

**A Study of the Relationship between Trust and the Effective
Communication of Information within Project Teams of Large High
Tech Organizations**

By

Alyson Scherer

Bachelor of Science in Mechanical Engineering

Submitted to the System Design and Management Program
in Partial Fulfillment of the Requirements for the Degree of

Master of Science in Engineering and Management

at the

Massachusetts Institute of Technology

[June 2008]
May 2008

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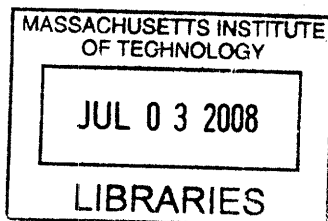
Alyson Scherer
System Design and Management Program
May 2008

Certified by _____

Michael Davies, Thesis Supervisor
Senior Lecturer, Sloan School of Management

Accepted by _____

Pat Hale
Director, System Design and Management Program



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Abstract

This study investigates the effects trust has on the truthfulness of communications and its effectiveness within a project team. The research focuses specifically on organizational context, the situational forces that exist within this context, and the effects they have on trust within project teams.

A review of previous studies of trust as it relates to human and organizational behavior is conducted, a definition of the context and situational forces of large, high tech organizations is provided, and an analysis of the information gathered through surveying various project team members and Project Managers is completed. The results indicate organizational contexts facilitating little trust between project team members and Managers are causing two significant inconsistencies. First, the information project team members claim they are willing to provide versus the information actually being communicated. Second, the information project team members are communicating versus the information Project Managers believe they are receiving. The complications encountered while soliciting project teams exposed a barrier in resolving these contradictions: Project Managers do not acknowledge the existence of such discrepancies let alone value the importance of resolving them. The study concludes by exposing the prevalence of trust issues among project teams as well as providing recommendations for management to successfully increase team trust to improve the functionality of the organizational context to ultimately increase the truthfulness and therefore effectiveness of communication throughout their corporations. Recommendations for future research are provided as well.

Thesis Supervisor: Michael Davies
Senior Lecturer, Sloan School of Management

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Acknowledgments

To my family, friends, and SDM cohort, my utmost thanks for providing support and encouragement, continually responding to my pleas for help and being my test subjects in creating the surveys for this research study.

A special thanks to my parents. To my father, who willingly read and critiqued all 102 pages. To my mother, the biologist, for helping me press forward and reminding me that sometimes your rats just die.

To Pat Hale and all of the others in the SDM office, thank you for your flexibility, understanding and guidance. Your dedication makes the program the success that it is.

My sincere thanks to my thesis advisor, Professor Michael Davies, for challenging my ideas, focusing my work, providing invaluable insights, and clarifying that when doing any experiment, you must first catch the rats.

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1. Chapter 1: Introduction

1.1. Motivation

“Situational variables can exert powerful influences over human behavior, more so that we recognize or acknowledge.” – Philip Zimbardo

When relaying any information, an individual is faced with the opportunity to tell the truth or not, to represent the facts accurately or distort them. As a member of a project team, the decision to be truthful affects not only the individual but the project as whole as more truthful information yields more informed decisions, more informed decisions are better decisions, and better decisions yield better project results. A lack of truthful and accurate communication can threaten the future of the project and even its organization. So, how does management ensure that project team members will always decide to tell the truth?

Several studies have demonstrated that a person within an organization makes decisions based on prior experience, morals, and future expectations. This belief, the dispositional view, focuses on the individual alone without consideration for the context in which he exists and his decisions are made. However, principles of System Architecture explain that everything exists within a context and a solution is dependent on and unique to the context or system for which the problem exists. This suggests that within an organizational setting, a person’s decision making ability and choices are strongly influenced by the context in which the individual works. This organizational context is comprised of the formal organizational and incentive structures as well as the individual personas of each employee and the prevailing company culture.

This thesis examines the decision making process of individuals within the context of project teams within large high tech organizations to understand the degree of influential power context has on truth telling behaviors. The influential power can be good or bad as it can improve or inhibit individuals’ decision making abilities and alter the effectiveness of communication. Therefore management must strive to provide a context which positively influences employees’ decision making abilities.

1.2. Organizational Context

“Systems are engines that run situations that create behavioral contexts that influence the human action of those under their control.” – Philip Zimbardo (2007)

Prominent psychologists such as Philip Zimbardo have long studied the effects of context on human behavior. The figure below illustrates the composition of and causal relationships within an organization’s context.

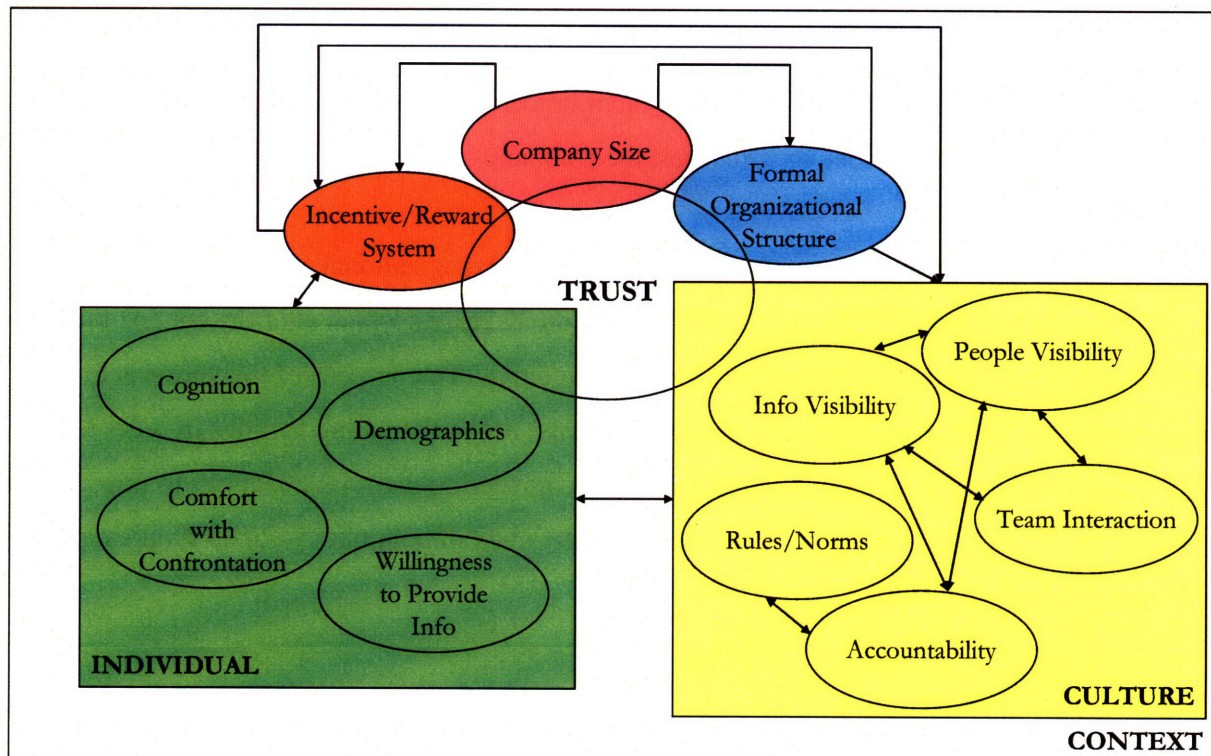


Figure 1: Trust in an Organizational Context

Every employee has individual personalities that are brought into an organization. The personalities are the result of experiences, values, and perceptions which when pulled together onto a project team within an organization, results in unique team dynamics. All other aspects of the organizational context have the ability to influence an individual in areas such as job satisfaction, comfort and openness, which in turn affects the company culture as the culture is derived from the interactions among the individuals within the system.

The formal organizational and incentive structures are often driven by the company size; as companies expand, more formal structures are put into place to maintain order and efficiency.

Both the formal organizational and incentive structures ultimately influence the culture of the company. The formal organizational structure influences the accessibility of both information and people with a company while the incentive structure influences the employees' motivation to seek out the information and others.

While the formal organizational structure strongly influences the company culture, leaders such as Louis Gerstner have demonstrated the importance understanding the existing culture in order to maximize the effectiveness of the formal organizational structure. At the core of every company's culture are social networks built on communication, expertise and trust. The culture of an organization is influenced by all of the other aspects of the organizational context: the formal organization and incentive structures, the company size, and the individual.

Trust is the common modifier of all of the aspects of the organizational context. The level of trust within an organization has the ability to drive the decisions which alter the context thus affecting communication and ultimately project outcomes. The purpose of this thesis is to understand the contextual forces affecting individuals' decision making abilities in order to provide management with recommendations for reengineering their organizations to improve the context thus increasing trust and the resultant effectiveness of communication to ultimately better the organization as a whole.

1.3. Participants

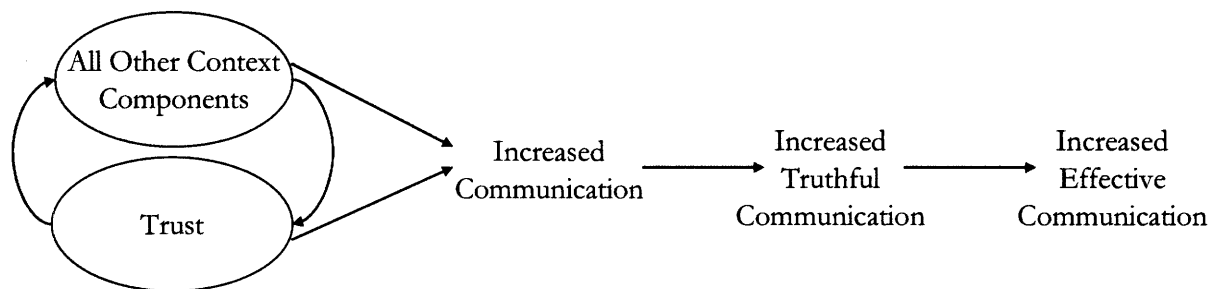
Two groups of individuals were chosen for this research study: a group of individuals and a group of Project Managers both within project teams of various large, high tech organizations. The responses of the project team members and the Project Managers were collected in two separate groups as the survey questions intended to collect the same information from each group but the questions had to be tailored to the individuals' positions within the team.

Originally, the study was intended to include analysis of a project team within one organization to allow for environmental controls such as organizational structure, physical work space and location, and project details such as platform, design and development plans, deadline, and budget. Since each individual is exposed to the same environment, the number of variables that

are influencing the responses is minimized strengthening the resultant conclusions. The project team was to be selected from a large biotechnology organization and therefore the concluding recommendations have been tailored to this industry but are also applicable to large high tech organizations within other industries.

1.4. Expected Findings

This study focuses on trust as it aims to test the hypothesis that the truthfulness of information flow within a project team and therefore the effectiveness of the communication are directly related to the trust between team members. When applying the process tracing procedure, the following is true:



The process states that organizations that cultivate systems to successfully increase the levels of trust between their employees will ultimately increase the effectiveness of communication throughout the project teams of the organization. This can be achieved through understanding the impact trust has on the contextual factors of a company which inevitably impacts the communication throughout the organization. Increasing trust between individuals fosters stronger, healthier relationships as it eliminates feelings of suspicion, doubt and ill will. This will improve the individuals' comfort and willingness to interact with others, share information and delegate responsibility throughout the organization. This chain of reactions caused by increasing individuals' trust of others and of the system will positively impact major components of the organizational context, previously defined by individual perceptions, formal organization and incentive structures, and the culture. As the context is positively altered, individuals will feel less of a need to withhold information which will increase the amount of information communicated. As individuals' become more forthcoming with information, continuing to increase the levels will continue to dissolve the fears surrounding distrust which will enhance the truthfulness of the communication. Ultimately this will improve the overall effectiveness of the

communication among individuals in project teams and ultimately the entire organization as effective communication is both profuse and truthful. The understanding of this process is important as increased truthful information among project teams allows the team and management to make more informed decisions. More informed decisions are better decisions and will return better project results.

There are several expected findings to support the hypothesis. These expected findings discuss the relationship between trust and the components of the organizational context previously described.

Expected Finding: Those teams with high levels of interaction and visibility, of both information and people, will have high levels of trust and therefore demonstrate a high degree of truth telling behavior. Those teams within large high tech organizations, where interaction and visibility is low will demonstrate a low degree of truth telling behaviors. Furthermore, this distrust will diminish the relationships among team members and affect individuals' level of comfort with both confrontation and exposing information.

Expected Finding: Truth telling and information withholding behaviors are dictated by classical conditioning, as described by Schaffhausen (2008), through the incentive structure and culture of an organization. The following is expected to occur and result in a learned behavior to lie as it is an accepted behavior with large organizations.

An individual is always calculating how likely it is that tolerance will follow lying. If tolerance happens every time lying occurs, then lying is an extremely good predictor of tolerance. Alternatively, if tolerance follows lying sometimes and other times appears after a different event (i.e. punishment), lying is only half as good at predicting tolerance.

Expected Finding: The willingness of individuals to expose project related problems is dictated by fear conditioning which is learned through the formal organizational and incentive structures as well as the culture of an organization. Much like Little Albert's fear conditioned response, prior experience on the team with exposing problems will dictate future behavior and willingness to expose them:

An individual is always calculating how likely it is that punishment or reprimand will follow telling the truth, when telling the truth exposes a problem. If punishment or reprimand happens every time telling the truth and exposing a problem occurs, then telling the truth is an extremely good predictor of punishment and reprimand. Alternatively, if punishment and reprimand follows truth telling sometimes and other times appears after a different event (i.e. reward), truth telling is only half as good at predicting punishment or reprimand.

This will result in a learned behavior to avoid telling the truth if it is going to expose a problem. Individuals will instead choose to withhold the information or lie to avoid the feared negative consequence.

Expected Finding: Those individuals who express generally positive results of job satisfaction and overall happiness with the team will have a high level of trust of others in the organization which results in a willingness to provide truthful information. Whereas generally dissatisfied, uninformed and frustrated individuals will have sparse trust networks. It is expected that those with large trust networks will display a higher degree of open and honest communication as compared to those individuals with sparse trust networks.

Expected Finding: When analyzing a project team's trust network, given that the effectiveness of communication is directly related to the level of trusts within a team, it is expected that increasing the density of the trust network within a team will ultimately increase the effectiveness of communication among that team; the truthfulness of information flow within a company is proportional to density of its trust network map. Conversely stated, scarcity of accurate and truthful information is inversely proportional to the density of the truth network map. In many cases, the contextual properties of large companies, specifically those cultural properties, has lent itself to sparse trust networks and consequently inaccurate communication of information and little truth telling.

Expected Finding: Withholding information is a positive feedback loop. If employees believe their Project Manager is withholding information, they will also withhold information thus

creating a self-perpetuating cycle as trust continues to decline and negative feelings continue to rise and more information is continually withheld.

Expected Finding: These results are predicted to be the same between team members and Project Managers as trust is a bidirectional relationship and therefore will affect the individuals and their behaviors equally.

Expected Finding: The conditioning which results from the formal organization structure, the incentive structure, and the company culture drives individuals to not rely on Project Managers for information and often avoid them. Thus there exists a lack of trust of Project Managers by the team members which is causing a breakdown in communication among the team.

2. Chapter 2: Literature Review and Research Questions

2.1. Definitions

In order to understand the research and subsequent analysis and recommendations, it is important to understand key definitions of the terminology as it exists in the context of this study.

2.1.1. Truth Telling

For the purpose of this study it is important to understand what constitutes truth telling. According to the Merriam Webster dictionary, truth is defined as “the state of being the case: fact; the property (as of a statement) of being in accord with fact or reality”. Therefore, any information that is not in accordance with fact or reality is considered non-truthful information. The act of withholding information will also be considered as non-truthful information since the omission of information can be just as problematic as the inclusion of non-truthful information. The inclusion of non-truthful information includes the acts of both lying and presenting nonsense as sense (NAS).

2.1.2. Lying and Presenting Nonsense as Sense (NAS)

Lying, as defined by Harry Frankfurt (2005) in his book On Bullshit, implies that the person telling the lie knows what the truth is and is purposefully trying to create another reality. A liar deliberately creates a proposition that is false and has the belief that what they are saying is not true. Frankfurt repeatedly emphasizes that in order to lie a person must think he knows the truth as a lie is designed under the “guidance of the truth”. Therefore Frankfurt concludes that if one does not claim to know the truth, the behavior must be classified in another way. The resultant other form which is neither on the side of the truth nor the side of the false has been described by the philosopher, Gerald Cohen, as nonsense presented as sense. Such nonsense-as-sense (NAS) as both Cohen and Frankfurt define is unconnected to a concern for the truth as there is no commitment to an accurate representation of reality. One who presents NAS is not concerned with the truth value and does not bother to find the truth therefore NAS is not lying but rather a misinterpretation of “another sort”. NAS is not a falsity but a fake or phony with the purpose to deceive, not lie. In fact, one who is presenting NAS does not care if reality is being described correctly as the words are merely chosen to suit the purpose of deceit. Frankfurt clarifies another difference between lying and NAS as the purpose of NAS is not to merely falsify but to attain a goal. As noted by Frankfurt, the societal consequences for NAS seem to be less severe than for lying. Both lying and NAS are deemed by Frankfurt as hot air or “empty talk” which occurs when a speaker communicates “nothing more than had he merely exhaled”.

Frankfurt concludes by seemingly defending certain types of NAS. He explains that NAS is unavoidable when a person has to “talk without knowing what he is talking about”. This occurs in companies when employees are obligated or given the opportunity to speak on topics that may exceed their knowledge of the facts. Further, Frankfurt states that NAS “rejects the possibility of ever knowing how things truly are”. As with other readings, this rejection may be largely due to the human obligation to act on the truth when it is known. When a problem is discovered, one may feel morally obligated to react whereas if the problem is ignored or convoluted, the conscience is relieved of such obligation. (Frankfurt, 2005)

For the purpose of this study, any information of the non-truthful form is undesirable. This includes withholding information as well as presenting NAS and outright lying.

2.1.3. Trust

The Merriam-Webster dictionary defines trust as a noun and verb, both applicable to the purpose of this study. As a noun, trust is the “assured reliance on the character, ability, strength, or truth of someone or something” whereas the verb refers to the ability to “place confidence in” someone or something. Further developing these definitions, Akbar Zaheer, author of the article “Does Trust Matter”, defines trust as “confidence or predictability in one’s expectations about another’s behaviors, and confidence in another’s goodwill” expanded to include the “expectation that an actor can be relied on to fulfill obligations, will behave in a predictable manner, and will act and negotiate fairly when the possibility for opportunism is present”. In other words, trust is an expectation based on reliability, predictability, and fairness. Dirks and Ferrin (2001), authors of “The Role of Trust in Organizational Settings”, largely agree with the definition by Zaheer and state that “trust is an expectation or belief that one can rely upon another person’s actions and words, and/or that the person has good intentions towards oneself.”

2.1.4. Effective Communication

In order for communication among a project team to be effective, it must be accurate, and portray facts completely and truthfully. Therefore, for the purpose of this study, the effectiveness of the communication is considered to decrease when non truthful or partial information is presented.

2.2. Human Behavior: Individuals’ Decision Making Influences

Several phenomenon affect individuals’ behaviors including the cognitive decision making process, conditioning, escalation of commitment, and Groupthink. These phenomena must be recognized and understood in order for management to be able to best create an organization with a context that will positively influence decision making processes to promote better decisions.

2.2.1. Cognitive Decision Making Process

“If we are to learn to improve the quality of the decisions we make, we need to accept the mysterious nature of our snap judgments.” – Malcolm Gladwell (2005)

The four stages of decision making as described by Roger Martin (2008) in “How Successful Leaders Think” include determining salience, analyzing causality, envisioning the decision architecture, and achieving a resolution. Determine salience requires one to decide what factors to take into consideration in making a particular decision. Often human nature results in simplifying conditions or details in order to reduce the complexity of the situation.

Oversimplification can lead to suboptimal decisions. Next, one will analyze causality or the links between the salient factors in order to create the decision architecture. Creating architecture of any kind requires a break down of the problem, creating of the sequence to reach a solution, while keeping the relationships between factors intact. Finally, achieving a resolution, or deciding occurs. As Martin (2007) described in The Opposable Mind, often reaching a solution requires an ‘either or’ decision. However, ‘either or’ decisions can result in settling for a suboptimal outcome. It would be more beneficial to resolve the tensions between factors to generate innovative output to reach a superior solution.

Unfortunately, the four stages of decision making are often inhibited by bounded awareness. As described by Bazerman and Chugh (2006), bounded awareness is a cognitive blinder that keeps a person from seeing, using or sharing relevant and important information when making a decision. Bazerman and Chugh explain the three opportunities an individual can unknowingly or knowingly bound awareness: failure to initially see information, ability to see but failure to use the information, or ability to see and use but failure to share the information. Failure to see information occurs, for example, when a company is focused so closely on financial performance that managerial violations lay “outside [the] bounds of awareness” and are therefore overlooked or ignored. This is not far from what Cramer (2002) has described occurred at WorldCom. Failure to share information occurs in organizations where groups have different pieces of information. An executive needs all, not pieces, of the information to make a good decision. Failure to share information therefore results in bounding of an entire organization’s awareness instead of only an individual. (Bazerman & Chugh, 2006)

2.2.2. Conditioning

“The reason so many lied is because so many people got away with it before” – James L. Cramer (2002)

Classical conditioning is the result individuals’ constant need to draw associations between stimuli and outcomes. As Joanna Schaffhausen (2008), a behavioral psychologist explains:

“An organism is always calculating how likely it is that event X will follow Y. If X happens every time Y occurs, then Y is an extremely good predictor of X. Alternatively, if X follows Y sometimes and other times appears after a different event (Z), Y is only half as good at predicting X.”

