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The River of Law

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This paper contains a set of sequential handouts that can be given to students to help them understand the process by which courts interpret laws. In addition to the handouts, an explanation of the cases and the process of the court system is included. The handouts track the development of the law surrounding the Texas Statute of Repose, a statute which protects constructors of improvements to real property from suit more than ten years after substantial completion of a project

Key words: Legal process, Repose

Introduction

It is often difficult for people not intimately involved with the legal system to understand how it works. Students are taught in middle or junior high civic classes “the courts interpret the law”. However this statement has little or no meaning, if not accompanied by an example. This paper describes an interactive activity that can be used to introduce the students to the legal system and gives them an understanding of how courts work, and how they “interpret the laws. This activity, called “The River of Law” follows a particular state court system’s interpretation of a particular statute.

Of particular importance is the analogy of the river. While cases normally go up-river from trial court, to appellate court, to Supreme Court, law flows down river. Law is placed in the river at the branch of the river where the court exists, and this law flows downstream to courts below it. Therefore, law from appellate courts flows only downstream to trial courts below that particular appellate court - law does not flow into courts located on other branches. A visual representation of this concept is often necessary to make the point clear.

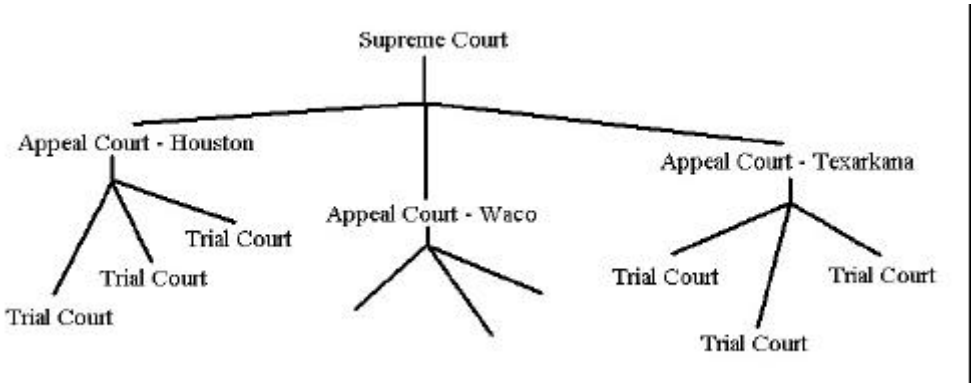

Figure 1. River of Law

Law is placed in the River at the appellate court in Houston and flows down river to the trial courts, which appeal their cases to Houston. Law placed in the River at Waco does not flow into those courts, but only into the trial courts below the Waco trial court. When different appellate courts reach conflicting determinations of the law in similar factual situations, the Supreme Court is more likely to accept a case for review, and decide the issue finally, for all courts in the state. Notice that law placed in the river by the Supreme Court flows down river to all courts below it. This same process works in the federal court system.

The Statute to be Analyzed

The specific statute used in the model is one of the statutes of repose, found at TEX.CIV.PRAC. & REM. CODE §16.009. This statute prevents certain claims against constructors from being filed ten years from the completion of an improvement to real property. Forty-eight states have similar statutes, though some state courts have invalidated the law for reasons, which will not be addressed in this article.

The statute, in its present form, was enacted by the Texas legislature in 1985. It reads, in pertinent part: "A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement....".

In its most basic application, this statute states in order to sue a contractor, the lawsuit must be filed within ten years of substantial completion of the project. This statute is typical of many statutes passed by the legislature: it leaves many unanswered questions. What is an "improvement" to real property? Who is a "person who constructs..."? Is a "person who constructs" ONLY a contractor, or does it include other manufacturers of things attached to realty?

The legislature has not defined these terms. It is up to the courts to do so - this is where the courts “interpret the laws”. And so begins a journey into the legal process and an understanding of judge-made law and its relationship to legislation, and an understanding of how the court system works. The activity normally takes an entire class period. Students are divided up into groups of about four or five and are given the first handout (*Figure 1*) containing a fact situation (taken from an actual case) and asked to predict how the court will apply the law. One student in the group writes out a simple analysis and conclusion for the group. It makes no difference how they decide the case. The second handout contains the decision of the court in the prior handout, plus the facts of the next case in the series. There are a total of eight handouts, with the last one being a hypothetical case not yet decided by the court.

