



NAC Executive Insights

Human Factors in Large Complex Projects

Key Points

- Human factors in the management of large complex projects encompass culture, motivation, emotion, habits, and rational and sometimes irrational thoughts. Over two dozen human factors that may be present in large complex projects are considered.
- Human factors are inescapable and may range from destructive through benign to positive and essential.
- Projects are composed of humans; each is an individual and each is a package.
- Diverse teams, appropriately led and motivated, outperform teams of experts when faced with complexity.

Introduction

Human factors are important on all projects. On large complex projects, however, the network of interactions grows in nonlinear ways. This nonlinearity is often underappreciated as are the human factors related to the management systems deployed, the work process used and the tasks performed with them, the equipment used and the facilities that are worked in, and a broad set of environmental and contextual factors. Human factors are affected by each of the aforementioned, but also affect and shape each of them.

Human factors¹ in the management of large complex projects encompass culture, motivation, emotion, habits, and rational and sometimes irrational thoughts. Table 1² enumerates a range of human factors that can affect management of large complex projects. Some of these factors are briefly discussed in this Executive Insight.

The intention here is to raise awareness of the range of potential human factors that may be present and impacting a project. These factors may vary across the various project teams as well as being present at the overall leadership level.

Application of issues discussed in this Insight is best accomplished as part of project, task, and functional performance reviews and serves as a good evaluation checklist in assessing nontechnical factors

¹ Also see Executive Insight, Dirty Dozen

² See also J. Spacey Twenty+ Factors in Project Management (2016) <https://simplicable.com/new/human-factors-in-project-management>

impacting productivity and project performance. From the author’s experience, these reviews are best accomplished using interviewing techniques with 360-degree reviews often helping to identify the root cause of the human factors at play. Near-miss and routine safety audits also may provide insight into many existing or emergent human factors potentially impacting performance.

Table 1 lists the human factors to be discussed in this Executive Insight.

<p style="text-align: center;">Table 1 Human Factors in Large Complex Projects</p>		
Abundance mentality	Cognitive biases	Cognitive dissonance
Convergent thinking	Divergent thinking	ERG theory
Fallacies	Flow	Heliotropic effect
Hygiene factors	Influencing	Intrinsic motivation
Intuition	Locus of control	Logic
Malicious compliance	Motivated reasoning	Motivation
Office politics	Organizational culture	Reactance
Resistance to change	Schedule chicken	Situational awareness
Social proof	Trained incapacity	

Abundance Mentality

Employees are in a good place, focused on the work of the project and not the politics of the office. Managers are focused on leadership, productivity, and the development of their team. As leaders they are busy building other leaders.

This contrasts with a scarcity mentality that focuses on getting a bigger share of the pie as opposed to baking more pies.

In an abundance mentality the entire project team exhibits an attention to detail; good, positive character traits; healthy competitiveness and a bias towards action; and a mix of right- and left-brained thinking.

Cognitive Biases

Cognitive biases are thought patterns that lead to suboptimal results. Everyone has biases and in addition to individual biases, teams, large organizations, and large projects can develop their own sets of biases, often the result of group think or patterns transposed to these organizations from strong leadership behaviors.

Cognitive biases include but are far from being limited to those reflected in Table 2.^{3 4}

Many of these biases will be familiar or self-evident while others will not. Awareness of the potential for biases, especially in management, is an important challenge on large complex projects.

Cognitive Dissonance

Cognitive dissonance is a particular form of cognitive bias that touches on biases related to the backfire effect, “cherry picking,” and “sour grapes.” Cognitive dissonance reflects a desire for internal consistency and leads to stress when internal consistency is not achieved. There is a tendency to view the unattainable as having limited value. Encountering evidence that is contrary to beliefs can lead to cognitive dissonance.

Convergent Thinking

Convergent thinking focuses on logically solving the problem at hand. It is about demonstrating that there is a correct answer. Engineers excel at this and often view it as the only approach to every problem. It contrasts with the creative thinking that is a hallmark of divergent thinking.

