

**AC 2007-2941: THE EFFECTS OF THEORY "X" AND THEORY "Y" ON
NETWORK ENGINEERS**

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The Effects of Theory “X” and Theory “Y” on Network Engineers

Abstract

Network engineering is a dynamic profession that consists of designing, implementing, and maintaining different aspects of network connectivity in a secure manner. As Information Technology (IT) changes and new security threats strike enterprise networks, network engineers strive to provide solutions to defend their networks from such threats. In addition to the demanding job responsibilities and challenges, network engineers are often managed in a fashion that drives them to job dissatisfaction and leads them to pursue other job opportunities. This paper covers some of the challenges that network administrators face and how “Theory X” and “Theory Y” affects their job satisfaction in addition to how an engineering manager can improve performance through job satisfaction.

Introduction

Network engineering is one of the most dynamic and challenging careers in the Information Technology (IT) industry. Network engineering has evolved in the past few years due to the yoke of the IT industry and the globalization of economy. As network engineers seek to provide better designs and implementations of computer networks, they also have to take into consideration certain factors such as the legal, security, accessibility, compatibility, and growth of the enterprise network. In addition to such challenges, management style and leadership can contribute to the job-dissatisfaction of such individuals and drive them to pursue other job opportunities or even changing careers. This paper focuses on how Theory X and Theory Y management styles affect the performance of IT professionals in general and network administrators and engineers in particular; in addition, this paper discusses how an engineering manager can improve the network engineer’s performance through job satisfaction.

According to ¹ network engineering, in telecommunications, is a career where individuals work in different IT related areas such as telephony, computer science, and radio communications. When it comes to telephony, network engineers are responsible for determining, developing, and implementing hardware and software solutions on switched networks. In computer science, network engineers are individuals that are responsible for providing hardware and software engineering to accomplish the design and goals of a computer network. In radio communications, network engineers work on developing network topologies.

According to ^{2,3} the US Department of Labor (bureau of labor statistics), two categories related to network engineering are listed which are the computer hardware engineers and computer software engineers. According to the same sources, a bachelor's degree is required for most entry-level jobs and starting salaries are significantly higher than for those with degrees in other fields; In addition, continuing education is essential for advancement as technology evolves.

According to ^{3,4}, network engineering is one of the most growing fields; network engineers may have to work long hours and weekends to meet deadlines and solve unexpected problems. In addition, network engineers are susceptible to eyestrain, back discomfort, hand and wrist problems such as carpal tunnel syndrome due to the long hours of work in front of a computer and the stress associated with such a job.

Technical Challenges of Network Engineers

Network Engineers, as with other IT professionals, face a great deal of challenges in their daily jobs. Challenges will be introduced in the following sections.

Network Engineering and Similar IT Related Career Challenges

There are a variety of challenges associated with network engineering and related jobs. Some of those challenges include:

Intrinsic challenges: Intrinsic challenges as presented by ⁵ represent items such as being able to keep busy all the time, the chance to work alone on the job, the chance to be somebody in the community, being able to do things that do not go against one's conscience, the chance to do things for other people, the chance to do something that makes use of one's ability, the pay and the amount of work one does, the chance for advancement on the job, the chance to try one's own methods of doing the job, the working conditions, the way workers get along with each other, and the feeling of accomplishment one gets from the job.

Extrinsic challenges: Extrinsic challenges as presented by ⁵ represent items such as the chance to do different things from time to time, the way a job provides for steady employment, the chance to tell people what to do, the way company policies are put into practice, the freedom to use one's own judgment, and the praise one gets for doing a good job.

Supervisory Challenges: Supervisory challenges are presented by ⁵ represent the way my boss handles workers and the competence of the supervisor in making discussions.

Other challenges: Other challenges include different factors that are not controlled by the employer or by the employee. Such challenges include the job market, the economy, and the global economy. According to ⁶, IT professionals are hard to find and not enough of them available for today's job market. In his study, Kamal (2005), indicated "...Specializing in one skill doesn't cut it anymore. But having technical aptitude is only a ticket to play. Companies are also looking for creativity, innovation and the mind-set to apply technology to business goal..."⁶ That focuses on the needs for continuously pursuing new knowledge in the IT field in order to stay current and effective in the job.

