PDHonline Course P191 (4 PDH)

Principal Agent Issues Facing the Engineer-Manager

Instructor: David J. Nowacki, MBA

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5272 Meadow Estates Drive
Fairfax, VA 22030-6658
Phone: 703-988-0088
www.PDHonline.com

Principal Agent Issues Facing the Engineer-Manager

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Objectives of this Course:

The professional engineer will be introduced to the principal-agent problem, commonly known as 'agency.' The licensed professional can utilize aspects of agency theory in practicing engineering, working with other disciplines, including political office-holders, and apply concepts in their personal activities. The course applies centuries-old theories developed in economics and finance which are still relevant today. Applications include issues involving employee performances, partnering issues and contract negotiations. 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

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Agency Issues Facing the Engineer-Manager

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these topics yet these are considered most critical in both personal and professional development, including operating a professional engineering practice

Specific Topics:
- Definition of moral hazard and how moral hazard is incorporated into the micro and macro viewpoints of the professional engineer.
- Utility theory and why this theory explains employee and partner behaviors.
- Handling Asymmetric information.
- Agency theory applied to how contracts should be constructed.
- Introduction to Game theory and some applications to engineers.

Professor David J. Nowacki is an adjunct professor teaching graduate finance courses at Texas A&M University-Commerce and through the Mechanical Engineering Department at Southern Methodist University (SMU), Dallas, Texas. Mr. Nowacki has 20 years experience in the investment-banking arena having worked for Wall Street firms in New York City, San Francisco, Houston and Dallas. His specialty is fixed income securities and derivatives including hedge strategies. Mr. Nowacki also consults on merger and acquisitions, strategic planning and the venture capital arena.

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Chapter 1

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Introduction into the Principal-Agent Problem

The Principal-Agent problem or dilemma is defined simply when one person acts on behalf of another. The principal ("P") can be any person, such as an owner or even a manager, while the agent ("A") is defined as that person who acts on behalf of someone else. P's can be 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. As boss, the manager is the P while the employees are the agents.   An additional definition for the principal and agent is that the principal 'enjoys' the outcome of the activities of the agent while the agent is the person performing the activities. The Principal-Agent relationship will be called P-A or simply "agency" for the remainder of this discussion

There exist conflicts between what Agents want to accomplish and what Principals want to get accomplished. At times, information is not completely shared between parties which increase the potential conflicts. This discussion will also introduce moral hazard and where this exists in the Agency issue, utility and marginal utility for both the P and A, and how to identify the potential for conflicts of interests. In essence, the Agency topic focuses on the use of contracts and how the structure of contracts can both reduce risk and conflict of interests and cause even greater harm.

Why the Professional Engineer needs to be aware of Agency issues

Agency dilemmas probably enter your daily life at least several dozen times per day. The P-agency issue is extremely important for all professionals, including the licensed engineer, as market participants will be better suited in a corporate or entrepreneurial environment. This course, *Agency Issues,* is designed to advance the professional engineer within his technical field by introducing the definition of the principal-agent problem and how utility theory describes why people do what they do. The principal-agent problem (commonly referred to as "agency") is incredibly broad-based with applications too numerous to outline, much less detail. Furthermore, the background and discussions (academic and otherwise) goes back centuries and still can provide tremendous insights into human behavior.

While personal computers have allowed complex financial modeling, no one has been able to model the human behavior or decision-making process (despite what the marketing profession says!).

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 are 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. The agency issue can help explain in a quasi-mathematical manner which is appealing to that right-brained thinker.

Before a complete launch into the agency discussion, a few background topics are needed. Utility theory and more specifically the idea of marginal utility, moral hazard and a touch of ethics are introduced in order to use these topics later. Game theory will also be covered at the end of the course.

Today's Morals

Pick any ten-year period in history. That period could be one that you experienced first hand (i.e. you were alive) or a time you learned from history books such as the 'roaring twenties', 1940's or the 1840's. Pause for a moment to consider the following question:

Given the ten-year period you selected and compare that period to today (for example, the last 10-years)…..

Are "we" "Better off"

More Moral / More Ethical / More Whatever

today than that time in history?

- **"We"** can be defined as your family, neighborhood, religious group, city, state, country; society.

- **"Better off"** might mean happier, more content or satisfied, more trusting of our neighbors or more confident in our political leaders

Ask the counter-question……Are we worse off?

While there are certainly arguments for all sides of these questions, I submit that we are no worse than any time in history.

AND

in the same breath, we are no better.

We humans are what we are. We have had a history of being incredibly kind to individuals and incredibly unkind to groups of people. There will be another ENRON as there have been other 'Enrons' in past generations!

If you feel we are worse consider for example the decades of religious training from all the religious training sources. Decades! Try centuries! One might guess that something would work after all this time!

In our society, we have an AMBER ALERT, a national early warning system to disclose when a child has been abducted.   This system is both a good thing and a bad reflection on our society. Not to mention the system is named after an Amber who was abducted!