This is also explained through the use of predicted and experienced utility: an individual has a predicted utility, or a prediction of what will occur if a particular decision is made, which is either realized or disproved when the utility, or outcome, is experienced and remembered. The resultant utility then becomes the basis for the next predicted utility (Frederick, 2008)

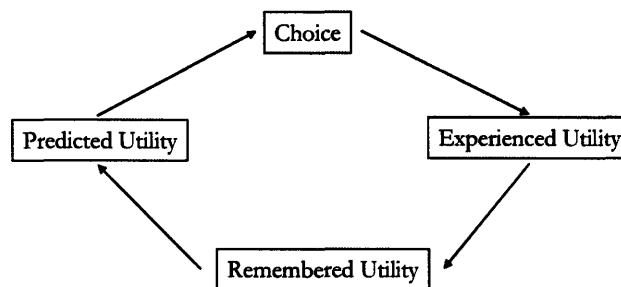


Figure 2: Predicted Utility

Classical conditioning, in agreement with the predicted utility theory, also known as Pavlovian conditioning, was first demonstrated on dogs by Ivan Pavlov in the 1920s. Concurrently, Edwin Twitmyer independently studied conditioned responses on human subjects. In his experiments, Twitmyer lightly tapped each individual below the knee with a hammer, accompanied by the sound of a bell, prompting an involuntary knee jerk. On one occasion Twitmyer accidentally sounded the bell without actually hitting the knee with the hammer to which Twitmyer discovered the individual’s knees still jerked. When replicated with other individuals, the same thing occurred: the sound of the bell, without the hammer, instigated the knee jerk. Importantly, the individuals could not control their knee jerks even when they knew when the bell was going

to sound. Thus, Twitmyer had discovered that human subjects are susceptible to conditioning and further once conditioned cannot necessarily control the response. (Green, 2004)

John B. Watson, the founder of behaviorism, furthered the study of conditioning through his 'Little Albert Experiment'. Albert was presented animals, from rats to monkeys, and objects from masks to burning paper, to which he never showed fear. However, loud noises did induce fear; when a hammer struck a metal pipe Albert was startled, his heart rate increased and he cried. At nine months the frightening noise was paired with the white rat Albert had been given previously. Over time Albert began to associate the frightening noise with the white rat and when the noise was removed from the scenario, at the sight of the white rat alone Albert showed signs of fear. Watson's experiment had demonstrated the specific phenomenon of fear conditioning. (Green, 2004)

As Schaffhausen (2008) explains, the fear response is very similar across species and "of all emotions, the brain devotes the most space and energy to fear". Thus fear conditioning is an often occurring phenomenon. Such conditioning can be useful for humans in situations such as touching a hot stove; people benefit from fear conditioning as these types of associations' keep individuals from repeatedly doing themselves harm. However, fear conditioning can be harmful as it can drive people to avoid taking necessary action as they fear negative consequences. This fear can keep people from doing things they otherwise should be doing, like telling the truth.

2.2.3. Escalation of commitment

"It is easier to resist at the beginning than at the end." – Leonardo da Vinci

The escalation of commitment, or 'foot-in-the-door' tactic, as described by both Cialdini (2001) and Zimbardo (2007), is the ability to gain influence over an individual's actions by initially soliciting a small and easily achievable task, to later be followed by a larger, related, more significant request. Barry Staw (1981) of the University of California, in his examination of a company overestimating its capability to build a brake for an airplane, illustrated the effects escalation of commitment can have on an organization. In this example the company was the lowest bidder and therefore awarded the government contract to build the airplane brake.

However, as the design efforts began, the company quickly recognized it did not have the resources or abilities to meet the specifications and deadlines of the project. But with careers and reputations at stake, the company pressed forward, produced an inadequate brake which was ultimately integrated into an airplane where it failed the flight test when the airplane skidded off the runway and almost injured the pilots during landing. The question Staw brings up in this as well as other examples, is why, when the company began to doubt its capabilities did it continue to press forward with the project? Staw answers this by explaining the escalation of commitment phenomenon that drives people to continue down a path of action even though they are aware they are making mistakes along the way. Individuals will press forward as an attempt to “rectify past losses as well as seek future gain” says Staw. This act of self justification, to prove they were not wrong in the earlier decision, to save face, locks them into a course of action, becoming over committed, regardless of the rationality behind it. Often this is the result of the social powers and group dynamics that can be strong enough to outweigh rational judgment as previously described as Groupthink. (Staw, 1981)

Staw (1981) touches on the “norm for consistency in action” that is deeply examined by Robert Cialdini (2001) in his book, Influence: Science and Practice, as he explains that escalation of commitment arises due to the nature of human beings to appear consistent. Society has created a culture that highly values consistent behavior and thus the drive to appear consistent will often cause people to do things in order to validate their past and future behaviors including things that may contradict their best interest or personal values. The desire to appear consistent provides the backdrop for the 'I did it once before, why not do it again' behavior which is often used to impose successively larger commitments on the individual. While commitment and consistency can be valuable and produce a positive final outcome, they can also unfortunately perpetuate negative ones. Erroneous decisions can become self-perpetuating as individuals will continue to justify and back an initially bad decision with larger ones for the mere purpose of maintaining consistency and not wanting to appear weak by wavering or going back on a previous decision and admitting it to be wrong. Furthermore, individuals may remain committed to a failing course of action in the hopes that ‘in the end’ they will succeed, thus proving they were right all along. Unfortunately, if they are unable to turn the failures around and do not succeed, the

consequences for the individual as well as the project team and company can be detrimental. (Cialdini, 2001)

2.2.4. Groupthink

“As long as you think everything I do smells like roses, we’ve got a problem.” – Deborah Alvarez-Rodriquez

Group dynamics can bind groups together, build momentum, strengthen positions, and drive results. Group decision making “can lead to confidence, risk taking and efficiency” which can produce very desirable outcomes for an organization. Conversely, group dynamics can amplify the dishonesty and group decision making can lead to overconfidence, failure to criticize or analyze issues thoroughly and biased conclusions. Psychologists such as Muzafer Sherif, Solomon Asch, and Stanley Milgrim have studied this behavior of conformance since 1935. Much of their research concluded that people, although they want to believe they are independent strong willed individuals, if given the right conditions will succumb to blind obedience. Social psychologist Irving Janis (1982) coined the term Groupthink to describe this phenomenon. In an organization where groupthink is present, individuals forego personal morals and beliefs for the sake of minimizing conflict and maintaining group cohesiveness. As Kath Hall (2006) explained,

“The most significant element of groupthink is the existence of a cohesive group.

Conditions within a group that can lead to cohesiveness include: a sense of belonging to a powerful, protective group, a similarity of member’s backgrounds and beliefs, a loyalty to the group leader, insular group practices, and a history of success”

The case of Enron’s demise is a perfect example of Groupthink. The decision makers of the organization were in a cohesive egocentric group with loyalty to the leader; in interviews with members of the Enron board, many could not recall a decision that was not unanimous. Both Janis (1982) and Hall (2006) have concluded that Groupthink occurs when people feel pressured to maintain conformity and avoid confrontation. It is this lack of conflict and unwillingness to investigate alternatives that leads to groups making uninformed and ultimately problematic decisions. Large organizations fall prey to Groupthink as they simultaneously place a ‘premium’ on “team players” while encouraging self preservation and protection. In response, individuals

conform and compromise as they quickly learn that the person with an opposing view, judgmental attitude or strong convictions is usually removed.

Groupthink was not derived as a positive phenomenon but rather one that can be detrimental, as seen in the Space Shuttle Challenger disaster and the Bay of Pigs invasion, both heavily studied by Janis (1982). Both the Challenger tragedy in 1986 and the Bay of Pigs invasion of 1961 exhibited classic groupthink characteristics: a high pressure situation with individuals who tried to voice alternatives but were quickly dismissed.

(Hall, 2006; Janis, 1982; Zimbardo, 2007)

2.3. Organizations

Organizations are systems composed of teams of individuals brought together to work towards common goals. Therefore, just as phenomenon exist that affect individuals' behavior, situations exist that affect the behavior of an entire system. The success of the project teams and subsequently the entire organization as a whole is dependent on the relationships between these individuals. These relationships rely on trust which can either be built or destroyed by the components of the organizational context: company size, formal organizational and incentive structures, and culture.

2.3.1. The Role of Trust in Organizations

“We've got thousands of investors counting on us. And we're a team of thousands of employees all counting on each other. That's fun.” – Jeff Bezos

In the article “Does Trust Matter”, Akbar Zaheer (1998), Professor of Strategic Management at the University of Minnesota's Carlson School of Management, discusses the effects of trust on inter-organizational relationships as well as the effects of interpersonal relationships on inter-organizational situations. In his research he has defined inter-organizational trust as “the extent to which organizational members have a collectively held trust orientation toward the partner firm”; the trust originates in an individual and is placed on an entire organization. Whereas interpersonal trust is defined as the extent to which an individual trusts another individual; the

trust originates in an individual and is placed on another individual. His conclusions can be applied to intra-organizational relationships and situations as well.

Zaheer's research explains how high trust reduces costs and improves performance in inter-organizational and interpersonal negotiations as there is a "more open and honest sharing of information" with less inclination for opportunistic and protective behavior, which leads to easier and quicker agreements. High trust simplifies the process of giving and getting of information; there is a willingness to share sensitive information and a belief that any information provided is not misrepresented. In low interpersonal trust situations, suspicion doubt tends to exist which ultimately hinders progress. Ultimately, the overall costs of such negotiations are lower as less time is wasted in reaching an agreement. Further, high trust means that a bidirectional expectation of reciprocation exists; each is willing to help the other out and give each other the benefit of the doubt. These behaviors can both reduce and increase conflict as individuals are concerned with preserving the relationship but also feel free to express themselves honestly which may lead to conflict. However, Zaheer states that it is important to recognize that conflict within a high trust situation does not have to have a "disruptive consequence" but in fact have a better chance at resolving issues rather than ignoring or "smoothing them over". Zaheer makes an important note that individuals are "more likely to confront trusted counterparts with 'harsh truths' than those they do not trust". This is exactly the phenomenon that leads to increased 'useful' communication. The usefulness of the communication increases as the accuracy and truthfulness of the information being interchanged increases. While the interpersonal trust is important, ultimately Zaheer's concluded that inter-organizational trust was the "over riding driver" and had a more significant impact than interpersonal trust when dealing with operations between companies. He concluded that building inter-organizational trust is important since although individuals will come and go, the organizations will remain and therefore the trust must be maintained regardless of the individuals involved at a particular time. However the importance of establishing interpersonal trust cannot be ignored as the analysis showed that where interpersonal trust was high, inter-organizational trust was also high; as Zaheer states "the more on trusts the [other company's] representative with whom one deals, the more one's organization trusts the [other] organization". The reciprocal is true as well, in fact high inter-organizational trust can compensate for low interpersonal trust. (Zaheer, 1998)

Kurt Dirks and Donald Ferrin (2001) have further studied the “Role of Trust in Organizational Settings” and have concluded that trust acts as a moderator by either facilitating or hindering the effects attitude, behavior and performance have on the success of project teams. Dirks and Ferrin suggest that high levels of trust provide the conditions necessary for higher performance and therefore better project outcomes. According to their studies, trust is a straightforward operation where higher levels of trust create more positive attitudes, increased cooperation and improved team performance. This occurs due to the power of trust to alter the perception one has of another person’s behaviors, motives, and abilities. When trust is low, suspicion and doubt are high. Whereas when high levels of trust exist among team members, members have a better perception of each other and therefore become more willing to take risks by sharing more information and cooperating more. Such risk activities will yield better performance and positive outcomes. Dirk and Ferrin also suggest that higher levels of trust can increase individuals’ job satisfaction, loyalty and commitment much like the effect trust has on non work related relationship. The important distinction that Dirk and Ferrin have made is that trust does not have the power to directly cause certain behaviors but rather moderate them; high trust will facilitate desirable behaviors while lower trust will hinder them. Further, the level of trust within a project team influences the culture of team success versus individual success. In low trust situations, Dirk found that group members became much more focused on meeting individual goals and were unwilling to take risks for the benefit of the team. An obvious sense of competition existed as well as the suspicion that the individuals were being ‘used’ or taken advantage of for the good of the team. Conversely, in high trust situations individuals were more willing to place a higher priority on the success of the team over purely individual goals. Dirk and Ferrin’s studies concluded that “trust influences task related behaviors and/or performance via moderation”. Further their observations strengthen the belief that the effects of trust are largely based on perception and how individuals perceive their reality. The conclusion of Dirk and Ferrin’s studies provided suggestions to management who are interested in “capitalizing on high trust or mitigating the effects of low trust”. Managers can attempt to change the level of trust among project teams through interventions, but may have more success in merely understanding the affect trust has on their organization and operate around it. (Dirks & Ferrin, 2001)

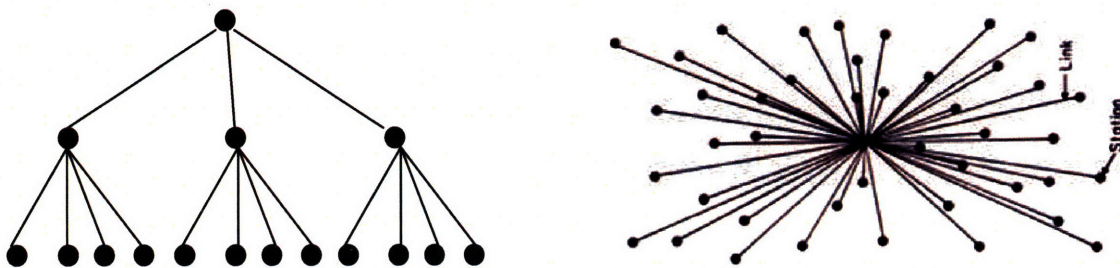
2.3.2. Organizational Size and Structure

Every organization has a formal structure that has the power to dictate the behaviors of individuals within the company. Two prominent structures exist within large high tech organizations: centralized and decentralized. It is important to understand the impact each structure can have on the context of an organization.

2.3.2.1. Centralization

“Union gives strength.” – Aesop (550 B.C.)

A centralized company is easy to identify and comprehend as there is a designated leader, obvious divisions of authority, and a specific location where major decisions are made. Laying out an organization in such a manner helps maintain efficiency and order; the day to day functions rely on processes and procedures delivered from the person ‘in charge’. As Brafman and Beckstrom (2006) describe in their book The Starfish and the Spider, a centralized organization is much like a spider. A spider has one head, one brain and legs which rely on the central nervous system in order to operate. The figure below illustrates this spider concept in its two forms.



Source: www.rand.org

“Introduction to Distributed Communication Networks”

Paul Baran

Figure 3: Centralized System

As the figures illustrate, a centralized organization heavily relies on the central node, whether literally in the center or residing at the top of the hierarchy. There is a clear delineation of responsibilities throughout the organization, each relying on the other to contribute to the functionality of the entire system. Thus if one dismantles or disrupts the central ‘brain’ of the organization, like a spider, it too will die. As Brafman has said, “that’s why assassins go after

the president of the country and armies invade capitals.” Also, much like a spider, “each leg is steady and helps support the weight of the entire organization” (Brafman, 2006). This creates security in knowing that ones job is imperative to the survival of the organization. This structure also allows companies to achieve economies of scale and operational efficiencies as well as increase profits.

However, centralized organizations, although efficient are not nimble. In order for a decision to be made, it must reach the decision making authorities which often requires climbing up the organizational tree, making the decision, and relaying the results back down the branches to be implemented. For example, Nupedia, the precursor to Wikipedia was designed as a top-down system with seven stages of review processes before anything was approved and distributed. The dependency on maintaining structure and following prescriptive procedures inhibits productivity. Further, centralized organizations can become coercive organizations in which the leader can easily take advantage of the authority and power allotted by the system. Additionally, the larger the tree, the greater the disconnect becomes between the workers and the company goals. Responsibility and accountability also suffer as the hierarchical tree expands its branches and the department sizes continue to increase. (Brafman & Beckstrom, 2006)

The figure below illustrates the breakdown of a centralized high tech organization.

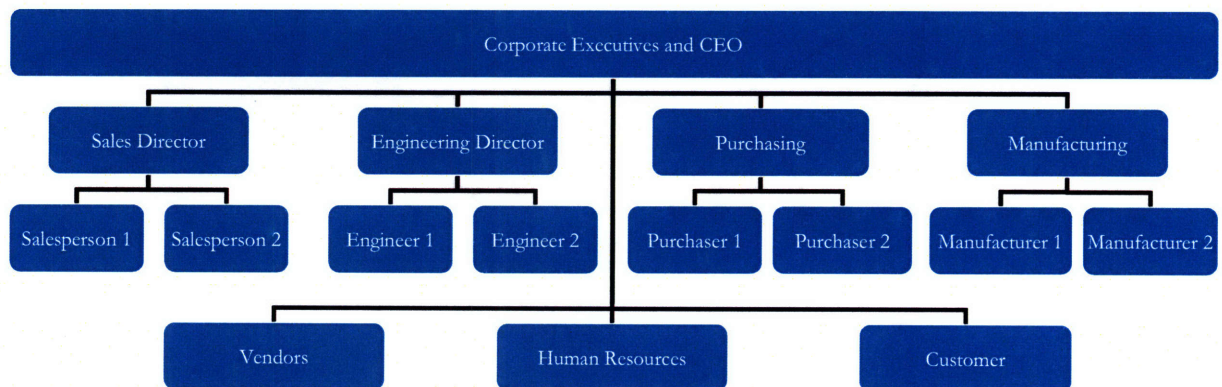


Figure 4: Fully Centralized Organization

2.3.2.1.1. Impact of Centralized, Hierarchical Structure on Communication

“Structuring groups into hierarchies automatically introduces restraints against free communication” – William H. Read (1962)

William H. Read’s (1962) study of “Upward Communication in Industrial Hierarchies” tested the belief that a “negative relationship exists between upward mobility of members of industrial organizations and the accuracy with which these members communicate upward in the hierarchy.” Read hypothesized that this relationship is modified by interpersonal trust between a subordinate and his superior. A lack of trust within this relationship would drive the subordinate to restrict or distort information communicated upward with fear of what the superior would do with any negative or unfavorable information; it could possibly be used against him. Read’s analysis concluded that an individual who highly values upward mobility within a company is likely to withhold or distort information communicated to superiors because of the fear that negative information may hinder the ability to move up within the company’s hierarchy. Further, Read concluded that trust was a very strong modifier in this relationship between mobility aspirations and accurate communication; when a subordinate placed low trust in his superior the tendency of these individuals to report less negative but also less accurate information was greatly amplified. Read’s analysis also concluded that individual’s who have already experienced a relatively high degree of vertical mobility within an organization have a greater tendency to report inaccurate and less negative information when trust in the superiors is low. This supports the idea that this type of communication is a learned behavior; the individual’s have established a link between the type of information conveyed and promotions and have continued to behave in this manner to continue to move upward within the company. However, Read could not conclude if high trust would help increase the accuracy of information reported upward. (Read, 1962)

As Read explained, the main problem with subordinates distorting or withholding information from superiors arises when superiors must make decisions for the company. The “lows” want to minimize conflict and confrontation with the “highs” in order to maintain good relationships. This leads to screening information that is communicated upwards. Such screening leads to less truthful communication, less accurate information and therefore less useful information and ultimately bad or uninformed decisions by the “highs”; Without accurate information, the

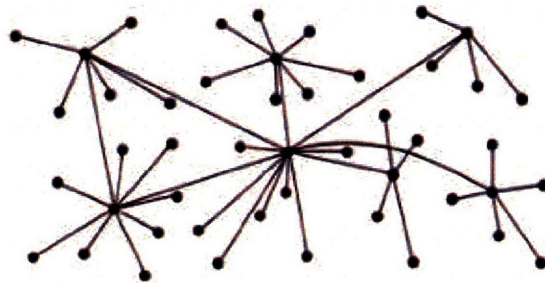
superior may not be aware of existing problems and will make a decision based on limited information. The subordinate is also doing a personal disservice as keeping the superior in the dark prevents the superior from providing help to fix the situation (Read, 1962)

Mathematicians have tried to explain the distortion of information that exists in hierarchical structures by quantifying the effect a hierarchical organizational structure has on the accuracy of the information being passed between the levels. Professor Dietrich Stauffer (2006) has derived mathematical proofs to explain this occurrence. Stauffer's studies of sociophysics, the study of social behavior expressed through mathematical equations, have analyzed the amount of information lost between layers within an organizational hierarchy. In the research article "Optimization of Hierarchical Structures of Information Flow" Stauffer performs a mathematical analysis of the amount of information lost between layers within an organizational hierarchy. The article uses a hospital as an example, with information, in the form of medical help required to a patient dissipated down through the medical hierarchy from chief surgeon to nurse. The mathematical model explains that in an organization with a discrete number of layers and b number of subordinates in the each layer, there exists N number of people separated by a total distance L from top to the bottom layer. Within this hierarchy, there exists x , the fraction of information decay with each new layer, either of initial or current information, stated linearly or exponentially respectively. Ultimately, Stauffer has derived the total amount of information, H , arriving at the lowest layer using two methods, Cayley tree or Scale Free Networks. The Cayley Tree method utilizes the concept of nodes as branches, with each branch having equivalent number of branches as its successor and results in the following equations representing total information lost through the hierarchical structure: $H=(1-xL)b^L$ or $H=e^{-xL}b^L$. Whereas, the Scale Free Network method illustrates the interpersonal connections as a network of nodes with some nodes acting as failure resistant hubs for others. In this situation, unlike the Cayley tree method, if one non-hub node fails the entire network will not show signs of degradation. Ultimately, the Scale Free Network expresses the total amount of information lost through the hierarchy as the summation of the fraction of information lost at each layer.

2.3.2.2. Decentralization

“Put together a close-knit community with shared values and add a belief that everyone’s equal, and what do you get? Decentralization.” – Ori Brafman (2006)

Unlike a centralized organization, a decentralized company does not have a hierarchy or headquarters and the power is distributed among all of the employees; it is a network of networks with a flat organizational structure.