The students then talk about the case and come to a conclusion. They often want to know what is an “improvement” and they are told that is the entire issue - they must decide if the law is applicable here or not. Often students want more facts, however, the court decided this case based only upon the facts given - they are to work with those facts, and cannot make up any others. Once the students complete the worksheet, they are given the next handout (*Figure 2*).

RIVER OF LAW EXERCISE - STATUTE AND CASE #1

LAW (aka RULE):
TEX.CIV.PRAC. & REM. CODE §16.009. “A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

CASE #1: *Ellerbe v. Otis Elevator*
Location of appeal court: Houston, TX

Facts: Plaintiff is injured by elevator installed more than ten years prior to the date of the accident. Plaintiff sues manufacturer of the elevator. There is no evidence indicating the elevator manufacturer had the repair contract, or in any way had any connection with the elevator for at least ten years. We do not know how, or what specific part of the elevator failed. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Does the above statute prevent the elevator manufacturer from being sued?

QUESTIONS:

What kind of issue is this? (Issue of Fact or Issue of Law). How can you tell?

Who will decide this issue?

Analysis: (Write here, Use reverse side if necessary).

Conclusion: (One word answer to issue above)

Figure 1. River of Law Exercise - Case #1

Notice how the student now has two “laws” - the original statute and the court’s decision in the Ellerbe case. The students can now use both of these to decide whether or not the statute applies to the defendant in the *Reddix* case.

If the students desire a more complete discussion of the case it can be discussed at this point. *Ellerbe v. Otis Elevator Co.* (1982) decided in 1981 out of an appellate district in Houston. In this case an elevator was defined as an improvement. The court said, "An elevator in a multi-storied building obviously constitutes an improvement on real property. The manufacturer of the elevator would be a person performing or furnishing construction of an improvement, even though it did not install it in the building.". The statute applied to the elevator manufacturer and it could not be sued after ten years.

Ellerbe has made judge-made law: elevators are improvements. Assume another case involving an elevator and the statute of repose, arises in Houston. The trial judge and the appellate judge should read *Ellerbe* and hold that the second elevator is an improvement. However, an appellate judge in El Paso, Texas, (which is VERY far from Houston, even by Texas standards) who disagrees with

Ellerbe, need not apply it. That judge may think the elevator is merely a fixture or a component part. The statute would not apply, and the elevator manufacturer could be sued anytime.

RIVER OF LAW EXERCISE - CASE #2

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Elevators are improvements to real property; therefore the defendant is protected by the statute and cannot be sued more than 10 years after the installation of the elevator. *Ellerbe v. Otis*, Houston

CASE #2: *Reddix v. Eaton Corp*.
Location of appeal court: Texarcana

Facts: Plaintiff is injured by electric hoist and hoist link chain that malfunctioned. The electric hoist and hoist link chain were installed in the construction more than 10 years prior to the date of the injury. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Does the above law prevent the electric hoist and hoist link chain manufacturer from being sued?

Analysis:

Conclusion: (One word answer to issue above)

Figure 2. River of Law Exercise - Case #2

The next appellate case to interpret the statute was *Reddix v. Eaton Corp.* (1983). The case involved an electric hoist and a hoist link chain that operated an outdoor elevator. The court determined that the hoist was a mere component part, and not protected by the statute. The court also discussed material providers and stated the statute did not protect them because they do not perform any work or labor in installing or putting the products/component part onto the realty.

In connection with items such as paint, wood and screws the *Reddix* court stated they were materials, and not improvements, and therefore the statute did not apply. Remember that the statute only protects "constructors of improvements to real property". The court defined materialman as "a person who has furnished materials used in the construction or repair of a building, structure, etc." The case then goes on to say "[a] "materialman" in Texas case law has been defined as a person who does not engage in the business of building or contracting to build homes for others, but who manufactures, purchases or keeps for sale materials which enter into buildings and who sells or furnishes such material without performing any work or labor in installing or putting them in place". *Reddix* has made law: materials are not improvements and are not given the protection of the statute.