Does the creation of the warning system mean a reduction in events? Does this imply that before the "Amber" system, abduction was a rare event? Consider the following example (where the data and dates are made up, but this is a true event, used here for illustrative purposes):

> In Los Angeles around 1972, there were 4,500 rapes reported.
> One year later, the number reported was 26,000.

What happened?

Was one year a fluke compared to the other?

Did society have a meltdown?

Did the classification of events change?

Was there a technological difference?

The answer is that the institution of (9-1-1), the reporting of emergencies over the telephone, made the reporting process easier. Now, this poses the following question:

Was the real number in 1972 under-reported or was the 1973 number over-reported?

The idea is that the reporting mechanism should not significantly change the true number of events. Today, the internet allows sexual predators easier access to their prey. Does the internet create these sick individuals, or were these individuals still in our society 20, 50 and 100 years ago?

Humans will be humans even with religions attempting to train us otherwise. Unfortunately, it is still buyer beware.

I don't feel we are better or worse. We are what we are.

Moral hazard

Moral hazard is where one person can control another; the condition where one individual or entity has the ability or opportunity to harm or otherwise take advantage of another party or parties.

Moral hazard cannot be eliminated or overcome.

Moral hazard is a fact of life and, by itself, is neither good nor bad. Parents are in a position of moral hazard. Teachers, ministers, doctors are all professionals who have a great deal of moral hazard in their professional positions. This list also includes professional engineers. Even supervisors have moral hazards.

There are areas of our society where tremendous issues have been raised. Press coverage of Presidential elections might be slanted because the media itself wants one candidate over the other. Better stories are aired or even just more airtime could slant biasness in the reporting processes.

Rules can be set up in society to hide or otherwise not report certain events. Large lawsuits can be settled for huge sums of money with the caveat that none of the facts of the case are ever made public.

A subtle issue involving moral hazard incorporates the idea of **asymmetric information**. Asymmetric information is that situation where one of the two parties to a relationship or contract has more information than the other. For example, you purchased a new automobile five years ago and now you want to trade it for another new car. You have years of knowledge about your old car and the person you want to buy it has very little knowledge about this specific car. This situation is a typical scenario utilizing game theory where participants make moves based upon what they think and what they think others will counter-move.

Take for example the idea of an owner selling part of his business. Assume the original owner and a single investor enter into an agreement whereby the investor purchases part of the firm's ownership interest. Assume further that both parties enter into such an agreement naively. In addition, the original owner is to remain as manager/operator for the now two owners.

 "Does it matter how much of the business is released?"

Absolutely, at 50% control passes from the original owner to the investor. What are the ramifications above or below this 50% threshold?

If the investor is the minority owner, the majority owner/manager could increase his salary so that no profits are created.

If the investor becomes the majority owner, the majority owner could release the current manager (who may have assumed he would have a great salary forever).

Whether above or below the 50% pivot point, the ownership structure in and of itself creates moral hazard for one party. We have not mentioned additional moral hazards due to operations issues. That is, before any sale of ownership, the owner could work as hard as he wanted as he only reported to himself. After the sale of ownership, no matter what percent was sold, the owner/manager may reduce his workload. Again, if the investor intends to be a silent partner or non-manager owner, moral hazard exists in that the investor will not be monitoring on a daily basis.

Utility Theory

Why is it that management and finance doctrine teaches that everyone should **maximize the value of the firm,** but real world actions don't add up to such efforts? Utility Theory is the theory to aid in explaining why humans do not maximize (returns, efforts or assets) or minimize (costs, expenses or losses). The basis of utility theory incorporates the use of a fictional thing called a 'util.' The 'util' might be considered a measure of pleasure while also implying some specific mathematical foundation. For example, two identical white cotton polo shirts are offered for sale with one having a brand placed upon it (such as Ralph Lauren). Since there are identical, why would anyone pay above and beyond the cost of the other just to get the brand? When asked, consumers would say they feel better or otherwise get better 'value' from the branded shirt. Some of the value might be part of a 'snob-factor'.

So, value incorporates utility as well as conveys information. However, value is incredibly personal because I might value something higher than you due to my preferences. For example, I *value* a certain brand of golf ball because I feel it 'performs' better. For the non-golfer, a golf ball is a golf ball and therefore will not value one ball greater than the other.

In order to relate future topics of utility into the P-A discussion later in this course, we now introduce the 'water example' as provided here, as this example should shed some insight into utility, and more specifically, *marginal utility*. The 'Water Example' is as follows:

- You are a moment away from dying of thirst in the desert when you are presented a glass of water. That glass of water saves your life!
- Almost instantaneous to you life being 'saved,' you are presented with another glass of water which now extends your life.

- Shortly, you are presented with a gallon of water, which allows you to sleep through the night.
- During the early morning hours you are presented with 3-gallons of water which allows you to gain strength and completely re-hydrate.
- The next day, you are presented with 10-gallons. With your re-stored strength, you begin the process of walking where you find an oasis.
- At the oasis, you have sufficient water forever and discover dates which you consume.
- There is an excess of dates so you plant them and irrigate these palm trees with the surplus water.
- Eventually, you become the largest exporter of dates in the world amassing significant wealth in the process.