The Hardware and Software Challenges of the Network

As technology changes over the years, more advanced hardware and software technology is needed in order to accommodate such changes. For instance, a few years ago, most operating systems and applications required less than 500 MHz processors and less than 128 MB (Mega Bytes) of memory; whereas, most current personal computers have at least 2 GHz of processing speed and even multiple processors; in addition, memory is becoming more essential and even faster where 1 GB of memory is not unusual for most purchased computers. Such new requirements are essential to run the latest software and applications adding more requirements on network administrators to maintain such change.

Not only have computers evolved in the past few years, telecommunication devices and installation have evolved as well forcing companies to consider staying inline with their competitors in order to survive the demanding marketplace and come up with better methods to make decision making. According to⁷, IT managers have a great deal of difficulties adapting to the ever changing technologies in order to stay compatible with the global market. According to⁸ network systems by themselves do not make decisions; however, they provide tools to collect, maintain, and help provide solutions. That put a burden on network engineers and administrators to plan and install networks that are capable of providing such solution is a secure and error free environment.

Such challenges have placed more pressure on network engineers in order to stay compatible with the marketplace from both technical and managerial aspects. The technical challenges are represented by keeping up to date with the hardware, software, and telecommunication needs of the organizations. As a result, network engineers are forced to pursue more technical certifications, continuing education courses and seminars, joining professional organizations, users' groups, and even self-paced training. Such additional activities require a tremendous amount of work and efforts that could lead to job dissatisfaction and job related stress. According to⁹, 62 percent of IT professionals operate in a "crisis" stress mode. According to¹⁰, over 45 percent of IT professionals have intentions to change their jobs due to job related stress and burnout.

The Security Challenges of the Network

As more computers and technologies are being implemented and used in today's global economy, additional security challenges are occurring from the organizational level all the way down to the home user level. As more Internet banking and online shopping is taking place, more cyber crime is occurring. As it is the responsibility of the end user to protect his/her own computer, it is still the reputation of the company that is providing the service is being compromised. Three major areas of security threats that network engineers face include the internal components of the company itself, the end user computer, and the connection in-between. The level of security concerns differ from one organization to another based on the importance of the files that are being protected. For instance, the US federal government established strict measures to protect classified data especially after the 9\11 terrorist attack.¹¹ Such new requirements added to the stress level of network engineers that are required to implement new security measures and use new techniques to meet the new standards.^{11, 12}

The internal components that a network engineer is responsible for include providing a secure means of keeping the information intact and secure while the information is being entered or maintained on the server at the company's premises.¹³ Such tasks include providing secure authentication, strong encryption methods, disaster recovery plan, and anti-corruption techniques.

The end-user components include the host at the customer premises or any host that is used by the customer. The major challenge is the location of the host itself and how the network engineer is going to be able to enforce the security measures on a computer that is not maintained by the organization that is providing the service and does not fall directly under the network engineer's direct supervision. Such challenges include maintaining the latest patches, service packs, virus protection definitions, clients, and even the basic rules of security as in writing the logon name and password on a sticky note attached to the monitor or on the back of the keyboard itself. Even though such challenges sound more related to the user, still the network engineer is more likely to be blamed if the security of the network is compromised at the user's end.

The connection in-between the organization's main network and the customer's host is another challenge that adds to the overall job-dissatisfaction of network engineers. The challenges associated with this area include ways to stop unauthorized connections and other unauthorized tapping to the connection while the customer is using the service. Such measures include advanced methods of encryption, continuous authentications, secure protocols, and private keys.

Even with applying the latest security measures and protocols, it is still a tremendous job to maintain such measures and requirements especially when certain elements are not controlled or managed by the network engineer. For organizations in general and financial institutions in particular, secure transactions are the key to success and survival in the global economy; therefore, a tremendous amount of pressure is put on network engineers in order to maintain the sound reputation of the company in providing a secure and non-corrupted means of data availability and transactions. Such pressure leads to job dissatisfaction especially when certain management styles or motivational theories are applied on those professionals.