We now have three categories to put items into: improvements, component parts and materials. If an item is an improvement it is protected by the statute, however, if it is material or a component part, it is not. The next case activity (*Figure 3*) involves an air conditioner.

RIVER OF LAW EXERCISE - CASE #3

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Elevators are improvements to real property; therefore the defendant is protected by the statute and cannot be sued more than 10 years after the installation of the elevator. *Ellerbe v. Otis*, Houston

Electric hoists and hoist link chains are mere component parts, and not protected by the statute. *Reddix v. Eaton Corp*., Texarcana

CASE #3: *Dubin v. Carrier Corp.*
Location of appeal court: Houston

Facts: Plaintiff's daughter dies after a forced-air air conditioning/heating unit malfunctions. The unit produced carbon monoxide gas, which caused girl's death. Unit installed in the construction more than 10 years prior to the accident. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Does the law prevent the air conditioner/heating unit manufacturer from being sued?

Analysis:

Conclusion: (One word answer to issue above).

Figure 3. River of Law Exercise - Case #3

In *Dubin v. Carrier Corp.* (1987) the court determined a heating unit was an improvement. The court said that improvements are all "betterment[s] to the freehold", and are "[some]thing that permanently enhances the value of the premises". Given this definition into what category would fireproofing material fit? It enhances the value of the premises because it reduces the risk of fires. What about paint? Perhaps paint does not permanently enhance the premises, and therefore is not improvement? However the opposing argument is that: does anything permanently enhance the premises? Buildings and parts of buildings deteriorate if not taken care of. Nothing permanently enhances the premises.

At this point in the development of the law a case was appealed up to the Texas Supreme Court. This case was *Conkle v. Builder's Concrete Products Mfg.* (1988) This case (*Figure 4*) involved a concrete batch plant. The court did not decide whether or not the concrete batch plant was an improvement. The court sent the case back (remanded is the legal term) to the lower court to

decide whether the plant was actually an improvement, given evidence that the plant was portable. The Texas Supreme Court also recognized the category of component part in the *Conkle* case and said: "Manufacturers of component parts do not come within the statutory language of section 16.009. We now have some, but not much, Supreme Court law that is effective in the entire state: a product is not an improvement if it is portable AND manufacturers of component parts are not to be considered "constructors of improvements". All courts in Texas must apply this judge-made law. Remember this is Supreme Court case, so the law it has made flows down river to all courts in Texas.

RIVER OF LAW EXERCISE - CASE #4

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Elevators are improvements to real property; therefore the defendant is protected by the statute and cannot be sued more than 10 years after the installation of the elevator. *Ellerbe v. Otis*, Houston

Electric hoists and hoist link chains are mere component parts, and not protected by the statute. *Reddix v. Eaton Corp*., Texarcana

Air conditioning/heating units are improvements to real property. *Dubin v. Carrier Corp.*, Houston

CASE #4: *Conkle v. Builder's Concrete Products Mfg.*
Location of appeal: Texas Supreme Court

Facts: Plaintiff's husband killed in a concrete batch plant built more than 10 years before. He died while inside, doing repairs, when a switch (which was in the "off" position, short-circuited, and the machinery came on causing him to be crushed. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Does the law prevent the manufacturer of the concrete batch plant from being sued?

Analysis:

Conclusion: (One word answer to issue above)

Figure 4. River of Law Exercise - Case #4

Other cases, which discuss the law, are not included in the exercise to keep it shorter. A heater/air conditioner combination unit was defined as an improvement in the appellate court case of *Rodarte v. Carrier Corp.* (1990). A garage door opener was considered an improvement in the appellate court case of *Ablin v. Morton Southwest Company* (1990).

Asbestos containing fireproofing material was not an improvement in *Corbally v. W.R. Grace & Co.* (19??). If you look at the legal citation for this case, you will see it is different than the other cites. It says "F.Supp" in the cite and the others say "Tex.App." or "Tex". The reason for this is the *Corbally* case is a case in a federal court, not in a Texas state court. Why is this federal court applying the law of Texas to this case? Why not federal law?