If you were to 'evaluate' your utility, specifically the marginal utility of your use of that water, that first glass had a virtual infinite marginal utility for you. Each increment of water was valuable but less and less valuable than the previous volume. Marginal utility declined as volume increased. Your use or utility of the water was always positive: more is better and increases in the water volume increased your usage and/or value. However, on the margin, each increase had less incremental value overall.

That is enough about water so let us apply utility and marginal utility to money. Is money good? Is money by itself good? No, money itself is not the goal but what money can do: purchase goods and services. It is the goods and the services that we seek.

Assume you are that average joe engineer, earning a better salary than the average American, better than average home and better than average car. Winning a small lottery, such as a jackpot, would provide you with a tremendous amount of comfort. Steak at any or every meal! Children can select any college (that they can get into). Your utility of that amount of money can be extremely high and possibly change your lifestyle completely.

Add another $10 million Lotto winning and things might really change. You can now have one or two vacation homes; never fly commercial again! So let us just say this is an ultimate dream.

Compare this dream to say the lifestyle of Bill Gates, one of the richest people in the world. Adding $10 million more in cash to his bank account does not have the same marginal impact as for joe engineer. His marginal utility is different than most. He can buy more cars than he has time to drive. (If in fact Bill Gates does drive!) He cannot consume more steaks because he is completely satisfied. There is one caveat, however, that needs to be mentioned. In general, people who are driven like Mr. Gates (was driven; now he is focusing on giving his money away) tend to use monetary figures as their scorecard. While they don't need an extra billion or two, they use such figures as targets, goals and things to aspire as benchmarks. They do have a utility for increased wealth but not necessarily in the 'worldly goods' categories.

Explaining 7-Eleven!

Okay, utility and marginal utility can be interesting but what does that have to do with my engineering professional life? Well, let us look at the basic caveat of undergraduate finance/business courses. The premise under which all such courses are taught is that the owners (individuals, small business owners and large public corporations) want to maximize 'something.' That something could be profits, wealth or wealth creation.

Applied to a corporation, maximizing the value of the firm implies that the firm is to take deliberate and necessary (conscience and subconscious) steps in making decisions to achieve this maximization. Applied to an individual (and collectively individuals as a society), this concept would mean that we maximize our returns on our investments AND we minimize costs whenever possible.

Just for a moment, look at the idea of total cost minimization. In looking to minimize our personal cost as a consumer, this would imply that all 'jumbo sized' goods, with a lower price per ounce, would always outsell any other size. Consumers would always purchase economy sized including the highest gas mileage automobiles!

For investments, this argument would mean that upkeep on an automobile (oil changed regularly, waxed and polished) would be the best method of maintaining values. Pure investments like stocks or bonds would be constantly tweaked always looking for ways to increase returns, reduce risk and reduce cost.

BUT, step back and determine if we, as a society, actually maximize returns or minimize costs? Do you, the continuing education participant, have any cash in your wallet or purse at this very moment? If yes, why is it there? You are not maximizing your returns as you could be earning some interest (granted in today's environment, it is very low rate of return; but positive!). There are arguments for holding cash: 1) emergency purposes (pure emergency like a car wreck, flat tire, broken bones); 2) economic emergency (today and today only a sale on the new golf club!) 3) anticipated cash transactions (lunch, coffee, vending machine.) However, a purely mathematical analysis taking into account the probability of an emergency and the need for cash, the need for transactions and for opportunities that present themselves, it is shown that consumers still hold more than needed. Why? Why do consumers hold more cash than needed, even when explained they have too much on hand already?

How can we explain 7-Eleven? This is an established store with a long, long history of operations where every product they sell can be purchased somewhere else and probably for less money. We as a society "ain't so stupid as to support something like this," or are we?

How can you explain Starbucks? Here is another store, which sells coffee for more than what others would charge for a cup of coffee. For some types of coffee orders, one might be able to buy a whole bag of beans and brew 15 cups of coffee for the same price.

The explanation for all of these is that our utility functions are being served when we make these decisions. We feel 'better about ourselves' when we treat ourselves to a latte at Starbucks. We feel energized when we throw the car in park, keys in the running car, and buy a gallon of milk at 7-Eleven. We did not measure and quantify time saved at 7-Elevenr versus Albertson's versus quality of time (less stressed, say).

Our feeling safe (or safer) with an extra $100 in our purse or wallets provides a utility of comfort. It is this utility of the $100 extra cash which accounts for over liquification of our assets. Economists and academics can argue until they are blue in the fact that past investment performance does not matter when selecting mutual funds. However, consumers need such as a crutch.

What do we do?

As consumers, individuals maximize their utility function as well as maximize their marginal utilities. A utility function (defined mathematically as: $U(x)$) is a general description of our own (and very personal) motivations, expectations, wants and desires. The function is incredibly personal because what motivates you may not motivate me! They are incredibly complex in nature. Maximizing salary or income does not fully define any one person's utility function in the fullest sense. A better utility function, for example, might be: maximize my salary (take home pay) subject to enough time to enjoy family and friends, keeping healthy and sane. Otherwise, 'maximizing salary' would require a 24-hour day for 7 days per week!