Divergent Thinking

Large complex projects suffer from assumption migration.⁵ Divergent thinking challenges assumptions, “we have always done it this way” thinking, and established ideas. It is a key element in opportunity analysis,⁶ a significant value creation in large complex projects.

ERG Theory

ERG (existence, relatedness, and growth) is shorthand for three types of motivation that influence individual behaviors. *Existence* deals with basic survival needs such as food and safety. *Relatedness* reflects social motivations. *Growth* is very much about self-actualization. Taken together they are considered primary human motivations and must be addressed to maximize the potential of project teams on large complex projects.

Fallacies – See *Executive Insight, A Failure of Logic*

Flow

Flow describes the intense focus that people bring to problem solving. There is a loss of sense of time, lunches get skipped, and importantly, complex problems get solved. This is the opposite of multi-tasking and is highly productive. Flow, however, is increasingly impacted by an addictive need to “check one’s devices.”

³ J. Spacey Twenty+ Factors in Project Management (2016) <https://simplicable.com/new/human-factors-in-project-management>

⁴ 25 COGNITIVE BIASES A Site Dedicated to The Psychology of Human Misjudgment <https://25cognitivebiases.com/>

⁵ Executive Insight, Assumption, Risk Driver and Constraint Tracking <https://www.naocon.org/wp-content/uploads/Assumption-Risk-Driver-and-Constraint-Tracking.pdf>

⁶ Executive Insight, Opportunity Analysis <https://www.naocon.org/wp-content/uploads/Opportunity-Analysis.pdf>

Heliotropic Effect

Like plants that grow towards the sun, people and project teams work towards the most positive image of themselves. It underscores the importance of corporate and team culture, compelling vision statements, and action-oriented mission statements with positive outcomes. Engagement grows with belief in an exciting mission.

An engaged workforce demands leadership and leaders who “walk the talk.” Leadership and engagement change the nature of the management processes and systems required as the workforce becomes increasingly self-empowered.

Hygiene Factors

Hygiene factors diminish motivation if not met. Meeting them, however, does not increase motivation and productivity. People expect to work in a safe, healthy, and clean environment. If those expectations are not met, motivation and productivity are adversely impacted. Post-pandemic, healthy work environments will take on increased importance. Not adequately addressing these expectations will negatively impact motivation.

On large complex projects a first check on pockets of low morale or productivity should confirm basic hygiene factors are being met.

Influencing

This is a fundamental human factor, especially in social settings. It is a principle change driver and motivation mechanism within large complex projects, but needs to be periodically assessed to ensure dissenting views and opinions are being given an adequate “voice.”

Significant factors affecting influencing, especially in decision making, include:

- Past experiences
- Variety of cognitive biases
- Escalation of commitment and sunk outcomes
- Individual differences, including age and socioeconomic status
- Belief in personal relevance

Some influencing approaches worth highlighting include:

- Active silence – includes listening, pausing for dramatic effect, and creating an uncomfortable silence in a negotiation so the other side moves first.
- Agreeing to disagree – leaves a contentious issue unresolved.
- Analogy – compares something new or complex to something familiar to facilitate a desired decision. Metaphors, allegories, or comparisons may be used.
- Anecdotal evidence – weak evidence based on examples from personal accounts as opposed to statistically significant information.
- Consensus building – obtaining general, broad agreement on a strategy, plan, decision, or other factor. Accomplished by making people feel they have been consulted.

Many other influencing approaches exist.⁷

Intrinsic Motivation

Intrinsic motivation is self-driven motivation to achieve results. It is in contrast to extrinsic motivation, which reflects a desire for social or material outcome. Types of intrinsic motivation include:

- Self-preservation
- Self-development
- Desire for meaningful experiences
- Self-actualization

Intuition

Intuition is the result of perception via the unconsciousness. Knowledge is acquired without the benefit of logical processes. This is an essential skill in situations where high-speed decision making or complex problem solving is required.

Locus of Control

Individuals with a strong locus of control believe that effort produces significant results over time. They will take blame when things fail and are motivated to improve and succeed. They believe they have significant control of outcomes.