Source: www.rand.org

“Introduction to Distributed Communication Networks”

Paul Baran

Figure 5: Decentralized System

As Brafman and Beckstrom (2006) described, a decentralized organization is much like a starfish. A starfish does not have a head or even a brain rather five legs that operate autonomously while maintaining constant communication. Each leg has its own set of major organs which allows each to function completely independent of the others. Therefore, if one leg were cut off, the starfish will not die. In a high tech organization, decentralization allows a company to grow but as highly autonomous, specialized groups operating as a modular network. Communication throughout a decentralized network is direct between employees and the knowledge resides among all people in the system rather than selected key players. This allows the network to make quicker decisions than a centralized organization. Further, a decentralized organization does not operate with one single budget but rather each unit or division is responsible for its own budget and sales reporting. The lack of a central profit center can be disadvantageous to large organizations that rely on sharing funds between divisions and units whenever necessary to maintain profitability. Additionally, the definition of autonomy requires that more workers are available as no unit should rely on the resource of another unit in the

unlikely event that that resource becomes unavailable. Less economy of scale is achieved through full decentralization as production volumes and operational efficiencies are minimized.

A decentralized system is not anarchy but rather functions around norms based on “flexibility, shared power, and ambiguity”. Leaders do exist, in the form of catalysts, which get the organization going then transfer the responsibility and control to the members. Unlike rules that are imposed by the hierarchy of a centralized system, norms are created and perpetuated by the people in the system rather than dictated from the top down. These norms are often more effective as individuals find it easier to break rules they didn’t make than the norms which they helped create. Ultimately, the success of a decentralized organization relies on strong, trusting personal connections and “tolerance for ambiguity” rather than a person in charge. (Brafman & Beckstrom, 2006)

However, less economy of scale is achieved through full decentralization; production volumes and operational efficiencies are minimized.

A decentralized company’s flexibility and adaptability also lends itself to growth. While more members can increase the networks diversity and creativity it can also diminish the power of small groups. With the growth, the members lose the closeness of their relationships and their bonds, and sense of accountability and ownership break down. Additionally, organizational growth can result in many different levels of decentralization throughout the company.

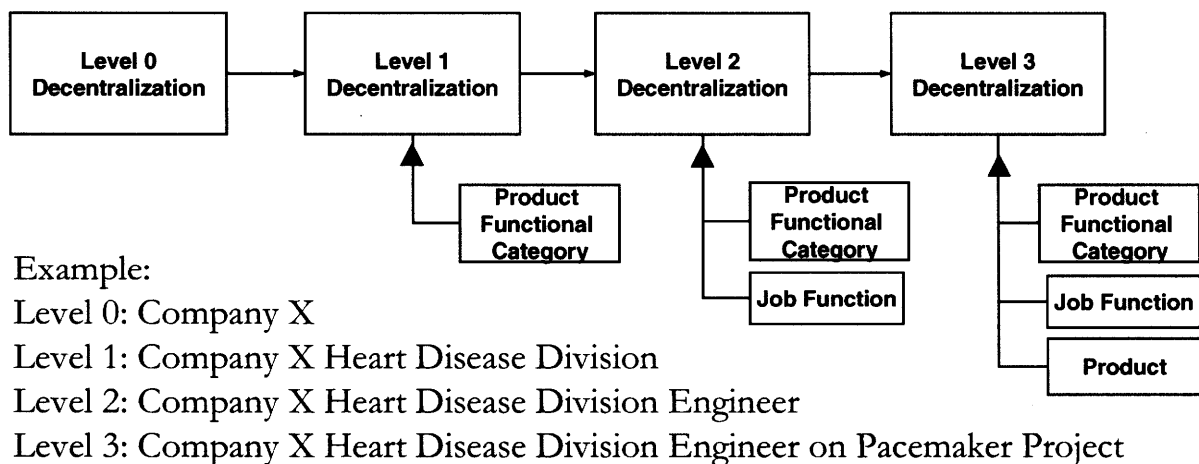


Figure 6: Levels of Decentralization

Decentralized companies must be cognizant of the levels and manage them. The figure below illustrates the breakdown of a high tech organization with level 3 decentralization.

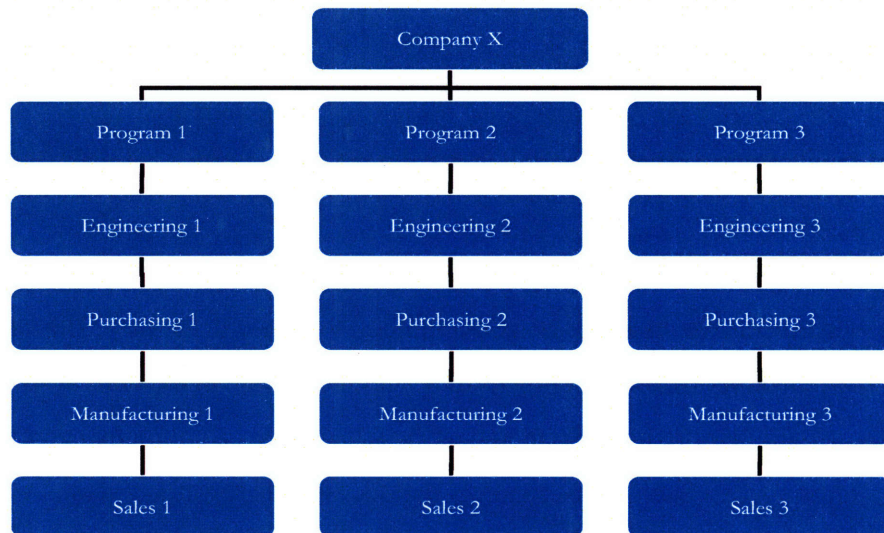


Figure 7: Fully Decentralized Organization

2.3.2.2.1. Decentralization Requires Trust

Trust is a major component of a decentralized organization as the leadership must trust the employees to make good decisions to keep the organization running smoothly, as everyone is entrusted with the power to do what it is right. Wikipedia and Craigslist are both prime examples of successful decentralized systems that heavily rely on trust. Many will argue that Wikipedia is not a reliable source of information because it is just that, an open system where anyone can contribute. However, investigations by Nature magazine have proven that the “average science entry in Wikipedia contained around four inaccuracies” while the Encyclopedia Britannica, a well known and trusted source, contained around three inaccuracies. “Like concerned and thoughtful neighbors, members of the Wikipedia community care enough to contribute regularly and are mindful to keep the content accurate” (Brafman, 2006). Both Wikipedia and Craigslist submitters and users refer to the systems as communities and neighborhoods in which there are no leaders, everyone is responsible for keeping themselves and everyone else on track, and everyone wants to contribute. These communities have high levels of trust and also require equally high levels of faith and vulnerability as one cannot control the actions of others in this flattened hierarchy. These emotional connections are the backbone of a

decentralized organization; people respond out of respect and belief in the members and the system. (Brafman & Beckstrom, 2006)

2.3.3. Incentive structure

“People don’t do what you expect, they do what you inspect” – Louis Gerstner (2008)

In reengineering IBM, Louis Gerstner (2003) had the intuition to recognize the importance of a properly developed incentive structure as he understood that incentives drive the culture of the company. In fact, Gerstner believes compensation and money are at the core of the culture and continually stresses the importance of understanding what values a company is creating with the measurements set in place. Such measurements include what is rewarded versus what is reprimanded. From his experience, Gerstner spoke of the example of IBM, a company that preached the value of teamwork but paid employees based on individual contribution. This contradicting statement drove employees to focus on personal contribution as no one wanted others’ performance to influence their compensations. This attitude is “deadly” for a company that needs to integrate or a project team whose success is largely dependent on collaboration, communication and teamwork. (Gerstner, 2008)

As Gerstner explained, a properly devised incentive structure gives each employee “skin in the game” which is important since how an individual will be compensated largely affects how willing they are to participate; everyone must feel they have something to lose or something to gain through their actions. Therefore, in order to encourage teams and divisions to collaborate and share information the individual compensation increases should be tied back to the goals of the entire organization. These goals must be both short and long term and must be relatable to the individuals. They must be ones in which the individuals feel they can impact rather than large corporate goals that seem far out of reach. Otherwise, individuals will lose interest in goals and bonuses as they do not feel they can impact or achieve them thus decreasing the potential affect the incentive structure has on the organization and employee behavior. (Gerstner, 2003)

2.3.4. Company Culture

2.3.4.1. “Powerful Situational Forces”

“A large body of evidence in social psychology supports the concept that situational power triumphs over individual power in given contexts.” –Philip Zimbardo (2007)

Philip Zimbardo (2007), a well known psychologist, focused his research on “real people engaged in life’s daily tasks, enmeshed in doing their jobs, surviving within an often turbulent crucible of human nature.” Zimbardo theorized that although individuals want to believe that their personalities are fixed, regardless of “time and space”, they in fact are in constant interaction with the world around them, and are not necessarily consistent across varying situations. For example, an individual’s behavior will differ when working alone or in a group, with friends or strangers, or in a familiar location or a new one. He is most well known for testing this theory in his 1961 Stanford County Jail Experiment which evaluated to what degree this influence of a system can have on human behavior; the Experiment tried to answer the question, “if you put good people in a bad place, do the people triumph or does the place corrupt them?” (Zimbardo, 2007)

In the Stanford Prison Experiment, Zimbardo selected students to participate in a simulation of prison life. 18 volunteers were chosen after thorough psychological testing to ensure that the selected students represented an “average group of healthy, intelligent, middle class males” (Zimbardo, 2008). Half of the students were arbitrarily assigned as inmates while the other half became the prison guards, each to be compensated \$15 per day of the experiment. The school facilities were converted to the ‘Stanford County Jail’ complete with group inmate cells with cots, a solitary confinement cell, one single eating area and access to one bathroom. The study began with the arrests of the inmates under fake charges although the process was authentic; the prisoners were stripped, sanitized, uniformed, and given numbers to replace their names. The process was meant to induce a sense of humiliation, fear, and depersonalization.

Quickly the simulation went from an experiment with volunteers to a real prison experience. The prisoners quickly forgot they could leave at anytime and began insisting on lawyers to get

parole. The guards took advantage of this situation and as the days went on, harassment and abuse increased in frequency and severity. Bathroom breaks became scheduled during the day and prisoners went in groups, chained together, with their heads covered with canvas bags. The cots, blankets, pillows and clothing were removed and the prisoners were forced to sleep on the cement cell floor. Excessive, even pornographic, abuse continued throughout the nights when the guards believed the researchers were not watching the surveillance cameras. The project became overwhelmingly real to both the prisoners and the guards; at one point, Zimbardo had to intercede:

"Listen, you are not #819. You are [his name], and my name is Dr. Zimbardo. I am a psychologist, not a prison superintendent, and this is not a real prison. This is just an experiment, and those are students, not prisoners, just like you. Let's go."

The two week study was stopped after only 6 days due to the overwhelming anxiety, harassment, and physical abuse the inmates were experiencing. When a Stanford PhD was brought in to interview the guards and prisoners, she experienced the strength of the situation and the power it had over the boys involved and insisted that the study ended immediately. Her experiences and recap of the interviews all expressed the same disbelief:

"I was absolutely stunned to see that their John Wayne was the 'really nice guy; with whom I had chatted earlier. Only now he was transformed...he not only moved differently, but talk differently...he was yelling and cursing...it was an amazing transformation from the person I had just spoken to- a transformation had taken place...just by stepping over the line from the outside world into the prison yard."

Hearing from her made it clear to Zimbardo that the point had been made, the situation had indeed altered the volunteers' personalities, and the study needed to end before permanent psychological damage was done to the volunteers.

Several important conclusions emerged from the Stanford Prison Experiment. The Experiment clearly confirmed Zimbardo's theory that individuals who are placed within a system with a strong fixed culture, regardless of the prior experience and personal background, will alter behaviors and conform to the survive in the present culture. The prison conditions, as Zimbardo hypothesized, did indeed bring out the "evil" in the volunteers, without full awareness of the

individual and what was happening to them. One prisoner wrote, “As I look back on the things I did it seems they had quite a strong, but subtle control over my mind.” Additionally, the Experiment reinforced the “Broken Window Theory” that a setting that masks a person’s identity also removes their sense of responsibility and accountability for their actions. The theory is often used by city police to explain the graffiti and vandalism that occurs to public property of large cities such as New York. In the Experiment, Zimbardo showed that by replacing a name with a number, and personal clothing with a nondescript uniform, the “conditions that make us feel anonymous, when we think that others do not know us or care to, can foster anti-social, self-interested behaviors.” Further, the group pressures played a large role in the basic “need to belong” and be accepted by others drove many of the guards to do things they condoned. To conclude, Zimbardo simply stated, “The primary lesson the Stanford Prison Experiment teaches is that situations matter.” (Zimbardo, 2007; Zimbardo, 2008)

More recently, James Cramer (2002) analyzed the effects systems have on individuals and the results these effects have on entire organizations in his book, *You Got Screwed: Why Wall Street Tanked and How You Can Prosper*, through his discussion of the notable collapse of companies such as WorldCom and Enron. In his analysis of WorldCom, Cramer explains that a large problem was the culture created by its executives, lived by the employees and fed by the public; WorldCom was a \$6 billion fraud, “perpetrated on shareholders and bondholders and low level employees”. According to Cramer’s explanation, WorldCom exemplifies Zimbardo’s theory of the bad barrel opposed to the bad apple in which good people are placed in a bad system that ultimately overtakes and changes them. The first flaw in the set up of WorldCom was that although it was a public company it continually operated as a private one, allowing its CEO Bernard Ebbers to make the decisions. Although providing executive options was an attempt to put executives on the same level as the shareholders by giving them options that didn’t make money until they were sold, it was ineffective. The executives ended up managing the company stock instead of the company itself; it shifted the focus from the company to merely the company stock price. The Second flaw was the reliance on Jack Grubman, a notorious telecom analyst. His previous success in making a lot of money for companies gave him such a strong reputation that any company treated him as a deity with the power to do anything. People made decisions based on Grubman’s opinions without looking into the facts themselves. Thirdly, the method of

valuation caused the new, young, mutual fund managers to develop their own “beat the street” set of rules which insured they would never take a pay cut and the company would always look good, as long as they continued to “beat the street estimates”. In order to continually beat the street WorldCom relied on reversals of bookkeeping charges whenever they needed to beat the street’s estimates. The media and the public liked the “beat the street” process because it was easy to explain and understand. If a company beat the estimates, that was good. If they didn’t, that was bad. And if the company merely did nothing and met the estimate, that was fine. Simplifying the process for the public made it easy to understand, and since people wanted to understand, they didn’t question the process’s legitimacy. Fourth, the WorldCom auditor, Arthur Anderson, decided it was less profitable to audit and more profitable to consult therefore leaving WorldCom with no true auditors checking their activities. Thus, the double accounting was overlooked. Failure to address the internal bookkeeping that showed WorldCom at a loss, while the external values showed positive gains, allowed the company to continue to prosper even when they were slowly failing. Many argued the SEC should have intervened, but SEC claimed it was not their job to audit and as long as companies filed the paperwork on time, regardless of the claims, the SEC had no reason to get more involved. (Cramer, 2002)

Possibly the ultimate promotion of the bad barrel was the government’s decision at the time not to prosecute white collar crime because it would’ve been too difficult and as long as the stock price was going up, “you would be hard pressed to find a jury that would convict them” (Cramer, 2002). The public was in it as well, making money when the stocks went up, losing money if the fraud was revealed, so the fraud continued uninterrupted.

2.3.4.2. *Resisting the Forces*

“I have proposed that we give greater consideration and more weight to situational and systemic processes than we typically do when we are trying to account for aberrant behaviors and seeming personality changes.” – Philip Zimbardo (2007)

Through the Stanford Prison Experiment, Zimbardo confirmed that a system, composed of “networks of people, expectations, norms and policies”, imposed on a group of individuals can dramatically alter their behaviors both independent of and between one another in a negative

way. Zimbardo believes that if this is true, than the converse should also be true: a system set up correctly to enforce positive behavior changes is equally capable of bringing out the “good” and changing people for the better. He suggests that combining three influence tactics, foot-in-the-door, social modeling, and identity labeling, will create a system to promote positive behaviors. All three tactics were employed in the Stanford Prison Experiment, but for the goal of achieving a negative effect. In order to promote positive behavioral changes, the foot-in-the-door tactic can be employed to request an individual to do something small, such as sign a petition for recycling, which requires little effort, and then later asked to do something related but of larger magnitude, such as donating money to the cause. Similarly, social modeling, or the visibility of positive social role models has been shown to increase the likelihood of others following their lead. It is the realization of the phrase “practice what you preach”, as more people are affected by actions than by words alone. The Salvation Army is a good example of positive social modeling. Lastly, studies of identity labeling have shown that people given identity labels such as caring, generous, and helpful are more likely to elicit those behaviors than those who are not labeled in a positive way. The goal of an organization should be to “create a setting in which people will comply with demands that intensify over time *to do good.*” (Zimbardo, 2007)

Additionally, Zimbardo addresses the responsibility of the individual to resist “the impact of undesirable social influences” and promote altruism and positive behaviors. In The Lucifer Effect: Understanding How Good People Turn Evil, Zimbardo laid out a ten step program for individuals:

1. Be willing to admit when you make a mistake
2. Be aware; do not function on automatic pilot
3. Take responsibility for your actions
4. Maintain your individuality; do not allow others to dehumanize you
5. Learn the different between just and unjust authority figures
6. Know when not to follow; value your independence
7. Be aware of the effects of framing
8. Avoid just ‘going with the flow’
9. Do not sacrifice personal freedom for security
10. Oppose unjust systems; resist

Zimbardo continually stresses the importance of recognizing that situations *do* influence human behavior and therefore individuals must make an effort to understand how to minimize the negative and maximize the positive effects for the benefit of the entire system. (Zimbardo, 2007)

2.4. Social Networks

The discussion thus far has examined the formal structures and processes that exist within an organization. However, it is just as important to understand the 'invisible' structures and processes that also exist. These structures and processes are in the form of social networks and have the same ability to influence individuals' decision making abilities as the formal structure and processes set in place by the management.

2.4.1. Social Networks in Organizations

Within every organization there are formal networks dictating employee position, responsibilities and rank within the company. However although the organizational chart may provide a visual depiction of a functioning company it is only part of the story. Within every organization there also exist informal networks often referred to as social networks, invisible, unofficial networks depicting the informal associations and connections, relationships and interactions. The most heavily studied social networks within companies include the advice, communication and trust networks. The advice network refers to those people whom an employee would go to for professional advice; those employees who have technical expertise. The communication network depicts to whom people talk to regularly. The communication linkages are unique in that the only linkages allowed are those where both people said they talk to the other regularly. The trust network investigates who people feel they can rely on and confide in at work.

A company, as described by Dr. Peter Gloor (2008), is analogous to the human body in many ways. The knowledge flow is the nervous system of an organization, gathering, controlling and storing information whereas the business processes are much like the blood system which allows the information to flow and be transported properly. Both the knowledge flow and business processes are defined by the data or the body parts of an organization. The organizational structure much like the human skeleton provides necessary support and strength. The

“invisible” social networks are the basis each of these systems and their successful operation.
(Gloor, 2008)

2.4.2. Social Network Analysis

“The goal of social network analysis is to improve the functionality of any organization” –
Robert Cross

In the article, “Informal Networks: The company” Krackhardt and Hansen lay out a method for collecting, mapping, and analyzing information for each type of network, including what questions to ask and how to double check the responses. These social network analyses (SNA) are a valuable source of knowledge as they can reveal information that may otherwise be unknown to a manager. Managers can use the information obtained through this analysis to develop strategies to support and leverage these networks to improve productivity. This information can be used to correct any problems, such as lack of communication between groups or holes where communication, trust, or advice sharing would be expected but isn’t evident. The SNA can be used to “promote effective collaboration within a strategically important group”. The ability to illustrate the knowledge sharing allows for the recognition of any isolation, fragmentation, or division occurring within a group. Problems such as these can then be corrected through various integration efforts. The SNA can also help identify similar problems not only within a group but across boundaries, whether departmental, geographical, or hierarchical. Integration efforts can then be implemented across those boundaries which the company would most benefit from increased communication and collaboration. Finally, the SNA can help to re-integrate after a significant structural change such as a reorganization or acquisition. The SNA provides a method for monitoring such changes for communication breakdowns, isolation, or fragmentation during and after the internal restructuring. (Krackhardt, 2000)

It is important for managers to understand these linkages as it is their responsibility to create and manage teams and within teams, relationships can often dictate success. Further, it is important for managers to recognize and redirect those who may stray from the central core of the networks and SNA is a tool to identify these individuals. Many will agree that much of the ‘real’ work is

accomplished through those informal networks of interactions which are not on any chart and for many managers remain misunderstood and 'invisible'. Simple social network analysis can have a very positive impact on an organization by making these otherwise invisible networks of interaction visible. (Krackhardt, 2000; Cross, 2002)

Social Network Analysis has the ability to expose valuable information to managers which can be used to develop strategies to support and utilize the "informal" networks to improve overall productivity. Through this social network mapping, key employees, bottlenecks, isolated individuals or groups are identified. Even more importantly, a thorough understanding of the social networks will uncover what and who employees truly value in a company; as Louis Gerstner has said, "the really important ones aren't written down".

2.4.2.1. Mapping Process

While an organizational chart provides a company's formal hierarchical information, a social network map is a visual representation of information flow, trust, and collaboration patterns among people within an organization.

Information required to create a social network map is gathered by providing individuals within a particular group with questionnaire pertaining to communication, advice, and trust among the group. For example, questions may include:

Communication: Who do you talk with regularly during the day?

Advice: Who do you approach with a question regarding a project related problem?

Trust: To whom would you tell a secret?

The participants are asked to answer each question by listing the names of those individuals whom best fit the description. They may list as many names that apply to each question, listing the same name more than once, as long as those listed are members of the group being studied. Alternatively, if no name is listed for a particular question, it is assumed that no one fits the description of the question. Often a name bank of those individuals associated with the particular group is provided for participants to use as a reference when answering each question. Once the participants have completed the questionnaire, the network maps can be laid out. Each individual, referred to as an 'actor', is represented as a node. Beginning with the communication

network, for each actor a link to those people listed under the questions designated as 'communication' questions should be drawn. For the communication network, one way communication should not be recorded; both participants must have listed each other in order for a link to be drawn. The same process is repeated for the advice and trust networks however one way links should be recorded for both. For each network, by placing a point for each actor and a link to all other appropriate actors, a map much like a spider web will emerge.