We make decisions based on a series of conscience and non consi

Financial economics assumes financial decisions or modeling based upon our utility curves and values received therein. If a consumer's utility is given the function of "U", then mathematically $f(U)$ represents our total utility function.

For our $f(U)$, we can learn some interesting facts:

$$F'(U) > 0$$

We increase in value as the function rises; more pleasure, more money. More utility is always better than less for the entire spectrum.

$$F''(U) < 0$$

The rate of increase in utility decreases as volume increases, that is, marginally, each incremental increase is worth less and less.

The field of marketing and marketing professionals probe and seek clues about utility functions and even attempt to manipulate them. Branding consumer goods and then marketing the concept that such good is superior or you will feel superior or your friends will feel your are superior.

Studies and market research is used to model decision-making; however, we cannot fully model humans or human decision-making. Consider the Allais Paradox. Choose your preference from "A" and "B," and then choose your preference from "C" and "D." Your choices should be one of the following (if not, you will have trouble with the quiz at the end of this course!)

Which Do you Prefer, "A" or "B"?
- A:
  - Certainty of receiving $100 million

- B:
  - 10% chance of receiving $500 million
  - 89% chance of receiving $100 million
  - 1% chance of receiving nothing

Which do you prefer: "C" or "D"?

- C:
  - 11% Chance of receiving $100 million
  - 89% chance of receiving nothing

- D:
  - 10% chance of receiving $500 million
  - 90% chance of receiving nothing

Take note for a moment that the Allais Paradox does not ask 'which is better.' The question asks for 'your preference.' This explicitly targets the utility function of the person participating in this exercise and, as such, signifies that there is not right or wrong or better yet, all answers are correct as the preference expressed is that which satisfies a person's utility function (at that moment).

The participant in this exercise would have one of the following patterns:

A then C

A then D

B then C

B then D

If your selection was either A then D or B then C, you showed a preference reversal in your selection process. That is, the math applied to the first answer in the first preference selection was not used in the second set of outcomes! Since no selection is incorrect, the only point to make here is that we cannot consistently model how humans will behave.

Another Digression: Price and Value

Price versus Value and Insulin

One major if not the major equation in business and economics that is most overlooked is the following:

Price (P) versus Value (V)

$$\text{If } P > V$$

Nothing occurs

$$\text{If } P < V$$

A transaction can / might / does occur.

What is P? Generally, it is the offered amount, displayed amount or negotiated amount.

What is V? Here is the dilemma; can we measure 'Value?' Is it quantifiable for an individual? For society?

Value is and can be a very personal thing. I see value in things that appeal to me where my utility curve is satisfied. Others may not see the save value!

I have the very good fortune that no one in my immediate or extended family requires insulin in the lives. Therefore, my personal *value* of this item is far less than the family with a member or individual who requires insulin on a daily basis. I can only imagine how this might be valued and I can appreciate such valuation but not being close to this medical issue creates less value in my mind.

In our first course in this of continuing education series, we used the concept of the math tools of time value of money to plan future events and evaluate alternatives. Note this was not 'time price of money' but time *value* of money. Value can and does have loose

parameters in that the 'equation operator' can select certain variables of their choosing. One person might select 10% as an appropriate rate to account for a certain risk-return scenario while another will pick 14%. Both will get different answers thus making for different market opinions.

Agency, or P-A or the Principal-Agent Problem

Consider an owner (100%) of a business and his particular office. Assume the office is palatial with elegant furniture. The proverbial question: "Does it matter to anyone in the world how thick the carpet is?" The answer is that it possibly affects two people: the owner (his utility is served, not to mention his ego) and the carpet salesperson (who may have received higher commissions). Besides the possibility of these two people, the carpet thickness does not matter.

Now consider that this owner (P) sells 50% of the business to you with the idea that the owner remains as operator. After this transfer of partial ownership the operation looks as follows: the Principals are the shareholders (you and the original owner) and the principals have contracted with an Agent (who also happens to be a 50% owner) so that the agent operates the business for the benefits of (all) owners. Reconsider the proverbial question, "Now does it matter how thick the carpet is?" The answer is that it absolutely matters because the agent spends the principal's money and receives benefits; however, both principals do not share in the benefit.

Here is a simple example of moral hazard; the agent can takes steps which might benefit one P over the other P. For example, prior to the sale and partial ownership transfer, the company did not supply anyone in the organization with a company vehicle. After the transaction, the company supplies the manager with one.

Assume further that the agent has full operating control including hiring and firing, wages and benefits. It is possible that the agent can increase his own salary to such a point that there will never be any profits.

