence of abnormal performance. Hollnagel, (1993) states that there is an underlying variability of human performance that cannot be eliminated and that actions perceived as erroneous therefore will happen.

Variations in performance do not necessarily lead to undesired outcomes or accidents either. They may, for instance, be detected and corrected by the system at an early stage, or the environment can be sufficiently forgiving (Hollnagel, 1983).

There are certainly also individual variations, but from experiences in Man-Machine–systems it seems that the occurrence and frequency of human errors often depend more on the interaction with the environment than on any stable inherent characteristic of the operator (Hollnagel, 1983)

The cognitive biases that influence our decisions in avalanche terrain are well known (McCammon, 2002). They include a number of biases that are relevant to decision making in general and they are shared by all humans to some degree. A particularly strong bias seems to be loss aversion, i.e. the tendency to strongly prefer avoiding losses to acquiring gains, This bias seems to be so fundamental as it is even found in other primates (Santos, 2009).

The fact that we know what the biases are and what triggers them, should also make them possible to predict and mitigate. The questions is, since we now are aware of these biases, and have good means to predict them, does it make sense to label the errors that follow from them, as the root cause of accidents?

3. THE BLAME GAME

The attribution of errors to fellow humans is sometimes a result of the "blame game". This is defined as "a situation in which one party blames others for something bad or unfortunate rather than attempting to seek a solution" (oxforddictionaries.com). The objective for blaming others can be to exaggerate the positive aspects of one's own performance, and exaggerate the negative for others. Other factors that could be driving attempts to attribute blame could be pressure from insurers to avoid liability. Blaming a single person that makes an error, can also be a means that is used to mask organizational problems.

Research implies attributing blame is intuitive, and that it is heavily biased. A person that is in some ways seen as less sympathetic will more often be blamed than somebody nice, regardless of rationality and the objective facts (Solan 2003, Alicke 2008).

Attributing blame is often counterproductive in an organizational context. When blame becomes a part of the culture, paranoia and fear of failure tends to drive decision making more than anything else. This results a culture of not taking risks, rigidity, low employee engagement and initiative, covering up of mistakes, and not learning from them.

4. IMPLICATIONS FOR TRAVEL IN AVALANCHE TERRAIN.

In the book Staying Alive in Avalanche Terrain, the chapter about the human factor starts "A telling example of the western mind is that what we call "human factors" occupies its own chapter – separated from everything else – instead of being woven into the fabric of avalanche decisions as they really are" (Tremper, 2001).

The human factor was introduced as a separate factor in avalanche risk assessment by the prominent educators Jill Fredston and Doug Fesler of the Alaska Mountain Safety Center, in the 1980`s. At the time, this was a very important step to raise the general awareness of the biases that influence decision making in avalanche terrain.

In avalanche accident reports, human factors were used to describe the errors in judgment, decisions and actions that lead to outcomes in the form of accidents. The practice was certainly useful to indentify and classify many of the cognitive biases involved. The biases that were found to influence decision making in the avalanche context has during the last decades been extensively studied (e.g. McClung 2002, McCammon 2002, Adams 2005).

When one considers travel in avalanche terrain as a task where human reliability is part of a system, the causal factors that determine outcomes may however be different. Although it may seem a little strange to use a systems approach to a regular ski trip, there may be a number of settings in which such an approach will be useful, i.e. organized tours, where somebody has a formal responsibility as a mountain guide, heli skiing operations, maintenance, construction and military operations in alpine terrain.

One example that can be interesting to consider in this context could be the following; An organized ski tour with paying clients, a mountain guide and the guiding company management. In a hypothetical situation one of the clients fails to follow the guide's instructions to stay within defined bounds because of inadequate skiing skills, veers into a slope prone to avalanching and releases an avalanche. The primary cause would be related to the action of the client. However, it can be claimed that the guide should have evaluated the client's skiing abilities before the tour and assessed the probability of the client being able to ski the slope properly and comply with the guide's instructions. But, if constraints are imposed by the management, for instance for economic reasons, that prevents the guide to spend sufficient time before the tour with the client to assess skiing abilities, then the system could be the root cause. The management would then ultimately be responsible for faulty decision making, i.e. for failing to implement a system that could prevent such an accident.

5. DISCUSSION AND CONCLUSION

It is increasingly recognized that the root causes of accidents are often linked to system issues rather than individual deviance from specific instructions or procedures. That is, even the individual who unintentionally deviates is a systems issue. Reason (1997, in Peng-cheng et al, 2012) argues that to maintain system safety we have to recognize that we cannot change the human condition, but we can change the conditions under which people work.

The culture of the group or organization is important. Looking at some high risk industries such as the military, the North Sea oil industry, and nuclear power plants, it seems that cultures that go beyond the blame game and make it safe to admit and report failures are most often the ones with the highest standards for safety and performance.

Many of the heuristic traps and biases that affect decision making have been described in psychological literature (e.g. Kahneman, Slovic, Tversky 1983) and have also been connected to the avalanche context and systems approaches have been suggested (Adams, 2005). If human error is to be expected with a certain probability, and if it is possible to identify the situations where the individual is likely to commit them, it should also be possible to use this knowledge in avalanche prevention work. Check lists and decision support tools exist for most objective factors, like terrain, snow pack conditions and weather. We feel that a systems approach that addresses the elements that can cause the “human errors” may have to be adapted individually because of the different organizational features. This requires some further development. The current methods and models do not include an explicit representation of the possible impacts of organization and management factors on human reliability. Mohaghegh and Mosleh (2009) pointed out that common among many models and methods is to solve three major problems: (1) the classification of the organizational factors that affect risk; (2) assessing how these factors influence risk, that is, building a causal model of human error; (3) assessing how much they contribute to risk, that is, building a quantitative method to quantify the contribution of the factors.

From a learning point of view it would be useful if avalanche accident reports could include questions as the following:

- was appropriate information provided at the appropriate time to minimize the opportunity for system induced erroneous actions?

- was resilience built in to compensate for human perceptual dysfunction?

- was resilience built in to compensate for human motor (and cognitive) dysfunction, contain provisions for detecting erroneous actions and for instigating corrective procedure?

Identifying individual errors and naming biases can be useful, but is not enough if one wants to find the root cause. There will be a need to look at the system surrounding the human making the error.

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