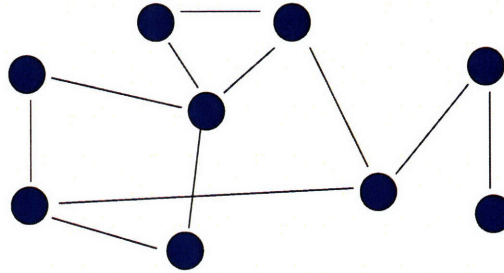


Figure 8: Social Network Map

2.4.2.2. *Interpreting a Social Network Map and Emergent Patterns*

Dr. Peter Gloor (2008), of the Center for IT Leadership of Partners Healthcare System, explains that when interpreting a social network map it is important to understand the two measures of centrality: degree and between-ness of the actors. Degree refers to the number of linkages connecting one node to another whereas between-ness refers to the shortest path calculated using the length of the total linkages.

There are several players within these maps that can be easily identified, such as central connectors, boundary spanners, brokers, and peripheral individuals. Central connectors are those individuals who have the most linkages to them; in other words, many people are connected to them somehow in the organization. Central connectors are obviously important to the organization as they have relationships with many others however they can also easily become a bottleneck as they are often overworked or too heavily relied on. Boundary spanners are extremely important to an organization as they are the people who link two departments or areas of a company together; this person keeps communication flowing between two otherwise separate clusters of individuals. Brokers are otherwise known as the 'middleman'. Finally, the peripheral individuals are secluded from the rest of the network map as they are not integrated well at all with the organization. These individuals are often underutilized and their skills and

importance to the organization go unrecognized. Peripheral individuals are typically evident in organizations with large turnover rates as new people do not begin as a well integrated member of the group. However, it is important to address the peripheral condition and make sure they become more integrated. (Cross, 2004)

These different types of individuals make up the network map which develops as one of two typical patterns, often referred to as the galaxy pattern and the star pattern. The galaxy pattern evolves from a heavily integrated network where central connectors are not easily identifiable. The star pattern is defined by several smaller groups, each with a central connector, bound together by only a few linkages. The star formations resemble 'cliques' as many people can be linked to one central connector but are not linked to the other groups or central connectors. This forms the clusters of the star patterned map. (Gloor, 2008)

The primary focus on this thesis is the trust network. While both the communication and advice networks can also be helpful to management, this research study focuses on building trust to improve decision making within an organization. The trust network map is a valuable tool for analyzing individuals' behaviors as well as to determine its overall affect on the project team.

3. Chapter 3: Research Methodology

Using the information collected through the literature review, this study has been created to examine individuals of cross-functional, project teams existing within the context of a large high-tech organization to determine how the context of such a makeup affects the decision making abilities of individuals and ultimately how these decisions affect the communication among the team and the outcome of the project. This study has been completed in accordance with the MIT Research Involving Human Subjects certification program.

3.1. Case Study Method

The case study method is appropriate for limited size, social science studies with qualitative information. This method is widely used to test theories through observation rather than experimentation and is valuable in testing unique predictions. Case study analysis allows for

theory testing, defining causal reactions, and why these reactions hold. The ability to choose cases with similar background conditions allows for control of variables.

Case studies use controlled comparison, congruence procedures, process tracing and the Delphi Method to test a theory. As Van Evera explains in Methods for Students of Political Science, “theories assume many causal patterns” and it is important to test these causal patterns in order to validate hypothesis or proposed theory. Controlled comparison provides comparison of results across cases to determine agreement or disagreement to support to disprove a predicted theory of casual reactions. The congruence procedure allows for multiple within-case comparisons; paired observations are assessed to determine whether they vary in accordance with the hypothesis being tested. In both controlled comparison and congruence procedures, the combination of multiple conditions will yield a particular result. For example:

$$A + B \rightarrow C$$

where A and B are conditions and C is the yielded result.

Process tracing allows for the exploration of a chain of events; it draws a link between cause and effect, independent variable and outcome. This is achieved by breaking down steps in between the initiating stimulus and the outcome into small, identifiable steps to be observed.

For example:

$$A \rightarrow x \rightarrow y \rightarrow z \rightarrow B$$

where A is the stimulus, x, y, z are intermediate results, and B is the ultimate outcome.

The Delphi Method directly consults participants involved in the case being studied in order to gather more information in order to validate the hypothesized theory. This method is a valuable tool for gathering information that requires interaction and is not achievable through observation alone. For this research study, questionnaires and limited interviews will be used to interact with the participants to gather the necessary data. (Van Evera, 1997)

3.2. Survey (Parts 1 & 2)

Surveys are an effective tool used in case studies to gather and analyze information from participants. The surveys used are original and tailored for the purpose of this research study. The surveys have been separated into two parts due to the nature of the responses. Part 1 is to provide a sense of the culture and atmosphere, prior work experience, as well as information

flow within project teams. Part 2 is to collect the necessary information regarding trust within the organizational context.

3.2.1. Survey Part 1: Context

The purpose of Part 1 of the survey is to gain an understanding of the context in which the team is operating; who are the people, what are they doing, how are they feeling?

There are many preexisting surveys which evaluate culture and information flow within a project team. Several of the questions that have been chosen are provided through QuestionPro.com and are regularly administered to help management better understand the environment and culture of the company according to the view of the employees. These questions have been supplemented by questions derived from The Hidden Power of Social Networks (Cross, 2004) to expand the cultural and communication questions as well as question the individuals' truth telling behaviors.

Survey Part 1 has been broken into four sections.

Section 1: Personal Information. The purpose of this section is to better understand the individuals participating in the study. In order to better understand the context it is important to understand the make up of the project teams.

Section 2: Degree of agreement statements

Section 3: True/False questions

Section 4: Always/Sometimes/Never

Section 5: Multiple Choice

*QuestionPro.com survey questions available for trial use

Two versions of Part 1 have been created: a Project Team Member survey and a Project Manager survey. The variation is required in order for the questions to make sense in the context of the employees' positions. The surveys can be found in the appendix.

3.2.2. Survey Part 2: Trust

The purpose of Part 2 of the Survey is twofold: evaluate the participants' willingness to provide sensitive information for the purpose of a research study and expose who they trust within their project teams for the purpose of trust network mapping and analysis. The same version of Part 2 is used for both the project team members and the Project Manager since the questions apply to individuals' personal preferences regardless of job function.

The degree of trust required for each situation was determined through a survey, administered through surveymonkey.com, of 100 people with various backgrounds. 75 participants were asked to rank each situation in order from 1 to 12 with 1 requiring the least amount of trust and 12 requiring the most amount of trust. The questions were as follows:

1. To whom would you tell a secret?
2. Who would you go to for advice about a personal situation?
3. Who would you give a spare house key to use in emergencies?
4. Who would you let baby-sit your children?
5. Who would you ask to housesit while you go on vacation?
6. If you had to access your computer while out of the office, who would you contact to log in for you?
7. Who can you confide in?
8. Who would you allow to interview perspective clients if you were unavailable?
9. If you could only press the pedals of your car, who would you let control the wheel?
10. Who would you ask to write a personal recommendation which you would not see?
11. With whom would you discuss your personal relationships?
12. Who would you ask for advice on your personal appearance?

The results were aggregated and averaged to conclude the average degree of trust required for each situation. The results are as follows: (listed from requiring least amount of trust to most)

Question	Average level of trust required
Who would you ask for advice on your personal appearance?	3.37
Who would you allow to interview prospective clients if you were unavailable?	5.65
Who would you ask to write a personal recommendation which you would not see?	6.32
If you had to access your computer while out of the office, who would you contact to log in for you?	6.53
Who would you ask to house-sit while you go on vacation?	6.70
If you could only press the pedals of your car, who	6.72

would you let control the wheel?	
Who would you give a spare house key to use in emergencies?	6.96
With whom would you discuss your personal relationships?	7.12
Who would you go to for advice about a personal situation?	7.12
To whom would you tell a secret?	7.57
Who can you confide in?	7.60
Who would you let baby-sit your children?	9.73

Table 1: Trust Question Rankings

Several questions fell within the 6-7 level range and therefore only a few will be used in this range. This will provide valuable information for the trust network map if, for example, individuals list one person for one situation but not for another. This general survey was a way to provide a “scale” for the trust questions being asked in the main survey. The resultant survey can be found in the appendix (note other network mapping questions, including communication and technical expertise, have been interspersed in order to deter the participant from understanding the real purpose behind the survey).

4. Chapter 4: Results and Analysis

The surveys were administered using surveymonkey.com and the participants were informed that all results would remain anonymous. Therefore, it is assumed that the survey responses collected are honest and accurate representations of the participants’ experiences, beliefs, and perceptions.

4.1. Analysis of Individuals

4.1.1. Survey Part 1: Context

4.1.1.1. Project Team Members

Preliminary studies conducted on 28 individuals within various technology industries allowed for an interesting analysis of several of the expected findings with regards to individuals behaviors.

4.1.1.1.1. Formal Organizational Structure

The majority of individuals surveyed have worked in their respective companies for an average of 1-6 years and on the project team in question for 1-2 years.

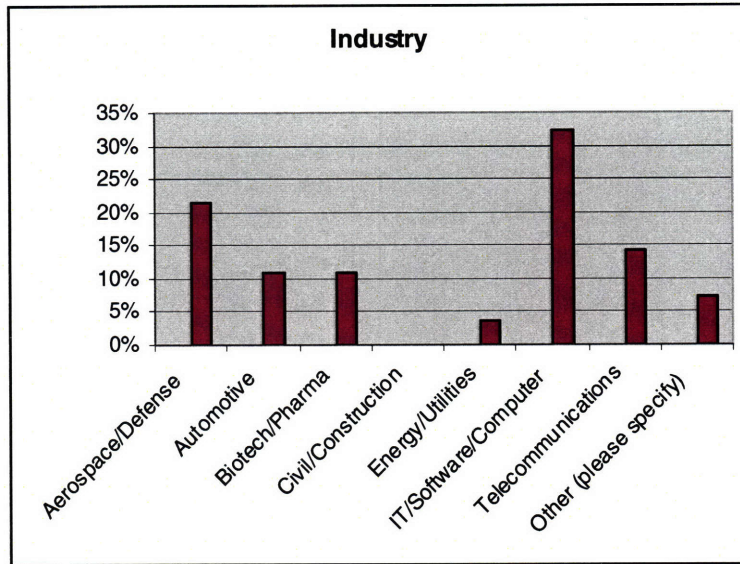


Figure 9: Team Members Industry

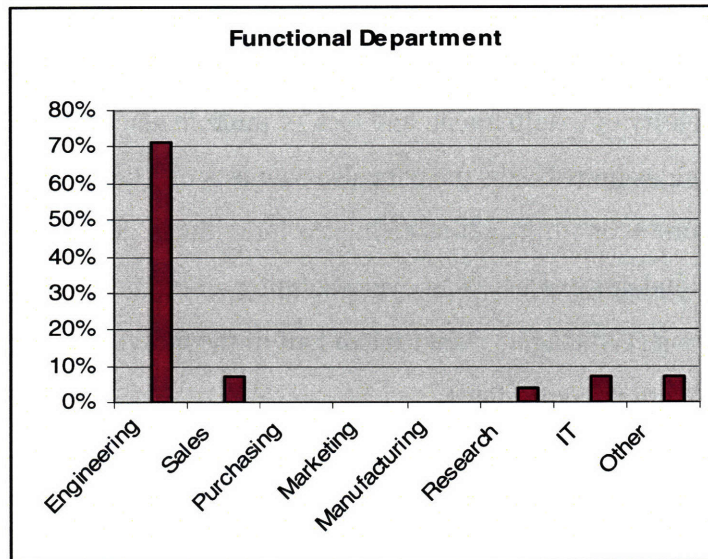


Figure 10: Team Members Functional Department

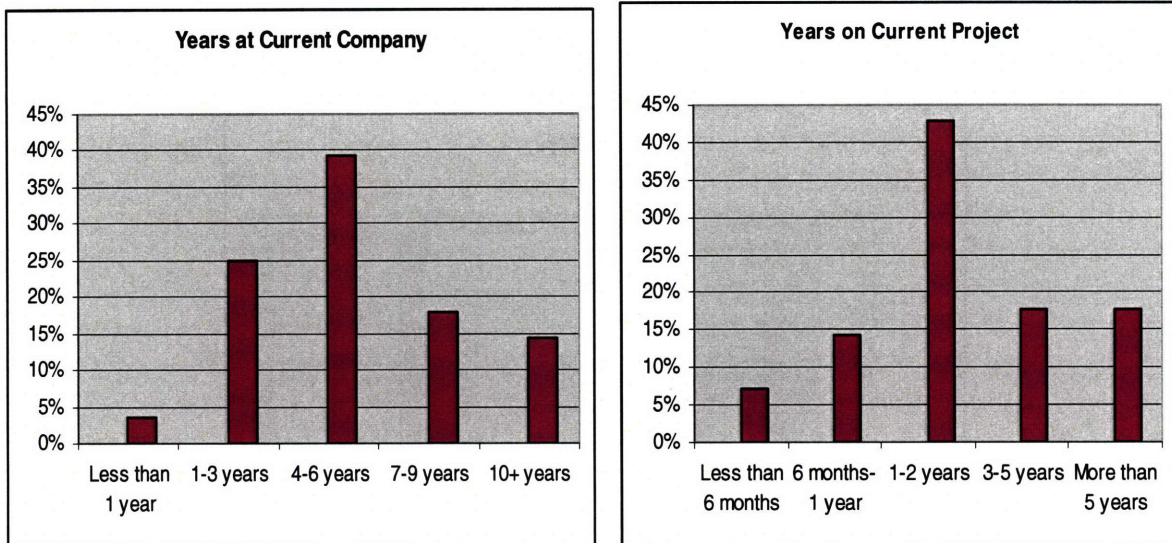


Figure 11: Team Members Years at Current Company and on Project

4.1.1.1.2. Individual Influences

Overall, the majority of the 28 respondents expressed satisfaction with their jobs and current employer. The data suggests that this satisfaction is due to the feelings of personal accomplishments, security of employment, and lack of micromanagement. Although they are content with their work as individuals, the data also suggests that there are underlying issues that impact the project teams even if it is not affecting the individuals' job satisfaction level. Furthermore, the respondents expressed an overwhelming willingness to voice their opinions to and challenge their Project Managers even though half of the individuals expressed that confrontation makes them uncomfortable.

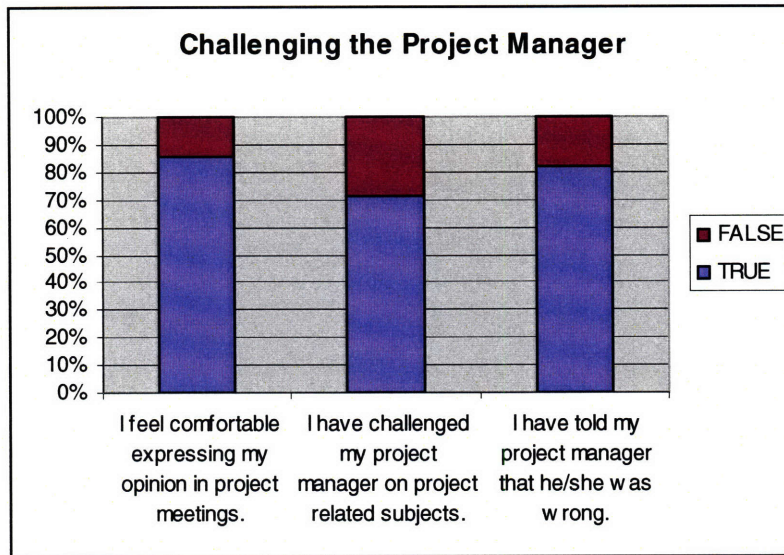


Figure 12: Team Members Challenging the Project Manager

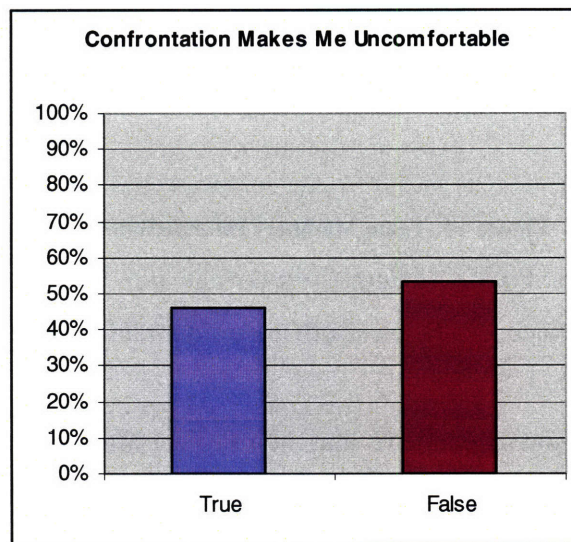


Figure 13: Team Members Confrontation

4.1.1.1.3. Organizational Culture Influences

The data received with regards to the information flow among project teams and Project Managers confirmed the expected finding that employees rely heavily on coworkers within their project team for information and rarely depend on the Project Manager. In fact, when requiring a second contact for information, individuals would rather consider an online database and documentation before contacting the Project Manager.

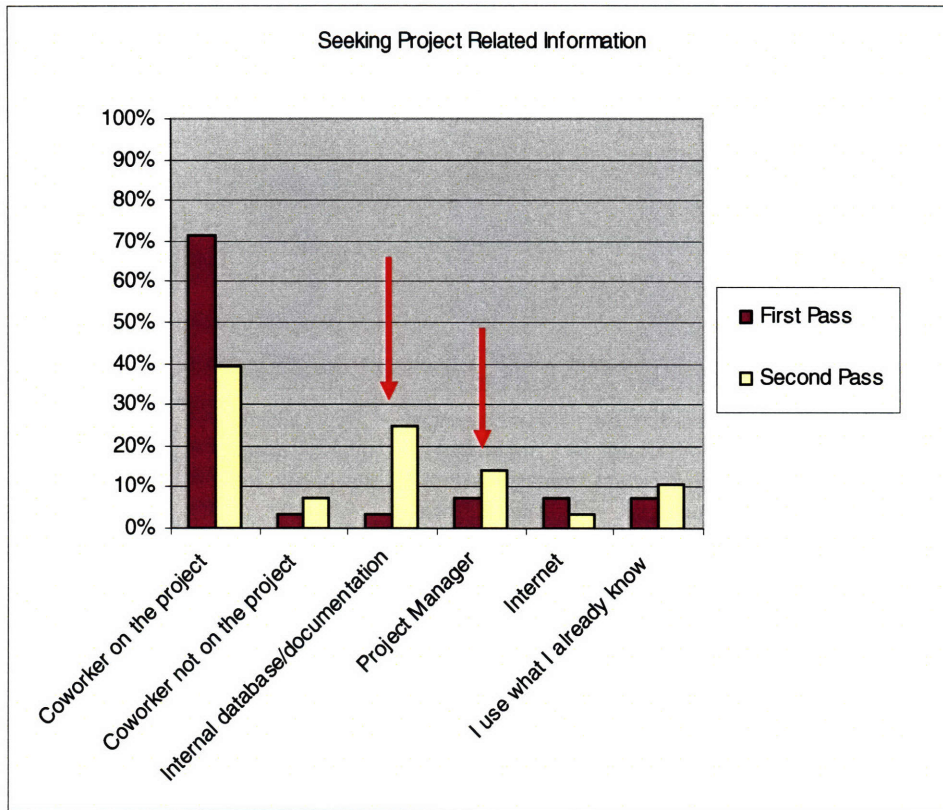


Figure 14: Team Members Information Sources

This suggests that either the Project Manager is unavailable or the individuals trust other resources more than the Project Manager. Both are unfavorable situations.

The belief of over 50% of the respondents that their Project Managers have withheld project related information from them may further contribute to this lack of reliance. Interestingly, while this belief exists, the majority of individuals reported that they do not withhold information from their Project Managers.

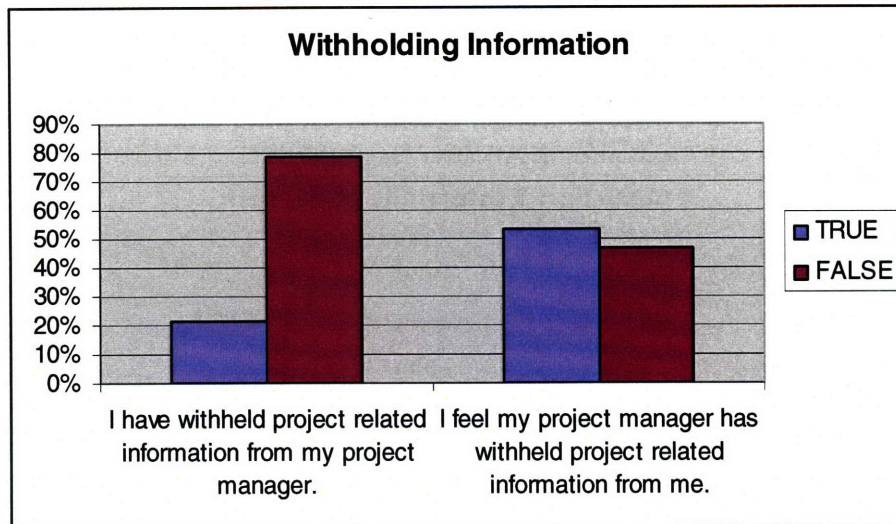


Figure 15: Team Members Withholding Information

The initial assessment of these findings may suggest that given the job satisfaction levels of the respondents and their general willingness to provide information and challenge their managers, regardless of the dislike for confrontation, the project teams are operating exceptionally well. However, further analysis exposes a strong breakdown in communication between Project Managers and project team members. This breakdown may be an indirect result of the distrust of the Project Manager that is subconsciously developed within the team members. It is valuable to note that while the majority of individuals did not feel they withhold information from their Project Managers, they also are not forthcoming with questions or skepticisms either. It is clear from the figures below that all respondents question, to some degree, the information presented by their Project Managers and coworkers in and out of their functional departments. However, while individuals are willing to approach coworkers in and out of their functional departments to clarify the information in question, a percentage of them will never directly approach the Project Manager to challenge information provided by management. Some individuals will not even consult another member of the team to question the information the Project Manager has provided. This is evidence that the groupthink phenomenon previously described is occurring within these project teams.