Let us take another example with the following facts. The agent-owner (remember he owns 50%, but all owners have hired him to operate the business) has filed paperwork with all governmental authorities indicating there is an additional 50% owner. Furthermore, he proclaims and/or will testify in whatever venue that you are a 50% owner. But taken to an extreme, this agent informs you that you are not welcomed in his office or welcomed to step foot on the company's property! Think about this….you own 50% but cannot access company property! Do you think this is realistic? Do you think this ever happens in the real world? Well buy 100 shares of Exxon Stock. You are an owner, but you cannot get into your company's World Headquarters!

The agent has significant moral hazard in this situation. Moral hazard cannot be eliminated; however, contracts can be instituted such that some moral hazards are reduced or eliminated. But contracts themselves are not the entire solution.

First versus Second Best Solution and the Structuring of Contracts:

Think about this question as it has a simple solution:

Q: In Life: What is the "First Best Solution" for you?

Best solution now implies not just maximizing one thing. It is maximizing your entire life. That is, we must view this as a maximization of your utility curve. As such, there are times when getting the highest salary is extremely important until such time when working 20-hours per day detracts from family, friends and leisure. So, marginal utility of individual items in your total utility structure are taken into account. From experience I now know that your child's T-ball game is more important than that 'big contract' which might not materialize!

The First Best Solution is where you, the principal, are maximized in whatever your utility function measures. This solution is without regard to anyone. So, assume an easy answer to the question is:

A: It would be that you are KING!

Okay, you (the P) own an ice cream shop. Viewed entirely from First Best Solution as it deals with potential employees (your agents A), without regard to any issues with the agent.

Your First Best Solution is to charge millions of dollars per scoop and have three employees working 25 hours per day, 8 days per week, 50 weeks per year (allow 2-unpaid weeks vacation) and paying an annual compensation of $1.00!!! Is this not your First Best Solution? (Actually wages could go down and hours up, but that is not the point).

Now, relax most of the previous assumptions while allowing market constraints to enter the picture. Concerning revenue from ice cream sales, supply and demand for desserts enters the picture along with the supply and demand of substitute goods (frozen yogurt or going bowling rather than the ice cream parlor, as alternate examples). The outside market constraints should create pricing mechanisms for what you charge for a scoop of ice cream; in fact, other market constraints (including labor laws) will also price labor costs and available hours for your agents.

Since the first best solution is not available, the second best solution is now reviewed: You want to maximize your utility of ownership of the ice cream store while being

subject to (S.T.) various market constraints. Your 'utility of ownership' implies that there may be times when the business reduces its profits, say, by leasing a car for the principal, and such steps actually benefit the owner. The leased car under the ice cream store does reduce profits (i.e., profits are not maximized; however, the utility of ownership might be increased as that leased car provides incremental benefits over the costs.) In Equation form, this reduces to:

Max U (the ownership of the ice cream store)

S.T.: agent and market constraints

Now, we must address the idea that the agent has a utility curve and a desire for the agent's First Best Solution. Assume the agent's First Best Solution is to get paid $1,000,000 per hour, he is scheduled for 2 hours per day but only shows up for one hour (union rules!); and when a customer enters the shop, he only has to point to where the customer finds items for a 'self-serve' experience. Nice First Best Solution, if you can get it!

However, the agent is subject to market conditions including comparable wages, competition for jobs and even economic conditions of the business. Since the agent cannot achieve his First Best Solution, the agent must work on his second best solution. The agent's second best solution might be described as maximizing his utility function for the ice cream clerk position while subject to constraints of the job.

Assume for the moment the agent is a teenager and this is his or her first job. The agent's utility function will have, of course, a financial component and the agent will work for a fee. The fee or rate of pay will be market driven (minimum wage or local economic conditions). Also, the agent's utility might be served by getting experience to use as resume building. Lastly, the agent might also assume that free "ice cream tasting" is included in the job. On the other hand, the agent is going to put forth as much effort as necessary for the position. Reducing to equation form, the agent's second best solution might be:

Max U (ice cream job)

S.T.: minimization of effort.

We now have incorporated utility curves into the analysis along with second best solutions. If we revisit part of the agent's utility curve, we see that there is a potential that one of the reasons to accept the job is "free ice cream tasting". Tasting leads into sampling which leads into a 'one meal per shift' benefit. So, in our simple example, how do we handle this potential loss of inventory?

The idea of monitoring costs must be introduced at this time. If, for example, the P (owner) will be working side-by-side with the agent or agents, there is no additional cost

associated with the monitoring or inventory. Here we assume the economic viewpoint that the P has no other activity which is more lucrative (opportunity costs are zero elsewhere).   However, if the P will not have a constant presence overseeing the agent, the P can create observation techniques such as installing cameras. The agent, without the constant oversight, is placed in a position of moral hazard. The agent is the only contact customers have and therefore represents the ice cream shop in its dealings and in serving customers.   The agent could yell at all customers effectively reducing the value of the operations. A contrary example is that the agent could provide such service that customers endure poor quality of ice cream just to experience the agent's service.

The installation of cameras and then viewing (either the P or the P hires additional agent(s) to monitor the initial agent) of the tapes creates an expense. So, monitoring costs can be quite expensive.