RIVER OF LAW EXERCISE - CASE #5

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Elevators are improvements to real property; therefore the defendant is protected by the statute and cannot be sued more than 10 years after the installation of the elevator. *Ellerbe v. Otis*, Houston

Electric hoists and hoist link chains are mere component parts, and not protected by the statute. *Reddix v. Eaton Corp*., Texarcana

Air conditioning/heating units are improvements to real property. *Dubin v. Carrier Corp.*, Houston

A product is not an improvement if it is portable AND manufacturers of component parts are not to be considered "constructors of improvements". *Conkle v. Builder's Concrete Products Mfg.*, Location of appeal: Texas Supreme Court

CASE #5: *Corbally v. W.R. Grace & Co.*
Location of appeal court: 5th Circuit

Facts: Plaintiffs injured by asbestos fireproofing material, installed more than ten years prior to injury. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Does the law prevent the manufacturer of the fireproofing material from suit?

Analysis:

Conclusion: (One word answer to issue above)

QUESTIONS:
In what jurisdiction is this case tried? Why?

What law must this court apply? Why

Is *Corbally* law in Texas? Why or why not?

Figure 5. River of Law Exercise - Case #5

This case (*Figure 5*) can be used to show the students how the federal and state courts interact. Federal courts do not generally have jurisdiction over state law matters. What is going on? This is one of those instances when a federal court has jurisdiction over a case involving state law issues. If the parties to a case are from different states, either of the parties can force the case into federal court. This is because the framers of the U.S. Constitution thought state courts would give preference to parties from their own states. In order to prevent this injustice, a party from a different state may force the case into federal court. There is another requirement though: the amount in controversy must exceed $50,000. If the amount the parties are arguing about is $50,000

or less, then they must go to a state court. The name for this type of jurisdiction is "diversity jurisdiction".

When a federal court has been asked to decide a diversity controversy, it must use the same law, statutory and judge-made, as the state court would have. In the *Corbally* case the federal court must use Texas law. The federal court cannot use federal law. It is not uncommon for courts to be called upon to apply the law of different states or even different countries. Care must be taken when using these cases to predict the law however. A federal case deciding state law is not precedent (law) for the state court. Using the analogy of the river, the federal courts are on their own branches; completely separate and apart from the state court system. The law from federal courts does not flow into any state court river. The only exception to this rule is if the case involves an issue of federal law - then the federal law is dumped into state law rivers that decide federal questions. State courts have jurisdiction over issues of federal law, however the opposite is not generally true: federal courts do not have jurisdiction over state law issues. If a case involving fire-proofing material came before a Texas court, that court could reject the finding of the *Corbally* court and say that fireproofing is in fact an improvement.

Readers are now armed with several categories into which items can be placed: improvements, materials and component parts. Determining into which box an item is to be placed can solve a case.

In order to determine if a product manufacturer is protected by the statute we would apply what has been termed an "improvement" test or analysis. In order to determine if a particular item's manufacturer is protected under the statute, one must decide into which box the item should be placed: improvement, component part or material.

The appellate court in *Williams v. U.S. Natural Resources, Inc.* (1993) however refused to grant protection of the statute to a manufacturer of a furnace installed in a house. This is despite the *Dubin* discussed above in which a heating unit was determined to be an improvement. How could *Williams* come to a different decision that *Dubin*? Because *Williams* was decided by the appellate court in Waco, and *Dubin* by the appellate court in Houston. The appellate court in Waco need not follow the decision of the Houston. Recall the analogy of the river. Waco and Houston courts are on different branches and law that flows out of the Houston court does not flow by the Waco court. The Waco court questioned the reasoning that allowed off-site manufacturers of goods purchased and installed by third parties to come within the protection of the statute. The Waco court did not believe that the Texas legislature meant to protect companies which manufactured items like heaters. It did not think that these entities were "constructors of improvements".

The stage has now been set: two appellate courts have decided factually similar cases differently. A manufacturer of a heater is considered a "constructor of an improvement" in Houston, but not in Waco. The law is in conflict. The time is ripe for the Texas State Supreme Court to hear a case involving this issue (*Figure 6*).