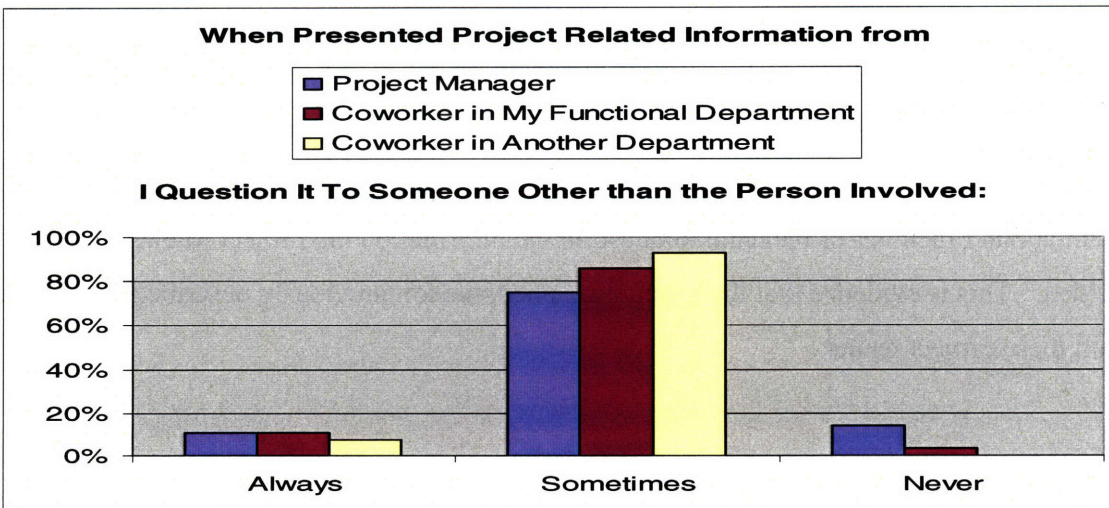
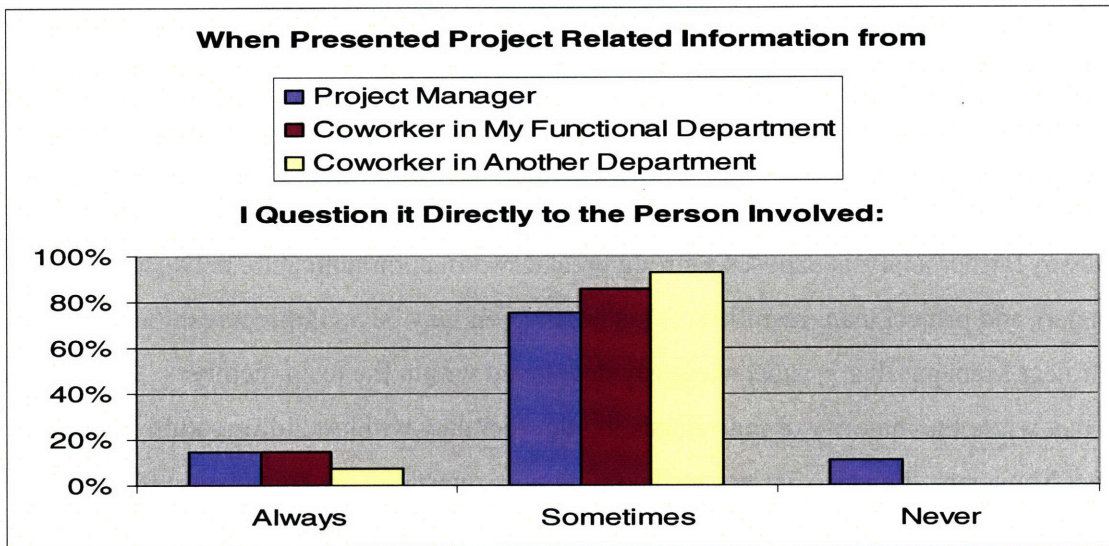
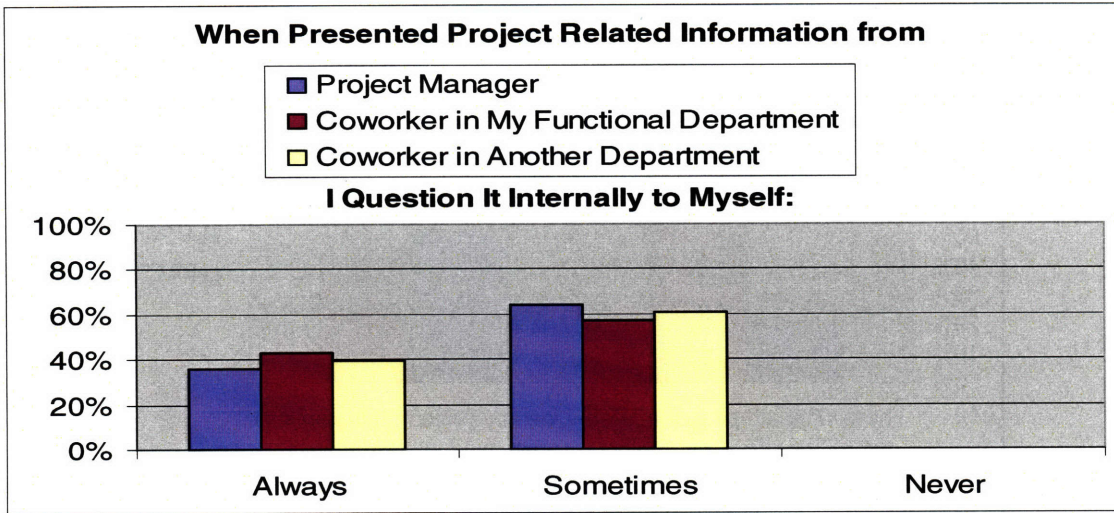


Figure 16: Team Members Questioning information

Further, when a Project Manager assigns a task, while all individuals question the task internally to some degree, there is a percentage of individuals who will never question the Project Manager or even other individuals on the team about the task.

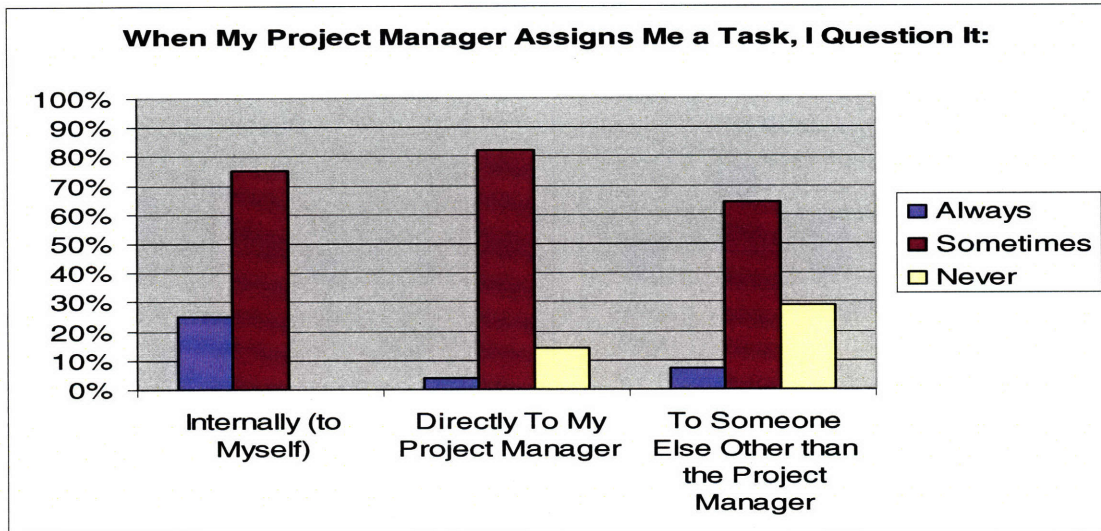


Figure 17: Team Members Task Assignment from Project Manager

The data suggests that although employees do question the information given by a Project Manager they do not follow up to receive clarification. The lack of vocalizing the internal doubt implies that Groupthink is occurring. As previously described, Groupthink is an undesirable occurrence among a project team as it will allow erroneous, inaccurate, and questionable information to disseminate throughout the team and affect the outcome of the project.

It can not be concluded as to whether the knowledge and visibility of other team members is affecting any of the outcomes in question. The majority, approximately 80%, of the respondents expressed a general knowledge of all team members including their names, job responsibilities and physical locations in the company. The responses regarding visibility, illustrated below, vary both in how many times a week team members interact as well as how many times they feel they should be interacting.

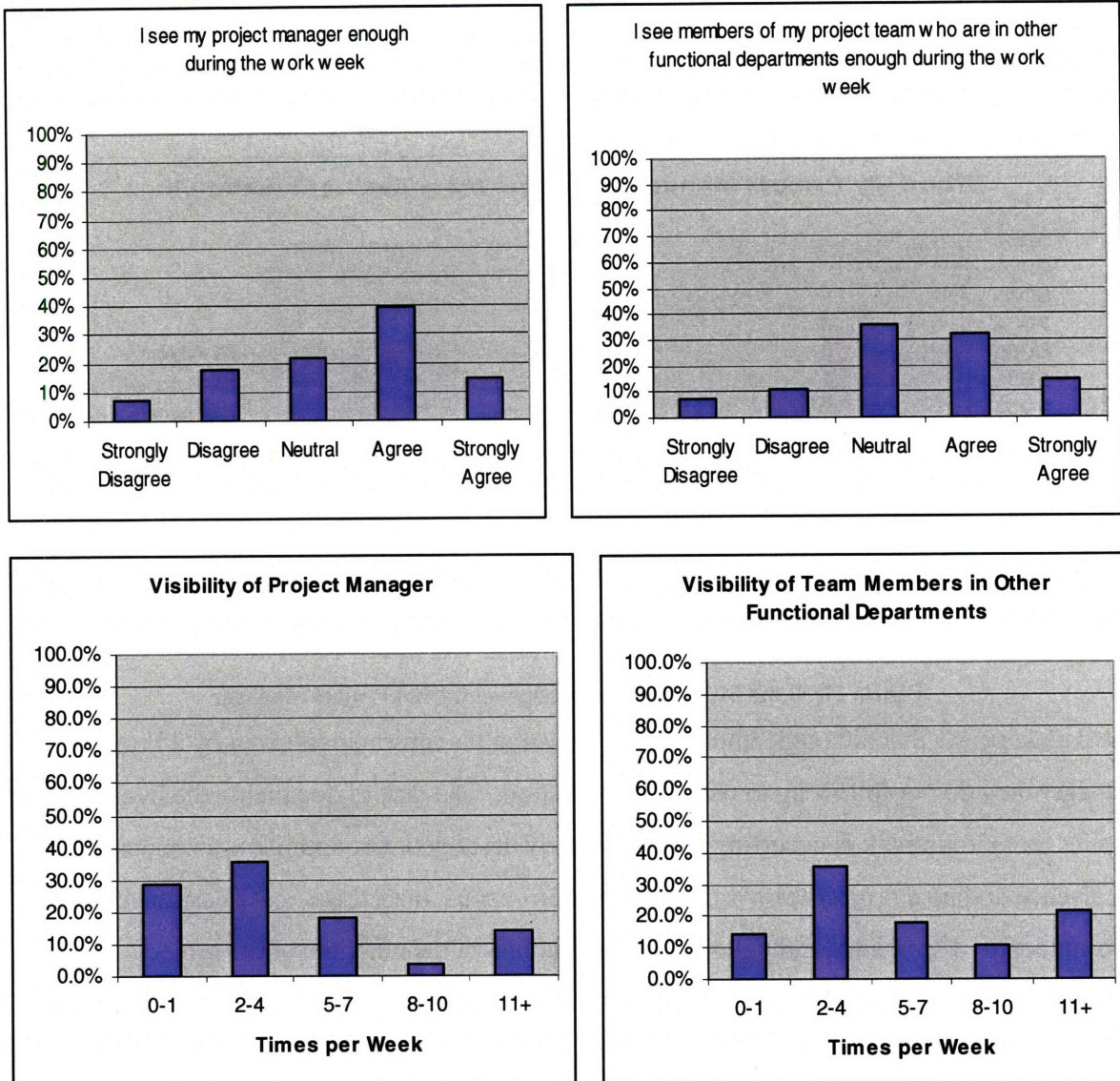


Figure 18: Team Members Visibility

It would be beneficial to further study the effect of visibility on communication by increasing the number of times a week team members interact with each other to see if the responses regarding questioning information vary with this change.

4.1.1.1.4. Incentive Structure Influences

It was originally expected that the data would show that an unwillingness to expose problems on a project could also be correlated to the Groupthink phenomenon as individuals' recent experiences in which they were either rewarded or reprimanded for such behavior would dictate future conduct. If individuals had been previously penalized for exposing problems on the

project, they would tend towards complacency furthering the Groupthink phenomenon whereas rewarding the individuals would have the opposite effect.

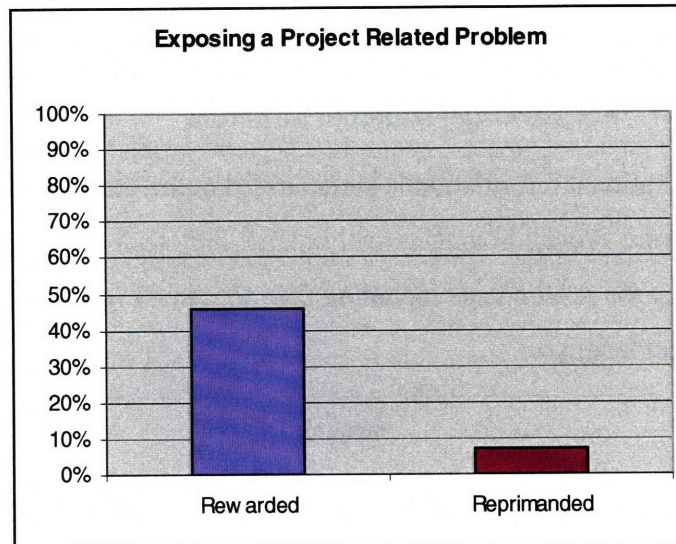


Figure 19: Team Members Exposing Problems

Regardless of those prior experiences, in which employees recalled instances where they were reprimanded for exposing project related problems, no respondent expressed discomfort in exposing project related problems to the Project Manager. However, the information collected regarding team members willingness to approach the Project Manager with questions revealed that a discrepancy exists in the responses. The survey was purposefully constructed to expose such discrepancies by separating particular questions. For example, the survey initially questioned the team members on their comfort and willingness to express opinions and expose problems. The majority of the respondents answered positively to such questions. However, later in the survey, questions regarding actual behaviors when expressing opinions or exposing problems revealed a discrepancy: the team members may feel they are comfortable but they are not behaving or acting in such a way to verify these feelings. This validates the belief that individuals will try to appear in the way they believe to be socially desirable and acceptable although it may not accurately represent their true behaviors. As shown in this study, a properly constructed survey will expose this discrepancy.

4.1.1.2. Project Managers

The Project Manager survey was administered to Project Managers of large high tech organizations. Just as with the project team members, this survey was distributed to over 60

Project Managers but only 12 individuals responded and completed the 15 minute survey in the two week allotted time frame as many expressed a general unwillingness to complete surveys for social science purposes.

4.1.1.2.1. Formal Organizational Structure

The respondent organizational information is summarized in the graphs below. While all individuals surveyed were Project Managers within large high tech organizations, many differences exist among the respondents including the industry, level and years in their organization and project team size.

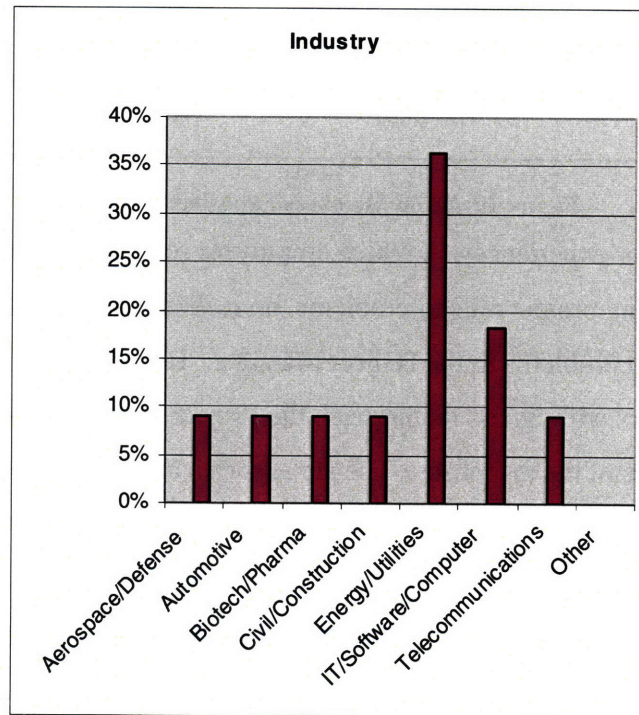


Figure 20: Project Managers Industry

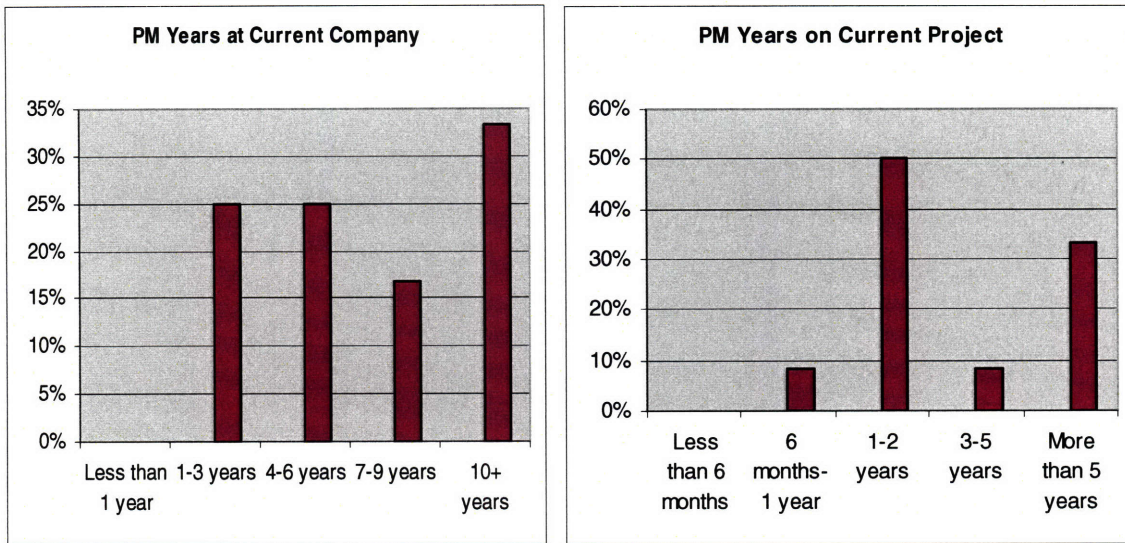


Figure 21: Project Managers Years at Company and on Project

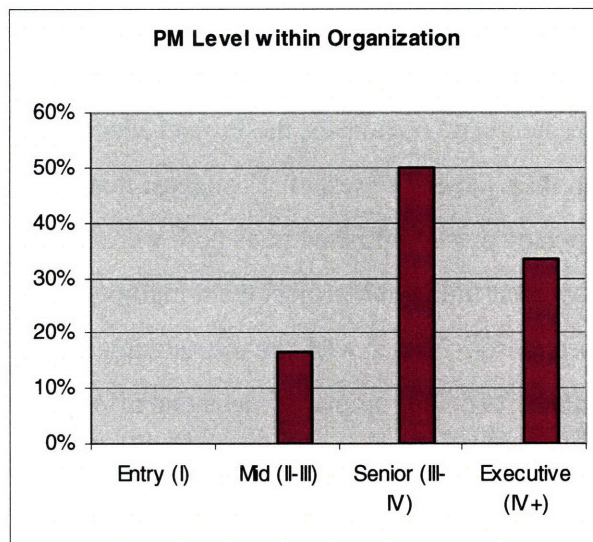


Figure 22: Project Managers Level within Company

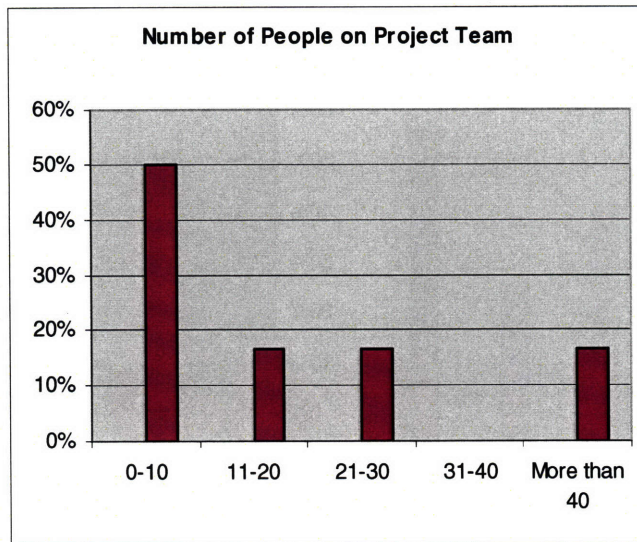


Figure 23: Project Managers Project Team Size

4.1.1.2.2. Individual Influences

Similar to the project team members' responses, the Project Managers expressed a general feeling of satisfaction with their jobs. The responses suggest that this satisfaction is due to the sense of job security and personal accomplishment as both were ranked high by the Project Manager respondents. However, unlike the project team members, a significant number of Project Managers expressed dissatisfaction with the information they receive from their project team members as well as their participation in decisions that affect their work; 25% of the Project Managers were dissatisfied with the information their project teams provided them and 33% of the Project Managers were dissatisfied with their involvement in decisions that affect them.