Another solution is to include a certain acceptable loss of inventory (normal spillage, normal spoilage and normal inventory reduction due to the agent (and the agents school buddies) as a cost of salary. The costs associated with inventory reduction and monitoring could be evaluated to determine the cheapest route.

Contracts as the Mechanism

A different method to replace monitoring costs is to create contracts, which induce the agent to work in the best interest of the principal. How are contracts structured to perform such acts? A contract might be structured which pays the agent an hourly fee. Because the agent is not paid on 'happy customers,' the agent will, eventually when the newness of the job wears off, become a clock-watcher!

Back to the super agent where customers endure poor quality ice cream but love the service. A contract might be written such that the agent gets paid for the "happiness of the customer". The agent agrees because the agent knows he can satisfy a super-majority of customers. How then can you quantify the "happiness" issue? Monitoring costs enter the picture again. Assume, rather, that the contract is based on volume, with volume being a replacement for happiness. That is, if customers are unhappy, they will not return but happy customers will return! So, volume is a stand-in measurement. In the short run, there is an issue. Assume there is no issue with monitoring volume (all pay for their fair share and the agent does not give out 'extras' as inducement to customers). This issue is that pay might be great in summer months but not late Fall through Early Spring!

The agent in the ice cream shop example was introduced as being a 'first job'. If and when agents such as these become older with established families, their willingness to accept the seasonality and wage payments (the fee) accordingly become less. We must introduce risk into the P and A utility curve.

Risk Category

There are three risk categories that individuals fall into:

Risk seeker
Neutral
Risk adverse

Risk Seeker

A risk seeker, in general, looks to increase risk without regard to outcomes or any other trade-off. Since these individuals tend to be self-destructive, they don't tend to be in the market or the world for very long. Furthermore, they are not interesting to this discussion.

Risk Neutral

Rick neutral people might be thought of as 'pure gamblers'. However, they are not risk seekers. By pure gambler, they are willing to take bets so long as the risk versus reward are proportional. Assuming odds do not change, a risk neutral person would take a $10 wager on an upcoming game as well as a $10,000,000 wager.

Risk Adverse

Risk adverse, by far, is the largest sector of the population. These people want to reduce risk. While they will accept greater risk, the potential reward may not be completely fluid. That is, rewards must increase greatly to get a risk adverse person to move.

Putting this altogether, we can have risk neutral or risk adverse principals and risk neutral or risk adverse agents.

Applying the P-A issues in the real world.

Contracts are the mechanisms by which P and A work together. The underlying question is:

"How do you structure a contract to induce the agent to act in the best interest of the principal?"

Furthermore, when you consider the risk position of both the P and the A, how should the fee structure be contracted to accommodate both the P and A simultaneously?

For the P & A that are both risk adverse and under perfect monitoring situations, the P should structure a contract where the P pays a flat fee. The risk adverse agent will only accept such arrangement if the fee is sufficient.

If the ability for oversight is not perfect, the A is now in a position of moral hazard. That is, the agent can 'slacken' effort when not observed. Since the P's risk is increased due to

the lack of 100% observation, the P would be interested in forcing more on the agent's effort for compensation, in hopes of reducing the slackened effort when not observed. One might consider this a commission only position. On the other hand, the A is not willing to take a full commission only position!

The compromise is to structure a contract such that the entire risk is shared. One way to do this is for the agent to receive some minimal base salary with an upside fees based on his performance. Performance can be actual results, such as sales, or just efforts themselves.

Have you ever had a sales call from your credit card company offering 'valuable services?' You continue to decline the offers and the person on the other side of the call continues to talk. Eventually, you speak into the phone that you are going to hang up and they immediately begin to speak real fast like, "if you want more information please call 1-800-555-XXXX".   Ever wonder why they speak real fast here?

The compensation is based on hourly wage and a bonus; with the bonus, or a significant part of the bonus, based on how many times they can deliver the "1-800" number to the customer (on the recorded line). Say, for example, the telephone representative was successful in delivering the number on 80% of the phone calls. Is this a suitable ratio or does the threshold need to be 90%? In these cases, the representative knows what the target it to be and what the bonus should be if the target is hit.

Under the risk neutral for both P and A, and perfect monitoring, the P will structure a contract where he pays a fixed fee to the agent and reaps all rewards in excess of that fee. The agent will only accept if such fee is sufficient.

Under a no monitoring scenario, the agent is placed in a position of moral hazard and the agent controls the outcomes. The P will desire a contact whereby the agent pays a flat fee and the agent reaps all rewards above such fee. This contract induces the agent to act in his own best interest assuming his effort is proportional to his ultimate fee. An example in the real world is a distributor who receives a fixed price from the manufacturer but can re-sell at any price above that amount.

Costs of Observations

There are costs associated with observing agents actions and monitoring their activities. First, the P may or may not have other activities that could be performed (for profit). So monitoring has an opportunity cost associated. Second, the P may monitor indirectly, say, remotely with a live or video taped camera. The physical equipment is a cost itself. Furthermore, remote monitoring still requires time and effort.