Logic

Logic involves thinking in a linear, step-by-step manner about how a problem can be solved. Logic is the basis of many principles, including the scientific method. Despite its appeal, logic is far from the only human factor in play on large complex projects.

Malicious Compliance

Malicious compliance is a form of resistance where an organization's own rules are used against it. It is often motivated by resistance to change or an unresolved grievance. Examples on large complex projects can be overly strict interpretation and adherence to work rules as part of an organized work slowdown.

Motivated Reasoning

Wants and fears influence rational decision making and actions. People look for a logical argument to do what they want to do rather than logically looking for what the best decision or course of action is. Motivated reasoning makes logic subservient to want-based decisions.

Motivation

Motivation is the will to do things. It evokes enthusiasm, ambition, determination, and initiative. Some common types of motivation include:

- Avoidance (of negative stimuli)
- Cognitive dissonance (desire for things to be internally consistent)

⁷ See <https://simplicable.com/new/influencing>

- Convenience and comfort
- Desires
- Drive
- Extrinsic motivations
- Intrinsic motivation
- Fear of missing out
- Needs
- Self-determination

Office Politics

Office politics relates to how decisions are made and power is distributed. It is a social process and exists in every organization, including large complex projects. It can be irrational and distracting and lead to significant levels of sub-optimization in complex settings. Office politics can also be cruel and lead to a broader degradation in team moral and performance. A range of strategies and considerations exist to navigate office politics.⁸

Team decisions often reflect the social dynamics of the group and, where office politics is present, may represent a series of sub-optimal compromises.

Organizational Culture

Organizational culture comprises the beliefs, values, principles, and norms of project organization. It also encompasses the language, history, and habits of the project team.

Organizational culture is shaped by strategy, leadership, organizational structure, knowledge and attitudes related to change, creativity, and innovation.

Reactance

Reactance is a motivation that develops in response to attempts to limit freedoms of action. It seeks to preserve individual freedoms and acts to undermine leadership and other processes that rely on social influence.

Resistance to Change

Resistance to change reflects either low levels of staff support for a strategy or change initiative or outright resistance, including passive resistance. Root causes can arise from:

- Lack of engagement
- Desire to preserve the status quo (power, influence, or fear driven)
- Office politics
- Fear of failure (again)
- “Flavor of the moment” perception

⁸ See <https://simplicable.com/new/office-politics>

Schedule Chicken

“Schedule chicken” can be thought of as a game where multiple teams are behind schedule but delay flagging their problem, hoping someone else will admit their problems first. The project manager then meets with each team separately and suggests the other teams appear to be on schedule. One should not underestimate the negative potentials of this peer-based competition in delaying any “bad news.”

Individual teams put their credibility at risk by engaging in schedule chicken. On one large nuclear project, for example, the nuclear pipe fabricator, engineer, constructor, and reactor vessel manufacturer all failed to admit they each were behind schedule even though the earned value for the overall project declined by 10 percent over an 18-month period.

Frequent granular reviews with the various teams involved in the execution of a large complex project can help head off this very dangerous game of schedule chicken.

Situational Awareness

Situational awareness reflects an ability to make a high frequency of high-quality decisions in compressed time frames. It is often a characteristic of large complex project leaders, especially those who have been impacted by disruptions of any kind.

Emerging artificial intelligence tools can act to aid in situational awareness.

Social Proof

Social proof uses social information as a key input into human decision making. The meteoric rise in various digital social platforms is reinforcing the importance and acceptance of social proof. Caution, however, is in order. Social proof can lead to a herd mentality and inadequate examination of broader factors and alternative viewpoints.

More recently, various social proofs have been manipulated to project a desired result and in fact are at risk to uncertainty with respect to the underlying demographic.

Trained Incapacity

Trained incapacity reflects the view that education, training, and experience may limit an individual’s ability to think beyond certain assumptions and constraints. For example:

- Experts may be unable to see how a layperson views certain project aspects.
- Specialists may be unable to think like a generalist.
- Bureaucrats may only be able to think within the rules.
- Convergent thinkers cannot think divergently.