The Project Manager data agrees with the expected finding that withholding information is not related to the level of comfort with confrontation as 100% of the Project Managers feel comfortable expressing their opinions in project meetings and a more significant percentage of Project Managers are willing to challenge team members and tell them they are wrong.

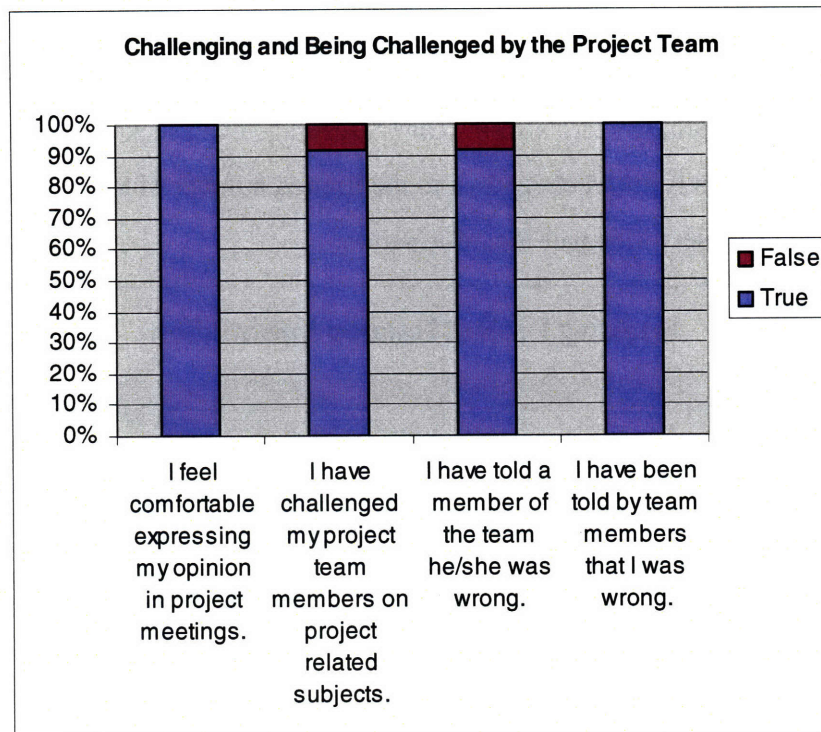


Figure 24: Project Managers Challenging the Project Team

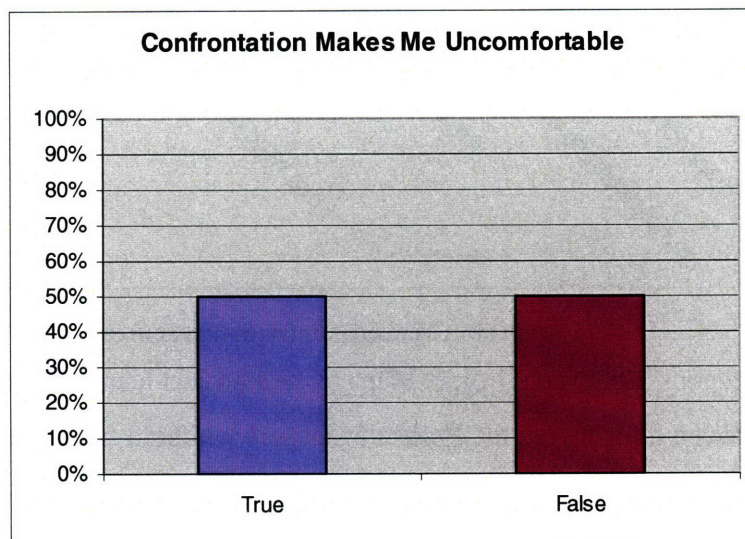


Figure 25: Project Managers Confrontation

4.1.1.2.3. Organizational Culture Influences

The Project Managers dissatisfaction with the communication by the project team members agrees with the data collected from the project team member who revealed that they typically do not approach their Project Managers when seeking project related information or clarification of

information provided and tasks assigned. Unlike the project team members, who avoided the Project Manager when seeking project related information, the majority of the Project Managers do rely on project team members and a significant percentage even seek out their Project Executive if needed. This is in direct contrast to the limited number of team members who would approach their Project Manager for information.

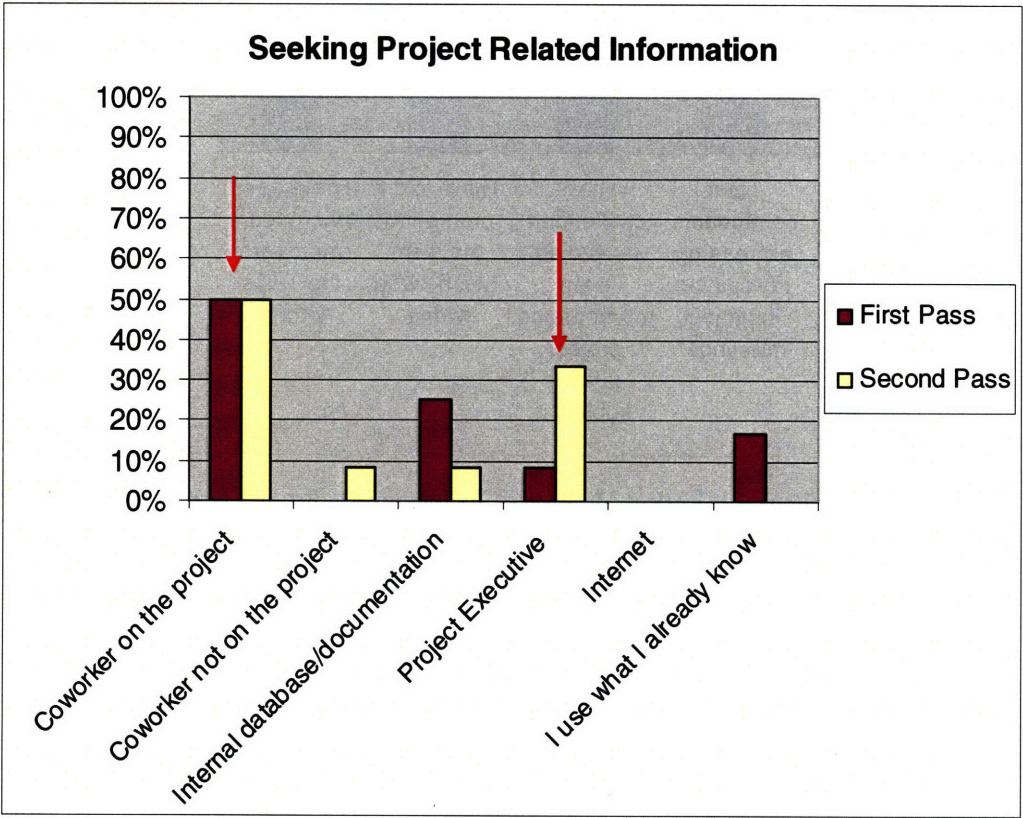


Figure 26: Project Managers Information Sources

The difference in responses between Project Manager and project team members continued with the relationship between information the Project Managers withhold from team members and information they believe is withheld from them; 46% of Project Managers have withheld information from the project team members and 58% believe the project team members have withheld information from them whereas almost 80% of team members claimed they do not withhold information from their Project Managers.

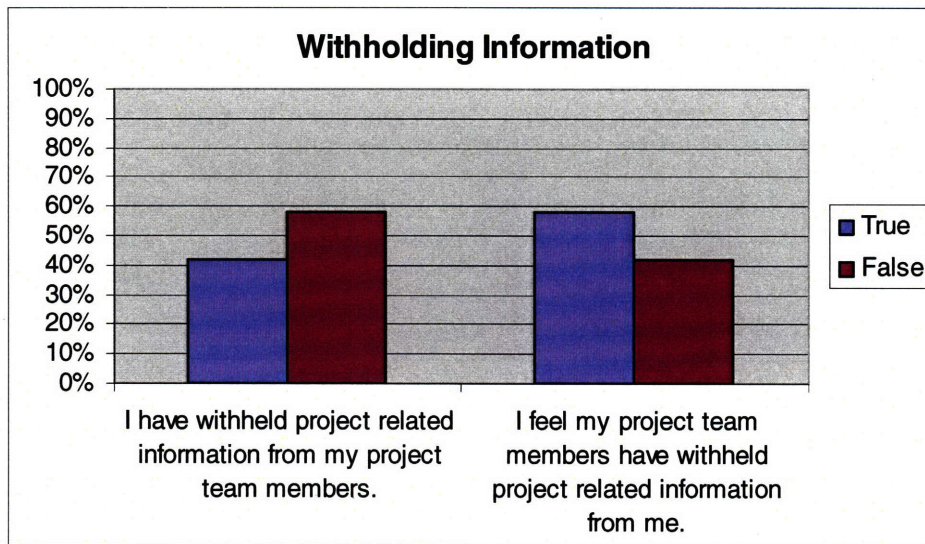


Figure 27: Project Managers Withholding Information

The data suggests that the behavior is a self-perpetuating cycle based on perception; the Project Managers know they are withholding information from their project teams and therefore perceive that the project team members must be withholding information from them. In addition, Project Managers in hierarchical companies often operate on a “need to know” basis thus withholding information from those below them. This theory however does not seem true in the upward direction of information flow, from project team member to Project Manager.

In addition to perception of how much information is being withheld, the Project Managers’ perception of what information the project team members question is also very different than the responses of the project team members. As the graphs below depict, a percentage of Project Managers believe that team members never question tasks they assign or information they present. This can be explained by the percentage of Project Managers who are directly approached by the team members about the task or information; if Project Managers are not approached or questioned, they have no reason to assume that the team members have any problems with the tasks or information being communicated. However, the data also shows that like the team members, although the Project Managers may internally question information they receive they will not always directly approach the person involved to clarify or rectify the situation.

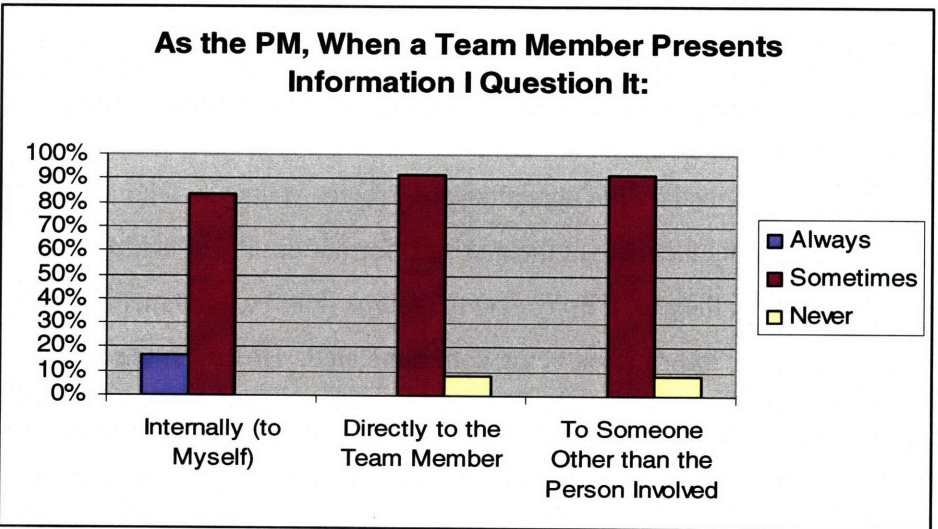
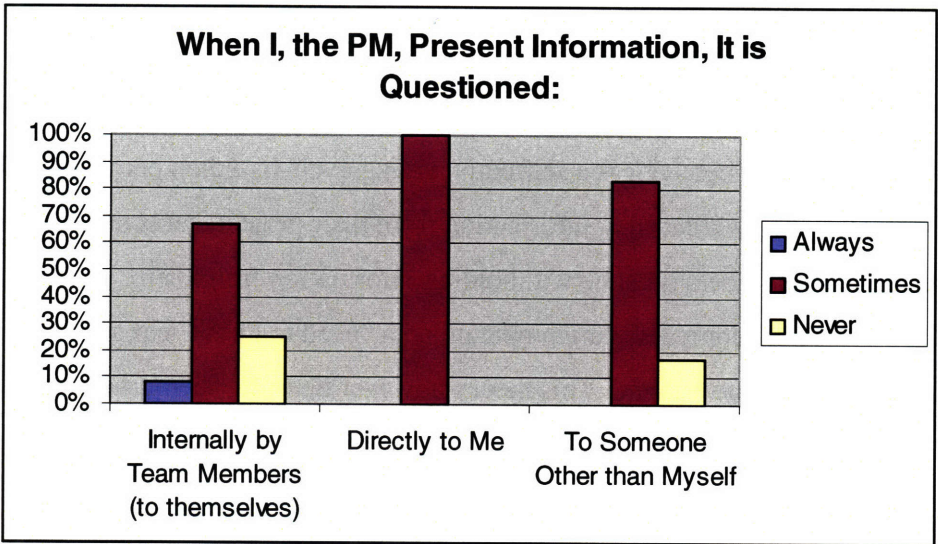
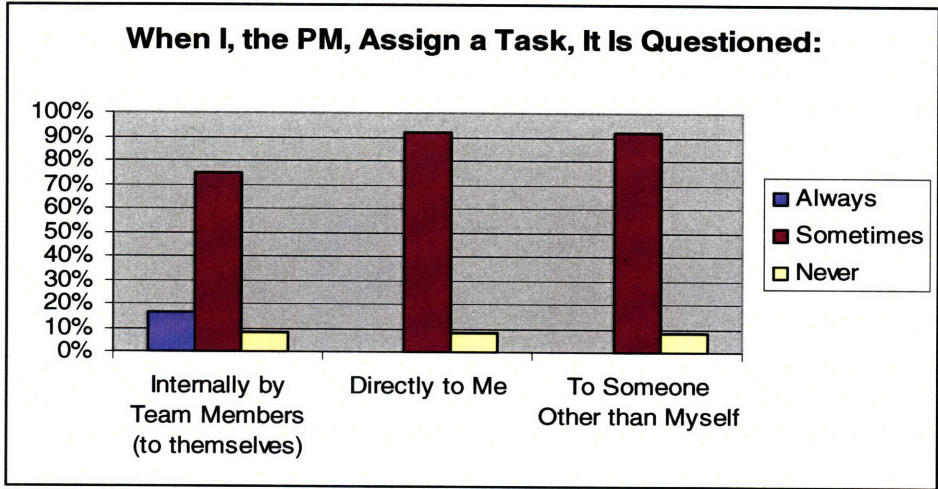


Figure 28: Project Managers Questioning Information

As with the team members' analysis, a correlation could not be drawn between the quality of communication and visibility of the team members. The majority of the Project Managers expressed positive feelings towards their visibility of the project team members, but the actual amount of visibility varied widely.

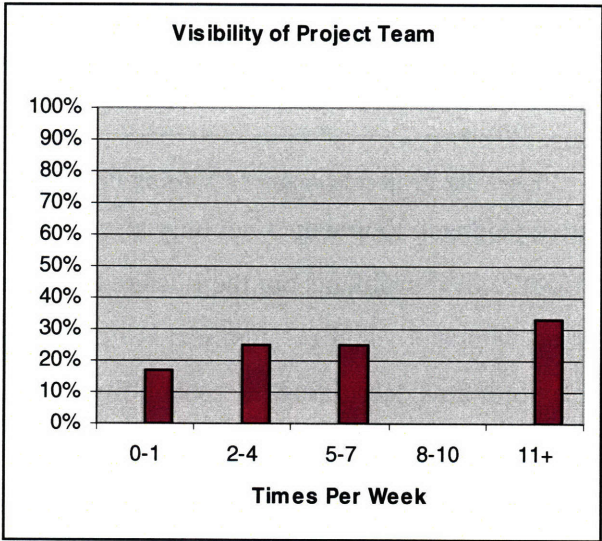
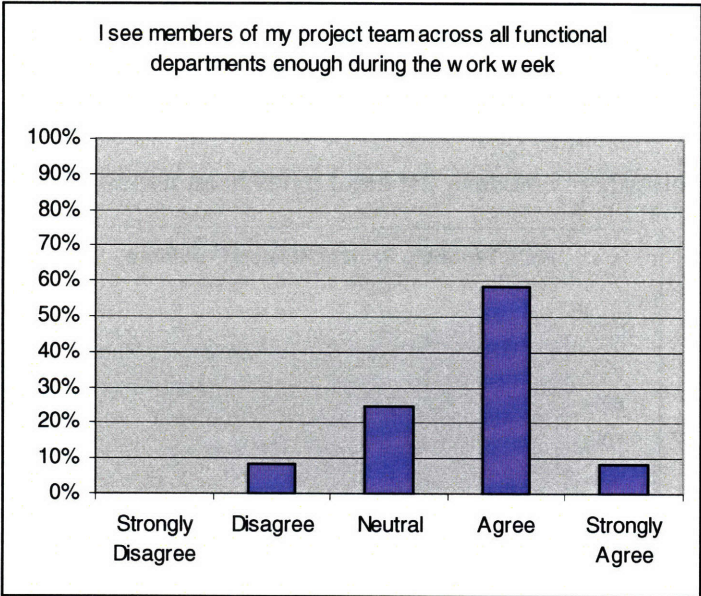


Figure 29: Project Managers Visibility

4.1.1.2.4. Incentive Structure Influences

Analysis of both the team member and Project Manager survey data has exposed a bi-directional lack of direct communication between Project Managers and team members. Unlike the team

member data, the Project Manager data does suggest that this lack of direct communication to openly confront or question project related information is the result of the learned behaviors imposed by the organizations' reward systems. The team members are more often rewarded for exposing project related problems while Project Managers are more frequently reprimanded. 25% of the Project Managers have been reprimanded for exposing project related problems whereas only 17% have been rewarded. This is in sharp contrast to the project team members' responses of 7% and 46% respectively. While the difference between the Project Managers reprimanded versus rewarded is modest, the trend tends in an undesirable direction.

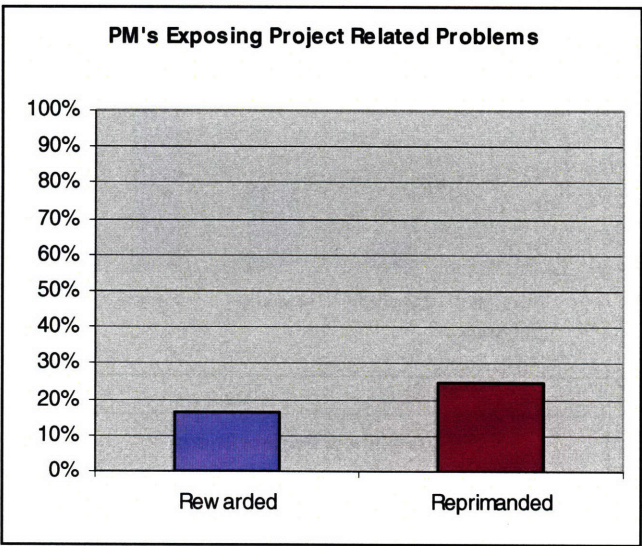


Figure 30: Project Managers Exposing Problems

This data suggests a negative feedback loop which not only affects the Project Managers likelihood of exposing project related problems but their desire to communicate with their team members as well. If a Project Manager vocalizes a project issue and is reprimanded, the Project Manager loses trust in the system thus decreasing the probability of vocalizing issues in the future. Furthermore, if the Project Manager is aware of the negative consequences of exposing a problem, the Project Manager will be discouraged from questioning team members as increased involvement may lead to problem discovery and recognition which if reported will bring castigation to the Project Manager.

4.1.2. Survey Part 2: Trust Network Mapping

The trust network survey was distributed to the various project team members and managers not to develop a trust network map of the individuals but rather understand the willingness or hesitations of individuals in completing such a survey. The information collected could not be used to create a trust network map that would be correlated to the responses in Survey Part 1 as the individuals participating in this part of the study are not members of the same company let alone the same project team. However, valuable information was gained through simulating the administration of Part 2, the trust network map survey.

Of the 28 team members who completed the survey only three individuals (~11%) were uncomfortable answering the questions regarding individuals who they trust, seek advice from, and communicate with daily. One individual expressed a concern with the anonymity since the trust network mapping process requires that individuals provide their name as well as names of those in their team. It was expected that the lack of anonymity for this section would be a major hindrance in retrieving information however it was only a concern for one individual. The other two individuals expressed that they did not spend enough time with the people in question and therefore did not feel their contributions should be included in the study. The remaining 25 individuals completed the survey without concern.

Of the 12 Project Managers who completed the survey, four individuals (~33%) were uncomfortable answering the network mapping questions. They expressed an overwhelming skepticism that any survey information ever remains anonymous. Additionally, they expressed a lack of time for filling out surveys and a general lack of interest in gathering trust data. One respondent clearly stated that this portion of the survey did not add any value to a project management survey and therefore would not take the time to complete it. Possibly the most enlightening statement was, "I do not see any need for this series of questions in the context of filling out this survey on Project Management."

In general, the project team members were noticeably willing to participate and provided feedback supporting the use of such a study whereas the Project Managers had a difficult time

recognizing the value. This data exposes an important finding that a disconnect exists between what the team members and the Project Managers value.

4.2. Analysis of Project Team

“Negative results are positive results in science.” – Dr. Steve Thompson (1972)

Unlike with individual participation, it was much more difficult to gain the support of organizations to participate in the study. This difficulty was not anticipated in the design of the research study but has nonetheless provided valuable information which has expose and validated the need for research studies such as this one.

4.2.1. The Biotechnology Industry

The research study and concluding recommendations focus on the biotechnology industry and that which management within this industry can do to implement a positive change in their organizational context. The biotechnology industry was chosen as it is unique and unlike other commercial industries in many ways.