Monitoring can be outsourced. A third party can be hired, but now we enter into another contractual commitment creating an additional P-A relationship.

The auditing of public companies is a cost of monitoring. These reports are to be created by independent entities (public accounting firms) who verify management's results and report such verifications to thee owners. This is a significant expense and a true cost associated with Agency issues.

As contracts are modified, say employees are given base salaries with bonuses based on profit incentives; the P may have given up incremental profits. There may or may not be a trade-off between the incentives given, an incremental increase in entity profits (that is, above the costs distributed to non-owners), monitoring costs for other contracts or the status quo.

Search and searching has a cost. Therefore, seeking outsourcing and verification of those entities should be included in the totals.

A final example of the costs of observation incorporates the selling of a used car. Assume that the buyer of the used car is a professional and has done this many times. The transaction involves asymmetric information. That is, you, the seller, know all about the car. The buyer has no information except what is in front of him. From the buyer's perspective, he questions "why are you selling the car?" Is it your personal tastes have changed or is there something truly wrong with the car?

Overall market averages for this particular car might be, say, $10,000. The buyer may offer some number such that if the worst-case scenario is realized, he can still pay to fix the defects and sell at a profit. The seller would never disclose defects, keeping to the position of asymmetric information. However, the seller would disclose positive information. For example, the seller would disclose if the transmission was replaced several months ago, new valve rings, etc., effectively disclosing the positive information so as to boost value in the eyes of the buyer.

Costs of Agency

There are true costs associated with the disincentives between the principal and the agent. An observation cost, the act of monitoring the agent, is one such cost previously discussed. The overall costs due to agency issues are not insignificant in individual operations or in the economy as a whole. If humans were all honest and forthright and such actions permeated all of business, there would be no need for the accounting profession! Since this is not the case, we must take into account the imperfect beings that we are, and that each of us deals from a position of rational self-interest.

Observation costs or monitoring costs can include television cameras, hiring another employee (like a team leader or manager) or programs to monitor how many websites an employee visits at work.

Slippage might be described as an agent's actions in allowing inventory to be lost. Lost inventory would include inventory going bad (spoiled bananas), harming the inventory (forklift ramming a box), theft/pilferage, waste (not using both sides of sheet in copying your graduate school text book at the office) and on and on. Can the principal structure a contract where the agent is responsible for losses? Or, does the salary provided to the agent take into account a 'normal' amount of inventory slippage? Again, the selected enforcement (read: 'contract') depends on the risk profiles of the agent and principal. Some agents would not accept such responsibility.

Another example of a principal agent cost is the costs of a penalty or fine due to 'pollution' versus the cost of repairing the pollution problem itself. If we really want to clean up our plastics disposal, set fines sufficiently high that it induces people to recycle.

The insurance industry has an adverse selection problem. That is, the people that buy health insurance, more so than not, tend to be those that either are sicker than others or anticipate themselves to be sick. One way the entire insurance industry handles the agency issue is to have deductibles in insurance policies.

Debt and the Evolvement of the Loan Covenants

Over centuries, lenders have accepted many losses after they have loaned money. Over the years, loan documents have evolved due to agency issues. Borrowers are required to execute documents containing covenants such as: no dividends are allowed until the loan is paid off; personal guarantees from the owners. In essence, the corporate control is transferred through debt obligation to the lenders under certain circumstances. In fact, the most famous academic paper in finance concerning options describes the owners of a leveraged company owner a call option. As long as the owners make the regular interest payments, the owners get another six months to operate the business. If they fail to pay, the debtors take control.

Firms near bankruptcy take greater risks so agency issues and moral hazards become even more important.

IPO: Initial Public Offerings are events when entities issue public securities to fund continued growth. During such a process, the original owners are not allowed to sell. What would this imply if the owner were allowed to exit? It implies the company is not a good investment otherwise he would remain! The IPO process is full of Agency problems not to mention the distribution of securities. Again, what does it say when major Wall Street Firms 'love this new company' but are willing to sell you shares? IF you like it so much, why are you selling?

The last cost of agency to be discussed involves large publicly traded companies. In these entities, managers in large corporations are not owners yet continue to act in their own rational self-interest. Part of their interest is to work as little as possible but still keep their job. Note there is no discussion on the academic "maximization of owner value!" The separation of ownership and control creates the agency problem. Did you know

owners do not have the right to nominate potential board members? Board nominees are offered by management which is voted upon by the owners. So, managers nominate friendly board members who in turn give raises back to management.

One result of the control issue is that some boards and managers think a diversified company, one that has many divisions, will serve the owners. Nothing could be more than the truth. How long does it take a corporation to purchase another entity? Can it close in six months? Sixteen months? Now you have another subsidiary, does your existing staff have expertise in that arena?
How long does it take for an individual or large stock portfolio to diversify? Three clicks of the mouse while attached to the Internet can accomplish the same diversification as the 16-month acquisition but cheaper and faster!

