



Principal-Agency Issues and the Engineer-Manager

An Online Continuing Education Course for Engineers

Course Number: BS-2010

Credit: 2 Hours / 2 PDH / 2 CPD

Principal - Agency Issues And the Engineer-Manager

Objectives of this Course:

This course will introduce the professional engineer to the principal-agent problem, commonly known as “agency”. Agency theory applies to all aspects of the licensed professional including the practice of engineering, working with other disciplines, including political office-holders, and personal activities. The course applies centuries-old theories developed in economics and finance, which are still relevant today. Applications of agency theory cover individual, managerial and employee work performances, partnering issues, and contract negotiations. Economic topics such as moral hazard, utility theory, game theory and agency theory will be described independently then interwoven into how professional behavior and management techniques utilize contracts to achieve mutually beneficial goals. Rarely does an engineering education include these topics yet agency theory is considered one of the most critical concepts in both personal and professional lives.

Specific Topics

- Define moral hazard; identify where and when moral hazard exists
- Define utility theory and marginal utility
- Overview of marginal utilities as it applies to decision-making
- Define first and second best solutions
- Identify the differences between price and value
- Define asymmetric information and how to address contracts when asymmetric information is apparent
- Define survival bias and why the mutual fund industry “lies” to consumers
- How monitoring costs affect contract structure including contract enforcement
- Total costs of the principal-agent problem
- Applying agency theory to contract construction
- Introduction to game theory and some applications to engineers
- Appreciation to America’s founding fathers for addressing the principal-agent problems with the creation of the branches of government

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Chapter 1

Why the Professional Engineer Needs To Be Aware of Agency Issues

This course, *Agency Issues*, is designed to advance the professional engineer within his technical field and enlighten him on the various aspects that affect his personal and professional life. “Agency” is broad-based with applications too numerous to outline, much less detail in this presentation. Agency issues are not a recent phenomenon as this topic dates back centuries, and yet we have not mastered it at all. While personal computers have allowed complex financial modeling, no one has been able to model the human behavior or the decision-making process (despite what the marketing profession says!).

Agency and agency dilemmas enter your daily life at least several dozen times per day. Applications of the P-A problem span the bridge building arena, the public works and dealing with governmental agencies, parents raising children, local and national politics, and interactions between the professional engineer and the public/private sector.

The P-A topic fully explains failures such as Enron, WorldCom, and the pending Fannie Mae (FNMA) and Freddie Mac (FHLMC) debacles in the mortgage arena. Conversely, the P-A topic also fully explains why Warren Buffet, currently the richest man in the world, at this writing, is the most successful investor to ever walk the planet (he has correctly implemented the P-A issue throughout his dealings).

For typical right-brained engineers, the entire agency topic might be both an eye-opening topic as well as explain many things not fully appreciated until now. For example, engineers by nature or nurture are very concrete in thinking; logic and reasoning is supreme. At times, engineers cannot understand why a family member does not minimize the cost for a ketchup bottle; especially after several lectures on the math behind such decision (large size has a better “price per ounce”). The agency issue can help explain in a quasi-mathematical manner, which is appealing to that right-brained thinker.

By understanding that the P-A issue exists, by being able to identify it and by understanding how to address conflicts of interest, licensed engineers will be better suited in a corporate or entrepreneurial environment. Solving for the correct stress-strain calculation for structural steel, the best business model and even the best patent will not compensate anyone if the P-A issue is not correctly addressed.

We begin our discussion with a few background topics, as these topics help to explain human actions. Utility theory, and more specifically the idea of marginal utility and moral hazard, with a touch of ethics are introduced along with the game theory.

Chapter 2

Introduction into the Principal-Agent Problem

A basic principal-agent problem involves two entities: the principal, who “enjoys” the outcome of the activities of an agent, and the agent, who is the entity performing such actions or activities. Simply put, a dilemma occurs when one person can, and does act for or on behalf, of another. At first, the principal-agent problem seems far removed from the engineering arena and the professionalism of that industry. In reality, the principal-agent relationship is one of the most important situations in our society and affects professionals on a daily basis. It is critical for all professions to identify the principal-agent relationship, to understand it and to take appropriate actions within the context of their conscience decisions. This discussion should shed significant light on this topic as well as show the professional engineer that the topics covered within this course might be the most important in their personal, professional, and career goals.

The principal (“P”) can be any person, such as an owner, a manager, even a child, while the agent (“A”) is defined as that person who acts on behalf of someone else. P’s can also be A’s simultaneously; for example, a manager is the agent for the owners of the business while, at the same time, the “boss” of employees. From the viewpoint of the employee, the manager is the P while the employees are the agents. The principal (the owners) “enjoys” the outcome of the activities of the agent (the manager of his operation). In turn, the manager (now the “P” in this view) “enjoys” the results of his subordinates (the agents in this view).

From an owner’s perspective (the principal), the agent (or agents, including managers and employees) performs activities or takes actions, which may result in a direct benefit and/or direct harm for the owner. Agents manage the owner’s operations, the sales process and hundreds or thousands of other activities, whereas the agent is paid a fee (salary, bonus, commissions, etc) and owner receives any profits. So, is it “right” that a fixed salary (say \$10 per hour) be paid to the agents while the owner receives excess profits (say \$1,000,000 per month)? In the same breadth, is it “right” for the agents to receive a fixed salary if the owner incurs losses of \$50,000 per day? Should agents participate in profits or not?

The basic question in the agency problem is...

“How do both parties, the P and the A, construct a contract such that both parties are ‘maximized’”.

While the basic question seems fairly straight forward, much in the way of background topics is needed in order to fully understand nuances within potential solutions. Or, the question is easy, the solution is very complex.

Overview of the Principal Agent Problems and The Professional Engineer

There exist conflicts between what agents want to accomplish and what principals want to get accomplished. It is this conflict of interest where the P-A relationship takes on new meaning for those not familiar with the topic. At times, information is not completely shared between parties, which increase the potential conflicts. In essence, the agency topic focuses on the use of contracts and how the structure of contracts can reduce risk and conflict of interests or, on the other hand, cause even greater harm.

Chapter 3

Utility Theory

Why is it that management and finance doctrine tells us that managers should maximize the value of the firm? Why do we care about the value of the firm? Why do the owners of the firm care about the value of the firm? Why do we care about the value of the firm? Why do we care about the value of the firm?

Utility theory is a theory of consumer behavior. It is a theory of how consumers make choices. It is a theory of how consumers allocate their resources. It is a theory of how consumers make choices. It is a theory of how consumers allocate their resources. It is a theory of how consumers make choices. It is a theory of how consumers allocate their resources.

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So, value is a subjective concept. It is a concept that varies from person to person. It is a concept that is not objective. It is a concept that is not measurable. It is a concept that is not quantifiable. It is a concept that is not comparable. It is a concept that is not commensurable. It is a concept that is not commensurable.

In order to relate future topics of utility into the P-A discussion later in this course, we