Management and Supervisory Challenges

Theory X and Theory Y Associated With Job Satisfaction

In his book, *Motivation and Personality*, Abraham Maslow in 1954 broke down human needs into five main categories that include the (a) physiological needs, (b) safety needs, (c) belongingness and love needs, (d) esteem needs, and (e) self-actualizing.¹⁴

Hierarchical Motivational Level	Characteristics
Physiological Needs	Most basic of needs The foundation of all other needs Need for food nutrients, shelter, clothing, and procreation
Safety Needs	Need protection from societal threats Need protection from natural threats
Belongingness and Love Needs	Need for friendship Need for romantic intimacy Need for nurturing and to be nurtured
Esteem Needs	Need to be thought well of by others Need to think well of one's self
Self-Actualizing	Becoming the fulfillment of one's potential Maximizing everything one can achieve Expressing one's talents fully

Table 1. Maslow's Hierarchy of Needs

When all five needs are satisfied a person is content and capable of performing the job contentedly. In his book, *The Human Side of Enterprise*, McGregor (1960) introduced "Theory X" and "Theory Y" as two different approaches of managing workers. According to McGregor, Theory X assumes that workers dislike work and only the threat of punishment will produce the desired results; whereas, Theory Y assumes that workers are self-motivated to the degree that they are committed to the organization's goals.¹⁵ Even with Theory Y, workers are not considered full and equal partners with managers and supervisors. According to¹⁶, Theory Z was the third generation of management style where employees are considered somehow equal to managers. In his own words, Ouchi (1981), described his summarized his theory by "all for one and one for all".¹⁶

Theory X and network engineers

According to¹⁷ Theory X was widely used during the industrial revolution when the supply of labor was high and workers were willing to work under hard conditions for little pay. Theory X was widely used by managers during that period. During that time, workers did not have a great deal of skills and not too many choices. The supply of workers exceeded the demand of workers, making it hard on workers to find or even keep their jobs and easier for employers to find workers.

Theory Y and network engineers

Theory Y differs from Theory X and is usually used in settings where trust between the managers and workers is high to the level where workers are considered part of the organization and not just tools to achieve the goals of the organization. Even with Theory Y, workers are still somehow considered inferior than supervisors; however, they were thought to be more trustworthy of performing their jobs if they were given the chance to be self-motivated to do the job as indicated in¹⁷.

Theory X and Theory Y on network Engineers

According to ¹⁸, Network Engineers are professionals that have strong beliefs and personalities and are more motivated when “pulled” rather than “pushed”. Such professionals want to know “why” certain things or procedures are implemented and not just doing it.

Improving performance through job satisfaction

In today’s high tech industry, the need of a motivator manager is a must to achieve the goals of the organization and get the job done. As the demand for network engineers increases, managers have to look for ways to motivate such professionals to keep them focused on the job instead of spending their efforts looking for other jobs. One of the roles of a successful manager is to be a motivator as well as a manager. Being a motivator is the result of understanding the needs and difficulties that face network engineers on their daily jobs. In his book, *Human Side of Enterprise*, McGregor (1960) lists the different roles of a successful manager as follows: “At times he [manager] may be in the role of a leader of a group of subordinates; at other times he may be a member of a group of his peers. Sometimes he is in the role of teacher; at other times he may be a decision maker, a disciplinarian, a helper, a consultant, or simply an observer”. ¹⁵ As indicated by McGregor, a successful manager is one that is willing and able to change roles to meet the needs of the professionals that are working to complete a certain task.

Summary and Conclusions

The network engineering field will continue to prosper in the coming years. As challenges arise, more skills and knowledge will be required to stay with the technology and the new challenges. Even the new challenges are unpredictable and are driven by the IT market and global economy. Software engineers will continue to face the traditional challenges that IT professionals are facing on daily basis. The new challenges that are forced by the ever-changing IT industry and the demand of the business world are other factors that contribute to the problem. Computer security still and will be one of the major challenges for network engineers; the software and hardware challenges will play a major role in the network engineers’ lives. Even though there may be layoffs and ups-and-downs in the IT industry, universities are not supplying enough IT professionals in general and network engineers in particular for the current and future jobs.

Managing network engineers differ from managing other workers and professionals due to the nature of the work, level of education, certifications, knowledge, and the responsibilities involved with their jobs. Some of the main differences include intrinsic, extrinsic, and supervisory challenges. A key challenge facing IT managers is to find ways to improve performance through job satisfaction and motivation. One of the methods managers can use to improve motivation and increase job satisfaction is to play different roles, such as a leader, peer, teacher, decision maker, a disciplinarian, a helper, a consultant, or simply an observer. In order for managers to play such roles, they have to understand the needs and requirements of network engineers. Due to the nature of network engineering, network engineers perform better in an environment where they are treated with respect. Therefore, network engineers continue to strive to do their jobs and struggle with all their daily challenges, Theory Y is a better fit for them than Theory X.

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