A real world example is Tyco which has over 1,000 subsidiary companies. If there were 20 Senior Vice Presidents each overseeing 50 companies each, that Sr. VP could only spend one week per year at his subsidiaries. However, because he has 50 companies to visit, the Sr. VP will argue they "need access to the corporate jet"! The corporate jet, and justifications for needing it, is another direct cost of the "Agency" problem.

The true cost of agency here incorporates that the stock price, relative to earnings, will drop. It is easier for a disgruntled shareholder to vote with his feet (sell the stock) than to fight management. As more and more shareholders sell, the stock price drops until one of two things happen. Either management begins to divest (liquidate) assets creating a more efficient operation or an outsider will purchase the stock (an acquisition) and divest assets. This recently occurred in North Texas when TXU (Formerly called Texas Utilities) was purchased and quickly broken apart.

One way to measure the cost of agency is evaluate an acquisition or buyout offer. That is, poorly run companies or companies where management carves out too much for themselves will eventually trade lower and lower. When the price gets low enough, buyers will swoop in with a offer. As an example, shares might be trading at $25 per share and an offer to buy the company might be priced at $32 per share. The $7 difference is the minimal amount directly related to the cost of "Agency". Why minimal? The buyer sees value, say, at $38 per share but offers $32 so that there is some incentive to purchase. The buyers tend to remove old management; why would they want the same people who have not maximized value to Remain?

Game Theory

Briefly, Game Theory is the idea that there can be specific strategies enacted in accordance with rules of a particular game or event. Game theory states that the participant will act in his or her own self-interest as well as anticipate their opponents' moves. A used car buyer will assume a worse case scenario as asymmetric information

does not allow otherwise. When information is disclosed, he can then raise or lower his purchase price.

"It's a Beautiful Mind" is a movie about how Nobel Prize winner Nash utilized game theory into far reaching activities (not necessarily revealed in the video). Nash's work eventually led to the idea of trading carbon credits. Polluters are to be given a certain amount of carbon credits. Efficient operators, who pollute less, would have excess credits. Inefficient and high polluters would be required to purchase credits. A valid market will ensue where the extra credits will trade at levels such that the polluter might be better off fixing his operations.

Pet PEEVES: Perks, Perqs and Perp Walk.

A couple of quick background items to introduce in an effort to be a well rounded individual. As we get into the principal-agent arena, the discussions will incorporate additional benefits, like a limo for the exec, a company jet, free dry-cleaning and on and on. At times, these benefits are referred to as "Perks." Engineer: there is no (formal) word 'perk'. 'Perk' is not a word. Benefits such as corporate jets, limos and five weeks paid vacation are called "perquisites." Perquisite is the word (sometimes shortened to "perqs") so you have learned a new grammar word for the day.

Next, we introduce what is called "the Perp Walk." I hope none of you have ever experienced this, but you need to know what the perp walk is. The "perp walk" is shortened from 'perpetrator walk' which is a formal event when a U.S. Marshal parades a white-collar arrestee around his or her professional offices and makes that person available for media pictures. This is a staged event. The strategy is such the embarrassment of this executive is so high is should scare other executives into cooperating with authorities AND serve as a deterrent to future white-collar criminals. When you have a chance to loose your job, your 'good name' (slight tongue in cheek here!), your house, your country club membership, your wife AND your two girlfriends, you may think twice about absconding with funds!

Look at media events or do independent research. You will see that virtually all Enron execs went through this, even Martha Stewart. Trivia #1: What crime was Martha convicted? It was not insider trading; she was convicted of lying. Trivial #2: What was Martha Stewart's earlier career? She was a stockbroker. (Do you think she knew exactly what she was doing with that insider information?)

Conclusion

The first two continuing education courses in this series dealt with hard numbers. The topics were accounting and time value of money which can be utilized in evaluating and analyzing opportunities. Time value of money and capital budgeting problems require predicted cash flows in order to evaluate current opportunities. There are math issues involved with these calculations along with the notion that predictions themselves are not accurate.

Accounting and financial reports do not necessarily make accurate reports due to book versus market values, cost basis and other issues. However, both of these mathematical disciplines can lead one to make business decisions.

No matter how good your accounting numbers might be and how good you predict future events to be, if an owner-manager gets the principal agent issue wrong by developing an incorrect incentive, the entire operation or opportunity could be at risk. That is, errors in time value of money calculations might make a difference between an 8% and a 10% return. On the other hand, errors or neglecting the P-A problem will lead to an entire collapse of the operations, ala Enron.

Agency is extremely important in our society and in dealing with others. I will admit my upbringing was packed with my own naïve thoughts at to how the world should, rather than did work. The hard rules of studying engineering and relying on math answers furthered my naïve worldviews.

I could not understand why, for example, politicians (at every level: national, regional, local, even at my college fraternity) were not acting out of everyone's best interest (however I defined that at that time). It was not until my exposure to the Agency topic and issues incorporated with that did I get an understanding of how the real world behaves, and only then can I come to handle past frustrating situations.

I hope the right-brained engineer can learn something from this course. If you disagree or feel that there is incorrect items here, feel free to research these topics more. I think a bigger world will open up to you.