RIVER OF LAW EXERCISE - CASE #6

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Elevators are improvements to real property; therefore the defendant is protected by the statute and cannot be sued more than 10 years after the installation of the elevator. *Ellerbe v. Otis,* Houston

Electric hoists and hoist link chains are mere component parts, and not protected by the statute. *Reddix v. Eaton Corp*., Texarcana

Air conditioning/heating units are improvements to real property. *Dubin v. Carrier Corp.*, Houston

A product is not an improvement if it is portable AND manufacturers of component parts are not to be considered "constructors of improvements". *Conkle v. Builder's Concrete Products Mfg.*, Location of appeal: Texas Supreme Court

Asbestos is a mere component part, and not protected by the statute. *Corbally v. W.R. Grace & Co.* Location of appeal court: 5th Circuit

CASE #6: *Williams v. U.S. Natural Resources, Inc.*
Location of appeal court: Waco

Facts: Plaintiff's family members injured by malfunctioning wall heater unit. Unit installed more than ten years before injury. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Does the law prevent the manufacturer of the unit from being sued?

Analysis:

Conclusion: (One word answer to issue above)

Figure 6. River of Law Exercise - Case #6

In 1995 the Texas Supreme Court decided the case of *Sonnier v. Chisholm-Ryder Co.,Inc.* (1995). This case (*Figure 7*) involved a commercial tomato chopper, and the issue was, "Is the manufacturer of the tomato chopper a 'constructor of an improvement'". The Texas Supreme Court decided that the Waco court was correct, and that the Houston court was incorrect. In other words, the Supreme Court overturned the Houston court. In fact the Texas Supreme Court overturned several cases that day, including its own decision, *Conkle.* It made a different law, which is explained below.

RIVER OF LAW EXERCISE - CASE #7

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Elevators are improvements to real property; therefore the defendant is protected by the statute and cannot be sued more than 10 years after the installation of the elevator. *Ellerbe v. Otis,* Houston

Electric hoists and hoist link chains are mere component parts, and not protected by the statute. *Reddix v. Eaton Corp.*, Texarcana

Air conditioning/heating units are improvements to real property. *Dubin v. Carrier Corp.,* Houston

The case was remanded to the trial court to determine if the concrete batch plant was an improvement to real property given the fact that it was portable. Case settled at some point, and no further law made.

A product is not an improvement if it is portable AND manufacturers of component parts are not to be considered "constructors of improvements". *Conkle v. Builder's Concrete Products Mfg.,* Location of appeal: Texas Supreme Court

Asbestos is a mere component part, and not protected by the statute. *Corbally v. W.R. Grace & Co.* Location of appeal court: 5th Circuit

Heating units are not improvements to the real property and not entitled to the protection of the statute. *Williams v. U.S. Natural Resources, Inc.,* Waco

QUESTIONS:
Do *Dubin* and *Williams* contradict each other?

How can this happen?

What is the next step likely to be?

CASE #7: *Sonnier v. Chisholm-Ryder Co.,Inc.*
Location of appeal court: Texas Supreme Court

Facts: Plaintiff injured by a commercial tomato chopper installed in the construction more than 10 years prior to the injury. Court decided issue based only on these facts. You may think the court needs other facts, however the court did believe other facts relevant to its decision on the following issue.

Issue: Is the manufacturer of the tomato chopper a "constructor of an improvement" under the statute? Does the law prevent the tomato chopper manufacturer from being sued?

Analysis: (Use other side if necessary)

Conclusion:

Figure 7. River of Law Exercise - Case #7

Effect of Purpose of the Statute in Interpretation

The Texas Supreme Court looked at the purpose of the statute, not just the literal meaning of the words, in order to reach its decision. What is the statute meant to do exactly? When problems develop in lower courts' interpretations of statutes, judges will often look to the purpose of the statute to make sure that the law is developing in conformity with the purpose. After all it is the purpose of law that is important, not law itself. If the law is NOT developing in conformity with the purpose, it might signal a need to change the law.

What are some of the purposes of this statute? A purpose of a statute of repose is to protect certain people, such as architects, engineers and constructors from liability. This is because they are unable to pre-test and standardize the improvements they design and build. Each construction project is unique, and results in a unique product. The product manufacturer, for example a heater manufacturer, produces standard products for general use. The product manufacturer can test and employ quality control standards at the factory. The manufacturer can change the product to meet new standards discovered after testing. Architects, engineers and constructors generally cannot standardize or pre-test the improvements prior to or after construction.