The biotechnology industry operates in a double uncertainty environment unlike other industries operating under single uncertainties. For example, in the automotive industry, a car manufacturer knows it is feasible to make a new car but whether the consumer will purchase the new car is unknown. In the computer industry, companies know consumers want a faster processor but the engineers don't know if they can make one. In the biotechnology industry companies neither know if they can make what people want nor if people will want what they can make; both feasibility and efficacy are unknown. Additionally, the industry highly regulated by agencies such as the Federal Drug Administration (FDA), Centers for Medicare and Medicaid Services (CMS), and Securities and Exchange Commission (SEC). The regulations exist in order to ensure the safety of the products being developed given that the final solution, a new pharmaceutical, medical device or implant, will ultimately be used on or in a human being.

“As defined by the Federal Food, Drug, and Cosmetic Act, 21 United States Code a medical device is an instrument, apparatus, implement, machine, contrivance, implant, in

vitro reagent, or other similar or related article, including a component part, or accessory which is recognized in the official National Formulary, or the United States Pharmacopoeia, or any supplement to them, intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease, in man or other animals, or intended to affect the structure or any function of the body of man or other animals, and which does not achieve any of its primary intended purposes through chemical action within or on the body of man or other animals and which is not dependent upon being metabolized for the achievement of any of its primary intended purposes". (FDA.org, 2008)

Finally, a shared belief within this industry exists as engineers of several local biotech companies expressed in informal interviews for this research study a strong sense of responsibility for employees to expose any problems during the product development cycle given the knowledge that covering up any issue could result in illness or death of the final recipient of the product. Given the strict requirements of the regulatory agencies coupled with this sense of responsibility, employees of biotechnology companies should have a greater incentive to be honest than those in other high tech industries. These unique characteristics of the biotechnology industry make the industry an interesting focus for this research study.

4.2.2. Securing Participation

Initially, individuals of managerial and director status, in six large biotechnology organizations were approached as candidates for the study. Of the six individuals contacted, two responded with possible interest in participating in the study, requesting more information. Upon receipt of the information, only one responded, who, after further conversations, deserted the study.

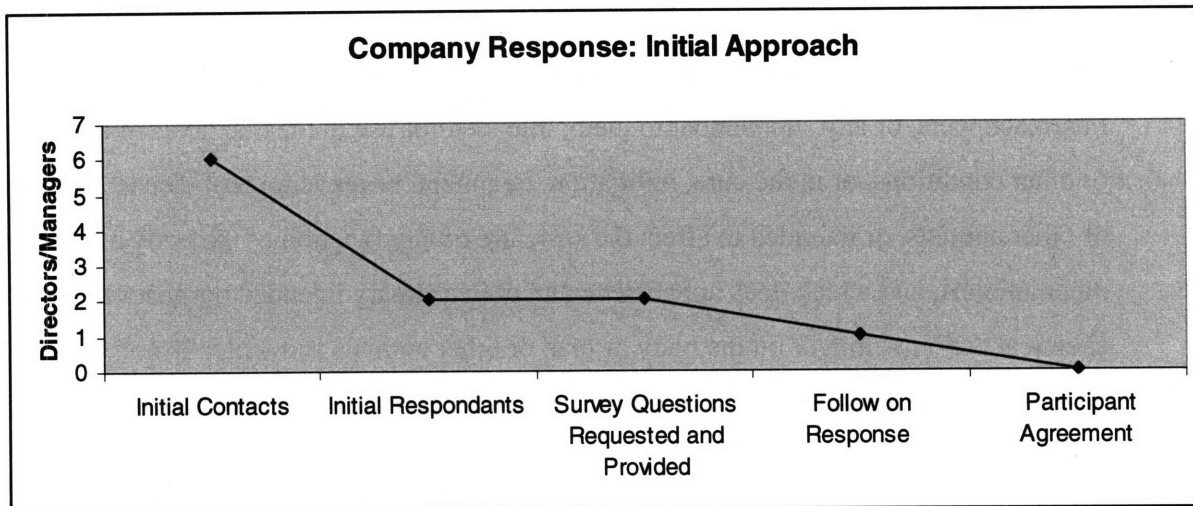


Figure 31: Initial Approach for Company Involvement

The one respondent, a Marketing Director was instrumental in securing Executive approval to proceed. Additionally, the Director’s enthusiasm allowed for the extremely fast implementation of the required paperwork, specifically a Non-Disclosure Agreement (NDA) to ensure anonymity and confidentiality. Once the NDA was in place, two project teams were selected by an Engineering Director as candidates for the study. These project teams were chosen by the Engineering Director based on their availability and the “low stress level” of the project. Additionally, the project teams were of appropriate size for such a study with approximately 40 employees each. While the Engineering Director was satisfied with the summary of the research to be performed, the Project Managers of the selected programs were wary of the benefit and value this research study would provide to the company. Although the detailed information they requested showed that the entire purpose of this study is to enable managers and increase effective communication among their teams, the managers still expressed concern over data being collected as it may be exposing issues team members have with the organizational culture and specifically their Project Manager. This is not surprising however and human behavior would explain their hesitations; people tend to shy away from aiding in exposing information that might not support them favorably. The survey might suggest a need for an organizational change, which is a daunting and intimidating task. It is easier to ignore a problem than try to address it. The Project Managers recognized that this research study could potentially expose issues and once exposed, they are harder to ignore. Ultimately, the Project Managers rejected involvement in the study, citing that their teams were too busy to complete the 20 minute online survey. The involvement by this company is illustrated in the plot below. It is important to

notice the amount of time taken by the Project Managers to determine whether or not they were going to participate. During this time they were evaluating the survey questions and purpose.

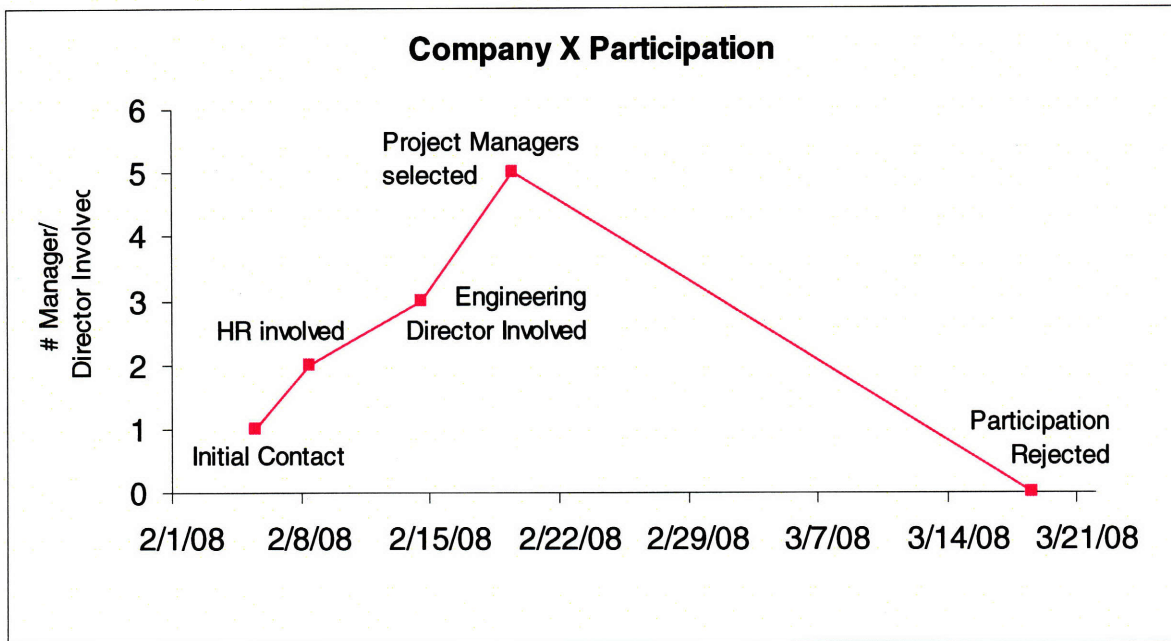


Figure 32: Timeline of Participation Consideration

This experience suggests that the Project Manager was unwilling to participate because the program was specifically chosen by the Director. Regardless of anonymity, the director would be able to easily associate the responses to the particular project and its Project Manager. It therefore may have been more successful to approach the Project Manager without involving the Director or higher level management. This lesson learned was incorporated into the second attempt to secure the participation of a project team within a large biotechnology organization.

The second approach yielded similar results.

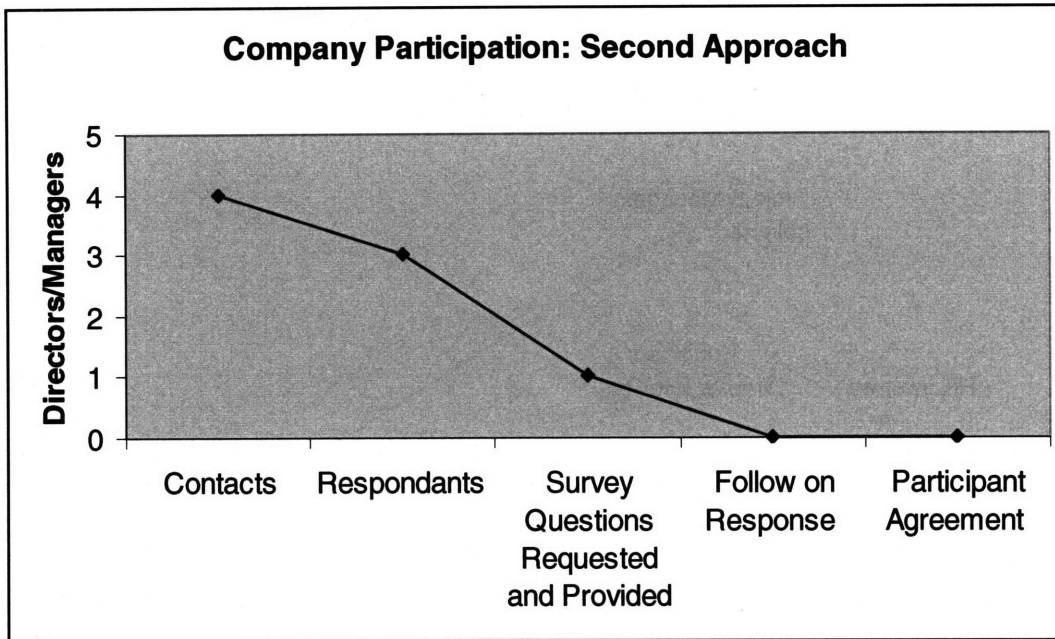


Figure 33: Second Approach for Company Involvement

Four additional Project Managers were contacted from three large biotechnology organizations and three responded with interest. However, after replying to the interested individuals, only one responded for more information. This was counterintuitive as the strategy of the second approach was to gain the trust and comfort of the Project Managers by purposefully not involving their bosses. Further, although one Project Manager expressed interest and shared empathy for the importance of such a study, unlike the previous Project Manager who communicated their rejection, this Project Manager ceased communication after the survey questions were sent, and did not follow up to accept or reject the invitation to participate. This suggests that the Project Manager did not have the same incentive to respond since the Project Director or Executive was not aware of the communications; the Project Manager may not have felt obligated to continue the dialogue since no one else in the organization knew the conversation was occurring.

Ultimately, 16 individuals within seven different large biotechnology organizations were contacted with regards to allowing one project team to participate in a 20 minute online survey for the purpose of this thesis research. Three responded with interest and were provided more information. At that time two remained engaged and were provided the survey questions. Upon

receipt of the survey questions, one manager rejected involvement and the other ceased communication. As a result, the analysis, as originally defined for this study, of the Project Team is inconclusive. However, the information collected through this exercise to secure a project team was extremely useful in creating the conclusive recommendations for effectively restructuring large high tech organizations as well as continuing this research.

5. Chapter 5: Conclusions and Future Work

5.1. Recommendations

“Willingness to change is a strength, even if it means plunging part of the company into total confusion for a while.” – Jack Welch (2004)

While the project team case study was not completed as expected, valuable information was obtained through the participation of team members and Project Managers as well as the lack of participation of a project team within a large biotechnology organization. This information has been used to create recommendations for large high tech organizations to increase trust by addressing and affecting the factors which ultimately shape the organizational context to improve the effectiveness of communication. It is important to understand that the purpose of this study and the proposed recommendations is to provide management ways to increase not the quantity of, but rather the quality of communication. Many attest to the fact that individuals of large high tech companies are inundated with emails, newsletters, briefings, and memos; individuals do not need or want *more* communication. The goal of this project is to provide ways that enable managers to increase the truthfulness and therefore effectiveness of the already occurring communication.

5.1.1. Recognize the Reality

“Face reality as it is, not as it was or as you wish it to be.” –Jack Welch

As the data has shown, there is a discrepancy between the information team members say they are willing to provide versus that which is actually given. Additionally, there is a discrepancy

between what information the Project Managers perceive is being communicated and what is actually said. While the Project Managers would prefer to assume the lack of communication is due to a lack of problems, the data has shown that this clearly not the case. It is the case that project team members are withholding problems and issues they have on their projects. Further, those Project Managers who believe the team members have more to say are not approaching or encouraging them to speak up. This research study has exposed communication problems that exist within project teams and the implications these problems can have on the success of the project.

It would highly benefit management to acknowledge these issues and value the efforts of those who strive to improve them. This in itself proved to be an underlying problem. As the data gathered from Project Managers and project teams revealed, the management teams often find little value in participating in such studies. Statements from senior management of large high tech organizations contacted to participate include: “Some questions are about situations that would never happen or that I don't really care about” and “It’s rare that I would take the time to complete a survey”. And possibly the most thought provoking response: “It’s too personal”.

As this research study has shown, situational forces *are* affecting project teams. It should be the desire of management to do something about it. The following are recommendations to management teams of large high tech organizations, most specifically of the biotechnology industry, to reduce the negative impacts these unquestionably existing situational forces are having on the project teams’ and organizations’ successes.

5.1.2. Gain Credibility

“People, who put their cards on the table and tell you what they know and what they want, usually earn a reputation as someone who is trusted in the organization.” – Joan Lloyd

Before managers can build trust among their teams, they must gain credibility and a positive reputation with their team members. Joan Lloyd, an organizational development consultant, describes several ways managers can establish integrity and trustworthiness as individuals including,

“Share information candidly and completely, stand up for what you believe in, be responsive and follow through on commitments, admit mistakes and have a plan to fix them, [and] preserve confidentiality.”

As Louis Gerstner (2003) has said, successful leadership requires “candid, straightforward communication”. It is important to maintain a high level of openness and honesty even during difficult times in a project or organization. Joan Lloyd gave the example of a manager who was questioned by employees about their jobs during a merger. In order to maintain his reputation and trust among the team, the manager, rather than ignoring the difficult question or providing the politically correct answer hoping to manipulate employees into staying, was open and honest with the employees, laid out all of the possible scenarios and ensured that they would be informed when more information was available. The majority of the employees respected their manager’s honesty and decided to wait for the information before making any career changing decisions.

5.1.3. Grow the Company, Keep the Teams Small

“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever does” – Margaret Mead

W.L. Gore and Associates has been successful in creating and maintaining a nonhierarchical organizational structure that emphasizes teamwork and collaboration. At W.L Gore large bureaucracy does not exist, associates are accountable to their peers not their bosses, all work is done in small teams and compensation is based on contribution to the team rather than the bottom line. This has resulted in a long standing culture with a “belief in the individual and power of small teams” focusing on the “long term view”. Even as W.L. Gore continues to grow, the company upholds the standard of limiting plant size to approximately 150 employees, the maximum number of people who could know each other well enough to “converse in the hallway”. This practice established and continues to reinforce the core values of the Gore culture: direct one to one communication and personal relationships built on “trust, honesty, and respect”. (Cotter, 2003; Kiger, 2006; Gladwell, 2000)

It would be beneficial for more companies to follow the lead of W.L. Gore as this research data showed the lack of visibility many individuals have of other team members, the Project Manager, as well as project related information.

5.1.4. Discourage Groupthink, Encourage Constructive Criticism

“When you’re screwing up and no one says anything to you anymore, that’s when they gave up.”
- Randy Pausch (2007)

The results of this study showed that individuals often internally question the information and ideas of others on their teams but do not contest them. As explained, this suggests a drift towards Groupthink, an undesirable effect of team cohesiveness. It is recommended that managers discourage such behavior and encourage vocalization of all concerns in constructive ways that will benefit the entire team. Challenging ideas does not have to be done in a confrontational manner and does not have to have a negative connotation but rather should be seen as an opportunity for all team members to strengthen their ideas by analyzing them to their fullest extent. Management can promote this behavior by challenging ideas, including their own, in project team meetings and creating a reward system based on individuals’ participation in such activities. This will ultimately lead to increased project performance and outcomes as erroneous information will not be allowed to perpetuate if it is thoroughly challenged within the team.

Equally important as rewarding those individuals who challenge information is not penalizing those who have provided the information or idea in the first place. As individuals have positive experiences with sharing and challenging information, trust will increase as it is a positive feedback loop and individuals will therefore feel more comfortable to voice their opinions and challenge ideas. However it is important to recognize that Groupthink can also occur when too much trust is present among a team; as trust increases and individuals feel more comfortable expressing new ideas, the high trust placed in others drives team members to take the information at face value. Worldcom and Enron are perfect examples of this phenomenon. Therefore managers must strive to create a team culture in which individuals not only feel comfortable bringing information and ideas forward, but questioning them as well, thus inhibiting Groupthink.

5.1.5. Decentralize Decision Making

“Top management is a function and a responsibility rather than a rank and a privilege.” – Peter Drucker (1999)

Louis Gerstner was hired as CEO of IBM during a time when the company was essentially ‘dying’ and in need of radical change for survival. Prior to his arrival, executives at IBM decided that in order for the company to survive, it must separate into units, or decentralize. Gerstner believed this would be a detrimental mistake and instead implemented strengthened centralization with selective decentralization. He stressed the importance of IBM as a “comprehensive solutions company”; clients looked to IBM for complete computer solutions of integrated hardware, processors, storage, software, and maintenance in one system at one price. However Gerstner also emphasized that centralization cannot just be a patching together of existing processes but rather requires an overhaul of the entire system. Gerstner’s efforts included centralizing the company strategy and common customer focus while decentralizing decision making where ever possible. (Gerstner, 2003)

Similarly, Chandrika Samarth (2008) of the Center for IT Leadership, Partners Healthcare System conducted a research study of a large hospital system in which he demonstrated how decentralizing decision making positively affects the logistics of the system. In his study, the social network maps of the hospital recovery room system illustrated the bottlenecks that existed in the hospital due to particularly overloaded nursing staff. The recommendations that resulted from the study included shortening the knowledge flow path, increase knowledge sharing and transparency and identify the key players in the organization. Following these recommendations would alter the hierarchical structure to a looser, flattened, more collaborative structure which gave individuals at all levels of the organization more authority ultimately reducing the over allocation and overloading of staff and resultant bottlenecks, thus decentralizing decision making while maintaining overall centralization. (Samarth, 2008)

Decentralizing decision making will increase trust as it inherently requires a high level of trust to be successful and effective; it is a positive feedback loop. First, it requires that the management trust the employees to make good decisions. eBay was created around this principle: “We

believe people are basically good. We believe everyone has something to contribute. We believe that an honest and open environment can bring out the best in people.” Second, it requires that the employees making the decisions trust that they will be fairly compensated when their good decisions positively affect the team. In hierarchical companies the management often does not see a problem until after it has become “pervasive and therefore expensive to fix”. Consequently, it makes sense to give the project team members the decision making power as they are involved in the lower level daily activities and have the “business intelligence” to address a problem at its inception. Granting these individuals more authority will not only build trust but also reduce costs and increase productivity. As employees begin to see the results of their decisions in their compensation, they will become more motivated to continue solving more problems, their performance will continue to improve and the trust levels between the management and the project team will continue to evolve. (Hamel, 2007)

5.1.6. Increase Transparency

“Don’t hide information – I hate surprises. Don’t try to blow things by me” – Louis Gerstner (2003)

As trust is built through decentralized decision making and employees are compensated for their efforts, it is important to continue the progress of developing the trust by increasing visibility of project related information to the team employees. The concept of information delivered on a ‘need to know’ basis creates a culture of secrets and high trust cannot exist in an organization with a lot of secrets.

In The Future of Management, Gary Hamel explains that having “open books” with transparent financial and operating data such as project profits, product sales, and future projections is the “only way to build a company that is bound by trust”. He also not only describes, but supports Whole Foods’ “No-Secrets management philosophy” in which employees have access to the compensation and financial data of their entire team. Such a philosophy would be beneficial to high technology companies as granting their employees access to the compensation data of all others on the team not only eliminates skepticism by team members and favoritism by managers,

but also motivates employees to seek out the higher paying jobs and learn the new skills required for the positions. (Hamel, 2007)

5.1.7. Create a Hybrid Organization

“Reengineering is like starting a fire on your head and putting it out with a hammer” –Louis Gerstner (2003)

Organizations oscillate between decentralized and centralized structures. Ultimately, the decision to centralize or decentralize a large organization comes down to balance; one must know when to integrate and when to separate. This decision should be driven by the needs of the client (Gerstner, 2008). As Brafman (2006) explains, a hybrid organization is a combination of the best of both worlds: decentralized and centralized. While organizations across many different industries can benefit from the following recommendation, they have been tailored to large biotechnology organizations to achieve a structure that best suits the unique needs of the industry.

Decentralize to induce accountability. General Electric had always been a centralized company, with a hierarchical structure, until Jack Welch, the company CEO, took the opportunity to decentralize units within the company. Welch separated GE into autonomous units each with its own profit and loss reporting. The rules were simple and the same for each unit: “be number one or two in a market or get out, and generate high returns on investments.” This separation gave the executives within each unit the flexibility to operate as they deemed appropriate but also made them accountable for their success. Skip Irving of Health Advances, a biotechnology strategic consulting firm, once remarked, “[One] must demand a return or they are not going to take you seriously.” Ultimately, if a unit was not profitable, it was sold which significantly decreased the inefficiencies within GE and allowed the company to increase its market value from \$12 billion to \$375 billion in 25 years. GM is a similar example of decentralization of business units. While a hierarchy and central corporate ‘command center’ exists within GM, and the executives often ‘suggest’ or ‘coax’ the managers of each division or unit, the managers are empowered with decision making authority. Distributing this decision making power allowed those close to the issue, which is often very specific to a particular unit or

division, to address the problem while executives focused on larger issues that affected the entire corporation.