Trained incapacity is often associated with a resistance to change.

Summary

This Executive Insight considers over two dozen human factors that may be present in large complex projects. The goal is to raise awareness of these factors to aid in their identification. Human factors are inescapable and may range from destructive through benign to positive and essential.

Projects are composed of humans; each is an individual and each is a package. Diverse teams, appropriately led and motivated, outperform teams of experts when faced with complexity.

For Additional Consideration

Table 2, Parts 1 and 2, offers more cognitive biases that are worth considering but are outside the scope and intent of this Executive Insight. Readers are encouraged to further examine these important human factors and biases.

Table 2 – Part 1 Cognitive Biases		
Reward and Punishment Super-Response Tendency	Above Average Effect	Cryptomnesia
Liking/Loving Tendency	Acquiescence Bias	Curse of Knowledge
Disliking/Hating Tendency	Ambiguity Affect	Decoy Effect
Doubt-Avoidance Tendency	Anchoring	Defensive Attribution Hypothesis
Inconsistency-Avoidance Tendency	Attitude Polarization	Disposition Effect
Curiosity Tendency	Attribute Substitution	Dunning Kruger Effect
Kantian Fairness Tendency	Availability Cascade	Duration Neglect
Envy/Jealousy Tendency	Availability Heuristic	Empathy Gap
Reciprocation Tendency	Backfire Effect	Expectation Bias
Influence-From-Mere-Association Tendency	Bandwagon Effect	False Analogy
Simple, Pain-Avoiding Psychological Denial	Barnum Effect	False Consensus Effect
Excessive Self-Regard Tendency	Base Rate Fallacy	False Dilemma
Over-Optimism Tendency	Begging the Question	Focusing Effect
Deprivation-Super reaction Tendency	Bias Blind Spot	Framing Effect

**Table 2 – Part 1
Cognitive Biases**

Social-Proof Tendency	Bizarreness Effect	Frequency Illusion
Contrast-Misreaction Tendency	Cherry Picking	Functional Fixedness
Stress-Influence Tendency	Circular Reasoning	Fundamental Attribution Error
Availability-Misweighing Tendency	Clustering Illusion	Gambler’s Fallacy
Use-it-or-Lose-It Tendency	Cognitive Dissonance	Group Attribution Error
Drug-Misinfluence Tendency	Cognitive Inertia	Halo Effect
Senescence-Misinfluence Tendency	Complexity Bias	Hard Easy Effect
Authority-Misinfluence Tendency	Confirmation Bias	Hasty Generalization
Twaddle Tendency	Congruence Bias	Hindsight Bias
Reason – Respecting Tendency	Contrast Effect	Humor Effect
Lollapalooza Tendency	Creeping Normality	Identifiable Victim Effect

**Table 2 – Part 2
Cognitive Biases**

Illusion of Asymmetric Insight	Planning Fallacy
Illusion of Control	Projection Bias
Illusion of Transparency	Quantitative Fallacy
Illusion of Superiority	Reactance
Illusory Correlation	Reactive Devaluation
Impact Bias	Rhyme as Reason Effect
Ingroup Bias	Rosy Retrospection
Insensitivity to Sample Size	Scope Neglect
Irrational Escalation	Selective Perception
Loss Aversion	Sharpshooter Fallacy
Lucky Streak	Slothful Induction
Technology as Magic	Social Comparison Bias
Mere Exposure Effect	Sour Grapes

Table 2 – Part 2 Cognitive Biases	
Misinformation Effect	Spotlight Effect
Mood Congruent Memory Bias	Status Quo Bias
Moral Luck	Survivorship Bias
Normalcy Bias	System Justification
Not Invented Here	Time Saving Bias
Omission Bias	Well-Traveled Road Effect
Optimism Bias	Worse than Average Effect
Ostrich Effect	Zero Risk Bias
Outcome Bias	
Parkinson’s Law of Triviality	
Peak-End Rule	
Pessimism Bias	

References

J. Spacey Twenty+ Factors in Project Management (2016) <https://simplicable.com/new/human-factors-in-project-management>

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