Case #8 (*Figures 8-A & B*) represents a hypothetical case, which has not yet occurred in Texas. The students can analyze the case using the above law to determine whether or not they think the state court will protect the defendant or not. Case #8 shows the students that the process is ongoing - *Sonnier* did not answer all questions raised in connection with the statute. The hypothetical *Smith v. Jones* case raises an issue that may or may not every be filed. The issue raised is: Does the statute provide protection to an entity that manufactures, but does not install, a custom-made product that is attached to the realty?

The Supreme Court did not address this specific question - it was not an issue in the *Sonnier* case. In fact, had the court discussed the issue it would have been "dicta". Dicta is discussion in a court opinion which is not necessary to the determination of the specific issues raised - it is not law, or precedent for future cases, though it can have an effect on future cases.

The tomato chopper in *Sonnier* was apparently a product generally available for sale to people seeking tomato choppers. What if the tomato chopper had been specially made for the particular plant? What arguments can be made to protect the entity who makes the tomato chopper? What are the contrary arguments?

The argument granting protection is: Since one of the purposes of the statute is to protect constructors of unique products, an off-site manufacturer of a unique product incorporated into the realty should be granted the protection of the statute. Read the statute again. Does it require annexation to the realty as *Sonnier* held? It merely requires that the entity be a "constructor". Another argument is that entities which manufacturer custom-made products cannot pre-test or standardize their products either, so they should be protected.

RIVER OF LAW EXERCISE - CASE #8 (p. 1 of 2)

LAW (aka RULE):
Statute: TEX.CIV.PRAC. & REM. CODE §16.009. A person must bring suit for damages for a claim ... against a person who constructs or repairs an improvement to real property not later than 10 years after the substantial completion of the improvement...."

Electric hoists and hoist link chains are mere component parts, and not protected by the statute. *Reddix v. Eaton Corp.*, Texarcana

A product is not an improvement if it is portable AND manufacturers of component parts are not to be considered "constructors of improvements". *Conkle v. Builder's Concrete Products Mfg.*, Tex. Sup. Ct. Location of appeal: Texas Supreme Court

Asbestos is a mere component part, and not protected by the statute. *Corbally v. W.R. Grace & Co.* Location of appeal court: 5th Circuit

Heating units are not improvements to the real property and not entitled to the protection of the statute. *Williams v. U.S. Natural Resources, Inc.*, Waco

The above statute protects entities that annex products to construction. It is the annexation of the product to the land that is important, not the product itself. It is also important that the product is unique - buildings and other construction works cannot be mass-produced and tested, as can products manufactured in industrial plants. This statute was not meant to be a products liability statute and protect certain products. It was meant to protect certain types of entities. The statute of repose does not protect manufacturers of standard products, such as garage door openers and heaters, unless the manufacturers actually annex the product to the realty. *Sonnier v. Chisholm-Ryder Co., Inc*. Texas Supreme Court

QUESTIONS: (USE REVERSE SIDE IF NECESSARY)
Which "laws" or "rules" disappeared, and why?

Which cases have been overturned? What happened to the plaintiffs in these cases?

How can manufacturers of custom-made products protect themselves under the present law?

What types of manufacturers were protected prior to *Sonnier* that are no longer protected?

How does financial power mold the law?

You will notice these cases deal with the definition of "improvement to real property". There have no cases dealing with the definition of "a person who constructs" or "real property". Why not?

Figure 8. River of Law Exercise - Case #8-A

The contrary argument is to more strictly construe *Sonnier*. Since *Sonnier* says annexation is required, then a party that custom-makes a product, but does not annex it to the realty should not be protected (White & Holland, 1997).

RIVER OF LAW EXERCISE - CASE #8 (p. 2 of 2)

CASE: Smith v. Jones
Location of trial: Brazos County, Tx.

Facts: Plaintiff's spouse is killed by specially designed and manufactured concrete batch plant equipment manufactured by Defendant. Defendant did not install equipment, but custom-made it for plant.