Decentralize to keep department and project sizes to a minimum. It is important to understand that the organizational structure should be based on the client needs. Unlike IBM, biotechnology organizations are generally not providing total system solutions but rather many diverse solutions to unique medical problems. Therefore, the organization would benefit from decentralized project groups similar to that of General Electric. These small groups have the benefit of the direct communication between team members which increasing the strength and quality of the relationships among the teams. As the team size decreases, so will the length of between-ness between members (Gloor, 2008). Improving these relationships will ultimately decrease the degree between members thus increasing the trust between members and positively affecting the truthfulness of the information communicated within the team. Additionally, decentralized systems are “incubators” for creativity, new ideas, and innovations which are essential aspects of a biotechnology organization who wants to maintain a strong position in the marketplace. As technologies continue to advance and discoveries continue to be made, biotechnology companies must be at the top of their game in coming up with ‘the next best thing’. (Starfish and the Spider)

Decentralize to increase modularity. Large companies often suffer from the spider syndrome in that every department and unit becomes absolutely essential to the success and survival of the organization. This can be disastrous for large companies as it is hard to manage each unit to know exactly what they are doing, how they are doing at any given time. Therefore, a biotechnology organization should focus on decentralizing the organization by project or subject based business units. This is beneficial as the biotechnology industry is extremely risky and the organizations are never sure which product is going to be successful. Therefore, if one pharmaceutical, for example, does not pan out, the organization can easily dissolve this unit without disrupting the others.

However, “the more important security and accountability become in the given industry, the more likely it will tend toward centralization” (Brafman & Beckstrom, 2006). This is especially

true of the biotechnology industry where much of the services are unfamiliar and daunting to its end users.

Decentralize to improve the customer experience. eBay was founded on the bottom-up approach with a decentralized customer experience, but the structure, control and profit potential follows the centralized structure. The decentralized customer experience is essential to eBay's success as the user reviews of sellers dictates future sales. Amazon, like all centralized organizations has "a CEO, a headquarters and warehouses", but it also incorporates the strengths of a decentralized network of reviewers to boost sales. Unlike eBay the reviews are not essential to Amazon's business model, but they do provide additional resources that help Amazon sell their products. In such instances of eBay and Amazon, the companies gave their customers a role thus decentralizing a portion of their business. Many biotechnology companies have attempted this type of decentralization by increasing interactions with hospitals and doctors to create a "culture of collaboration". This is in response to the increasing competition in the biotechnology industry. Companies recognize that doctors have options when it comes to which implant, device or pharmaceutical they will give to their patients. Therefore it is becoming increasingly important for companies to respond to this competition by better incorporating the users in the product development process. The goal is not to ignore the competition or discount the users' freedom of choice, but rather embrace the customer and decentralize the product development process to include them more.

Centralize the 'control center'. Biotechnology organizations operate under strict guidelines from many regulatory agencies. In order to maintain order of such a large organization, a hierarchy of sorts is necessary. The organization must have a CEO, but as previously explained the CEO should be there to maintain order but not dictate all control.

Centralize manufacturing facilities. Centralization provides the comforts of order, standardization, and focused economy of scale, all desirable characteristics of a biotechnology company's manufacturing system. As mentioned previously, all biotechnology products as defined by the FDA must adhere to the FDA's Good Manufacturing Practices in accordance with the Quality System Regulations. The medical device classification, which is determined

according to the level of control required to ensure safety and efficacy of the device dictates the procedures and specifications that must be considered by the company. Such controls can require companies to take compliance actions ranging from simple package labeling to more complex performance standards of calibration and validation. The rigor involved in the GMP approval and adherence processes drives biotechnology companies to minimize duplication in their manufacturing facilities as each new facility is a significant monetary cost to the company. Centralized manufacturing processes and facilities also minimize the effort required for the training and documentation for such activities. Additionally, automation of any manufacturing procedure requires an audit and approval of the software and system to be used therefore minimizing the number of machines requiring this audit and approval process will also minimize manufacturing costs. Centralizing the biotechnology manufacturing facilities will save the company both time and money.

Centralize benefits and the incentive system. In a large organization it is very important that employees feel they are being treated fairly. In order to maintain consistency, employees of each division or unit should be offered the same benefits. It is also important that the incentive system is consistent throughout the organization in that all individuals have the equal ability to realize their potentials and be fairly compensated for their efforts. The most effective incentive system is on which is centralized with decentralized components. This allows individuals to obtain compensation for achieving individual goals while maintaining the importance of participating in reaching the group goals. Ultimately the organization will have to pay employees more as they achieve the goals and earn the bonuses but this really means that the company will be increasing profits as more goals are being achieved.

The resultant hybrid organization will resemble the structure shown below:

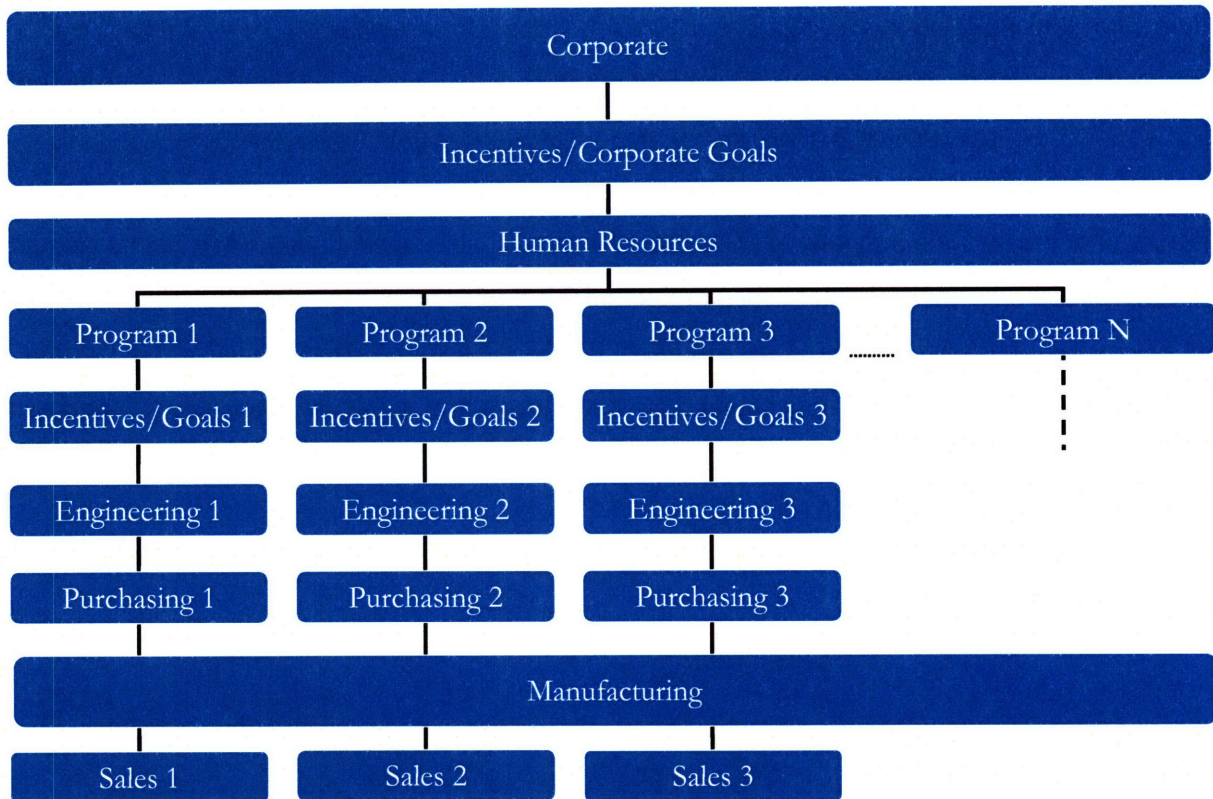


Figure 34: Hybrid Organization

5.2. Future Work

5.2.1. Single Organization Case Study

A study of the relationship between trust and effective communication in a project team within a single large biotechnology organization can be completed by utilizing the following model which was created based on the findings of this research study.

5.2.1.1. Surveys

The two surveys are to be administered to one project team of a single large biotechnology organization. As previously described, the Project Team Member Survey, Parts 1 and 2 are to be administered to the project team members across all functions but only within the single organization. Outside vendors, suppliers and customers are not to be included in the survey. The Project Manager Survey, Parts 1 and 2 is to be administered to the Project Manager of the selected team. In contrast to individual responses, the resultant project team trust network map,

built from the compilation of Part 2 responses of the selected project team, is to be examined to determine a correlation between the density of the trust network map and the Part 1 information of the effectiveness, accuracy, and truthfulness of communication among a team.

After collecting the responses from the entire project team, the trust network map can be created using the method previously prescribed in Section 2.4 Social Networks. Triangulating the results of the surveys and trust network map will allow for the analysis of specific relationships within the team in an effort to better understand how trust plays a role in the decision making of project team individuals to ultimately increase the effectiveness of project team communication.

5.2.1.2. Analysis of Specific Relationships with Trust as the Modifier

5.2.1.2.1. Process Tracing

Team dynamics is heavily influenced by both the individuals in the organization as well as the culture of the company. As seen in the findings of the team member and Project Manager studies, team dynamics does affect the quality of the communication within a project team.

Using the process tracing method for case study analysis, the team dynamics causal chain has been identified as:

Team dynamics → Team trust level → Truthfulness of information → Effectiveness of communication

Where the intermediate relationships identified are:

- The team dynamics yield the identified team trust level
- The identified team trust level yields an identified degree of truthfulness of information
- The degree of truthfulness of information yields the level of effective communication among the team

And the final causal relationship identified is:

- The team dynamics yield the level of effective communication among the team

Visibility refers to both the amount of physical interactions between project team members with each other and their Project Manager as well the accessibility to project related information.

Using the process tracing method, the information accessibility causal chain is identified as:

Level of information accessibility → Team trust level → Truthfulness of information →
Effectiveness of communication

Where the intermediate relationships identified are:

- The level of information accessibility yields the identified team trust level
- The identified team trust level yields an identified degree of truthfulness of information
- The degree of truthfulness of information yields the level of effective communication among the team

And the final causal relationship identified is:

- The level of information accessibility yields the level of effective communication among the team

Using the process tracing method, the interaction causal chain is identified as:

Degree of interaction with team members → Team trust level → Truthfulness of information
→ Effectiveness of communication

Where the intermediate relationships identified are:

- The degree of interaction with team members yields the identified team trust level
- The identified team trust level yields an identified degree of truthfulness of information
- The degree of truthfulness of information yields the level of effective communication among the team

And the final causal relationship identified is:

- The degree of interaction with team members yields the level of effective communication among the team

5.2.1.2.2. Congruence Procedure

Congruence procedure as defined for a case study analysis allows for the comparison of individuals with the single project team. Using the results from the team member and Project Manager studies, the valuable comparisons within the single project team have been identified as:

- Perceived existing team dynamics + Low trust → A little/lot truthful information
- Perceived existing team dynamics + High trust → A lot/little truthful information
- Perceived visibility + Low trust → A lot/little truthful information
- Perceived visibility + High trust → A lot/little truthful information

5.2.2. Alternate Research Methods

While a case study is a valid form of analysis in order to validate hypothesized theories, shortcomings leave some skeptical of the strength of the case study method. Some will argue that when a case study is completed using a single source, while studying one case may provide backing for a theory, it will not provide the necessary information to identify the theory's "antecedent conditions". These antecedent conditions, or background conditions necessary for the theory to exist, may be unique to the one case that was studied. Further is these antecedent conditions introduce extraneous third variables that even if they can be identified, they cannot necessarily be controlled. These variables which may have an impact can not be controlled in order to understand exactly what effect they may be having on the outcome. It is not possible to verify this as the data collected in such a study is not randomized and there are not many data points. Along the same lines, case studies are also criticized because the theories generated can then not be generalized to other cases. However, while shortcomings exist, the case study method provides a very strong and valid way of testing a hypothesized theory. (Van Evera, 1997)

The shortcomings of a case study can be rectified through the other research methods. First, although the data collected for this research study provided insight into a project team at one point in time of the life cycle of the project, it would be beneficial for future research to be conducted over the life of the program rather than a snapshot in time to understand how the relationships discussed in this thesis may vary over time. This would provide valuable insight into the existence of phenomenon such as groupthink and escalation of commitment that may

affect an individual's decision making abilities. A study over a period of time would also provide a better understanding of the effect individuals' interaction levels has on team communication to test the newly derived hypothesis that increasing the number of times team members see each other throughout the week will improve relations, therefore increasing trust, and increasing effective communication. Surveying a single project team, as done in this research study, will identify the current level of personnel interaction and the current level and quality of communication and information flow within the team. Through simple reorganization of office space or building travel routes to increase the interactions between team members, one can evaluate the change, if any, in the level of information being not only transmitted but challenged and questioned. Additionally, while case study analysis is valuable for understanding how and why a theory exists, it is important to understand whether the theory is scaleable. Expanding the study to a very large number of cases, 'large N study' would allow for testing of the theory to see if it holds on a large scale or if it is unique to the particular cases that were selectively chosen. This expansion allows for the use of the case study method of controlled comparison between two or more project teams to further define the theory in question. For the purpose of this study, the controlled comparison relationships to be discovered per team and then compared across teams include:

Team dynamics + Team trust level → Identifiable degree of accurate information

Team perception of others + Team trust level → Identifiable degree of accurate information

Team visibility + Team trust level → Identifiable degree of accurate information

Additionally, expanding to multiple case studies to apply controlled comparison is helpful in identifying the antecedent conditions. Finally, if possible, experimental testing would provide the strongest results in testing a theory however is often difficult when testing social science behaviors. However, if possible, an experimental approach is an alternate method for testing hypotheses.

6. Appendix

6.1. Survey Part 1

6.1.1. Project Team Member Case

Personal Information

1. To whom do you directly report on the project team?
2. What best describes your level on the project (i.e. mechanical engineer II)?
 - a. Entry (I)
 - b. Mid (II-III)
 - c. Senior (III-IV)
 - d. Executive (IV+)
3. What best describes your job function?*
4. How long have you worked for the company?*
5. How long have you been on this project team?

Strongly Disagree, Somewhat Disagree, Neutral, Somewhat Agree, Strongly Agree

1. I am comfortable exposing a project related problem to my Project Manager
2. I see my Project Manager enough during the work week
3. I see members of my project team who are in other functional departments enough during the work week
4. I am held accountable for my work
5. I feel secure about my job at this company
6. Employees are constantly watched to assure that rules and procedures are followed.*
7. I would recommend this company as a career to my friends.*

8. Employees feel secure about their jobs at this company.*
9. My work gives me a feeling of personal accomplishment.*
10. The Company does an excellent job of keeping employees informed about matters affecting us.*
11. I am satisfied with the information I receive from my Project Manager on what is going on in my project
12. I am satisfied with my involvement in decisions that affect my work.*
13. Considering everything, I am satisfied with my job.*

True/False

1. I have withheld project related information from my Project Manager.
2. I feel my Project Manager has withheld project related information from me.
3. Confrontation makes me uncomfortable.
4. I know everyone on my team (by name, occupation, a few personal facts about themselves, etc).
5. I know where each functional department on my team is located.
6. I feel comfortable expressing my opinion in project meetings.
7. I have challenged my Project Manager on project related subjects.
8. I have told another member of the team he/she was wrong.
9. I have told my Project Manager that he/she was wrong.
10. I have been rewarded for exposing a problem on my project.
11. I have been penalized or reprimanded for exposing a problem on my project.
12. I would choose this company again if I had a job choice to make.*

Always/Sometimes/Never

1. When my Project Manager assigns me a task, I question it internally (to myself)
2. When my Project Manager assigns me a task, I question it directly to my Project Manager
3. When my Project Manager assigns me a task, I question it to someone else other than the Project Manager
4. When my Project Manager presents a fact, I question it internally (to myself)
5. When my Project Manager presents a fact, I question it directly to my Project Manager
6. When my Project Manager presents a fact, I question it to someone else other than the Project Manager
7. When a coworker on my project within my functional department presents a fact, I question it internally (to myself)
8. When a coworker on my project within my functional department presents a fact, I question it directly to this coworker
9. When a coworker on my project within my functional department presents a fact, I question it to someone other than this coworker
10. When a coworker on my project in another functional department presents information, I question it internally (to myself)
11. When a coworker on my project in another functional department presents information, I question it directly to this coworker
12. When a coworker on my project in another functional department presents information, I question it to someone other than this coworker

Multiple Choice

1. When I go to find information/answer to a project related question, who/what do I contact first?
 - a. Coworker on the project
 - b. Coworker not on the project
 - c. Internal database/documentation
 - d. Project Manager
 - e. Internet
 - f. I use what I already know
2. When I go to find information/answer to a project related question, who/what do I contact second?
 - a. Coworker on the project
 - b. Coworker not on the project
 - c. Internal database/documentation
 - d. Project Manager
 - e. Internet
 - f. I use what I already know
3. I see (include 'run into') members of the team who are in other functional departments than my own ___ times a week?
 - a. 0-1
 - b. 2-4
 - c. 5-7
 - d. 8-10
 - e. 11+
4. I see (include 'run into') my Project Manager ___ times a week?
 - a. 0-1
 - b. 2-4
 - c. 5-7
 - d. 8-10
 - e. 11+

6.1.2. Project Manager Case

Personal Information

1. How many people report to you on your project team?
 - a. 0-10
 - b. 11-20
 - c. 21-30
 - d. 31-40
 - e. More than 40
2. What best describes your level on the project (i.e. mechanical engineer II)?
 - a. Entry (I)
 - b. Mid (II-III)
 - c. Senior (III-IV)
 - d. Executive (IV+)

3. How long have you worked for the company?*

 - a. Less than 6 months
 - b. 6 months-1 year
 - c. 1-2 years
 - d. 3-5 years
 - e. More than 5 years

4. How long have you been on this project team?

 - a. Less than 6 months
 - b. 6 months-1 year
 - c. 1-2 years
 - d. 3-5 years
 - e. More than 5 years

Strongly Disagree, Somewhat Disagree, Neutral, Somewhat Agree, Strongly Agree

1. I am comfortable exposing a project related problem to my project team
2. I see my project team members enough during the work week
3. I see members of my project team across all functional departments enough during the work week
4. I am held accountable for my work
5. I feel secure about my job at this company
6. Employees are constantly watched to assure that rules and procedures are followed.*
7. I would recommend this company as a career to my friends.*
8. Employees feel secure about their jobs at this company.*
9. My work gives me a feeling of personal accomplishment.*
10. The Company does an excellent job of keeping employees informed about matters affecting us.*
11. I am satisfied with the information I receive from my project team on what is going on in my project
12. I am satisfied with my involvement in decisions that affect my work.*
13. Considering everything, I am satisfied with my job.*

True/False

1. I have withheld project related information from my project team members.
2. I feel my project team members have withheld project related information from me.
3. Confrontation makes me uncomfortable.
4. I know everyone on my team (by name, occupation, a few personal facts about themselves, etc).
5. I know where each functional department on my team is located.
6. I feel comfortable expressing my opinion in project meetings.
7. I have challenged my project team members on project related subjects.
8. I have told a member of the team he/she was wrong.
9. I have been told by team members that I was wrong.
10. I have been rewarded for exposing a problem on my project.
11. I have been penalized or reprimanded for exposing a problem on my project.
12. I would choose this company again if I had a job choice to make.*

Always/Sometimes/Never

1. When I assign a task, I feel the team members question it internally (to themselves)

2. When I assign a task, I am question directly by the team members
3. When I assign a task, I feel or know it is questioned to someone else other than myself
4. When I present a fact, I feel the team members question it internally (to themselves)
5. When I present a fact, I am question directly by the team members
6. When I presents a fact, I feel or know it is questioned to someone else other than myself
7. When a team member presents a fact, I question it internally (to myself)
8. When a team member presents a fact, I question it directly to the team member
9. When a team member presents a fact, I question it to someone else other than the team member

Multiple Choice

1. When I go to find information/answer to a project related question, who/what do I contact first?
 - a. Coworker on the project
 - b. Coworker not on the project
 - c. Internal database/documentation
 - d. Project Executive
 - e. Internet
 - f. I use what I already know
2. When I go to find information/answer to a project related question, who/what do I contact second?
 - a. Coworker on the project
 - b. Coworker not on the project
 - c. Internal database/documentation
 - d. Project Executive
 - e. Internet
 - f. I use what I already know
3. I see (include 'run into') team members of ALL functional department on average ___ times a week?
 - a. 0-1
 - b. 2-4
 - c. 5-7
 - d. 8-10
 - e. 11+
4. I see (include 'run into') my project executive ___ times a week?
 - a. 0-1
 - b. 2-4
 - c. 5-7
 - d. 8-10
 - e. 11+

6.2. Survey Part 2

Answer each question by listing the name(s) of individuals on your project team whom best fit the description. List as many names that apply to each question. You may list the same name more than once. Please only name those individuals within your company on your project. All names will be converted to numbers to maintain anonymity.

1. Who do you approach when you have a question regarding your technical responsibilities on the project?
2. If you had to access your computer while out of the office, who would you contact to log in for you?
3. If you had a computer problem, who would you call?
4. To whom would you tell a secret?
5. If you went out for lunch, who would you invite?
6. Who would you go to for advice about a personal situation?
7. Who would you ask for advice on your personal appearance?
8. Who do you sit closest to for the majority of the day?
9. Who do you speak to the most during the day?
10. Who would you ask to write a personal recommendation which you would not see?
11. Who would you give a spare house/apt key to use in emergencies?
12. Who would you let baby-sit your children?

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