Issue: Does the law prevent the defendant from being sued?

Analysis #1: (Support a "No" conclusion. Use reverse side)

Conclusion: No.

Analysis #2:

Conclusion: Yes. (It is possible to support a "yes" conclusion using the law from *Sonnier*. Can you do it?) Use reverse side.

Figure 9. River of Law Exercise - Case #8-B

Effect of Sonnier on the Cases

Sonnier had the effect of overturning many, but not all of the lower court decision, which had analyzed the statute, was overturned. Which ones were overturned? *Ellerbe v. Otis Elevator Co.* was overturned because Otis did not annex the elevator to the realty.

Reddix v. Eaton Corp. has not been overturned. This was the case involving the elevator hoist, which was determined to be a mere component part, and not an improvement. Component parts were never protected under the judge-made law. *Dubin v. Carrier Corp.* and *Rodarte v. Carrier Corp.* have been overturned as they involved heaters which were not annexed by the defendants. *Ablin v. Morton Southwest Company* is partly overturned. That case involved both the constructor, Morton Southwest, and the garage door opener manufacturer. In connection with the constructor, the case is not overruled - the contractor annexed the garage door opener to the property and is therefore protected under the statute. In connection with the manufacturer the case is overturned; manufacturers of improvements are not protected.

What happens to the plaintiffs in these cases that have been overturned? Nothing happens to them. The *decisions* in those cases still stand; only the *law* has changed. The only actual parties who will be affected by the law are the ones involved in the *Sonnier* case. In fact it is unlikely the parties in the overturned cases are even aware that the law has changed. Many of those cases are over twenty years old and it is unlikely the parties have followed the law. It is also unlikely the attorney in the case will contact the client and tell them things would be different if their lawsuit were filed today.

Summary

Texas case law interpreting TEX.CIV.PRAC. & REM. CODE §16.009 offers a good method for studying the process by which judge-made law is developed. When the law was passed by the legislature it was not clear if manufacturers were to be protected by the statute or not. To fill this void, which is one of the main purposes of judge-made law, the appellate courts developed an "improvement" test to determine if an item was to be protected or not. An item was an improvement if it improved the value of the realty. However other categories of items, namely component parts and materials, were not protected. One appellate court did not agree with this improvement analysis. Eventually another case involving the same law was decided the Texas Supreme Court. The court rejected the improvement test and adopted what might be called the annexation test. Entities that annexed products or materials to real property were protected.

As is typical, the case law has not answered all of the questions that the law might raise. It is up to future cases to more fully develop the law.

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Reddix v. Eaton Corp., 10. 662 S.W.2d 720 (Tex.App.-Texarcana 1983).

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Conkle v. Builder's Concrete Products Mfg., 749 S.W.2d 489 (Tex. 1988).

Rodarte v. Carrier Corp., 786 S.W.2d 94 (Tex.App.-El Paso 1990, writ dism'd by agr.).

Ablin v. Morton Southwest Company, 802 S.W.2d 788 (Tex.App.-San Antonio 1990).

Corbally v. W.R. Grace & Co., 993 F.2d 492 (5th Cir.).

Williams v. U.S. Natural Resources, Inc., 865 S.W.2d 203 (Tex.App.-Waco 1993, no writ).

Sonnier v. Chisholm-Ryder Co., Inc. 909 S.W.2d 475 (Tex. 1995). Actually the case involving the tomato chopper was in the federal court. The federal district court (the trial court) entered judgement in favor of the manufacturer, and the injured party appealed to the federal Circuit Court. The federal Circuit Court recognized that the state of the law was uncertain in Texas and asked (certified the question) the Texas Supreme Court to clarify the law. So the Texas Supreme Court did not actually decide the case, it merely outlined the law to be applied.

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Strategic Management in Construction Education

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Increased competition and changing economic conditions are requiring construction students to understand a wider range of issues than ever before in areas such as strategic analysis, knowledge management, and emerging technologies. However, the development of construction curricula to provide this strategic knowledge is noticeably lacking in current graduate construction programs. With a tradition of project management-focused programs, expanding educational opportunities for students in the area of strategic management represents a significant challenge for construction educators. In response to this challenge, this paper introduces a new course to provide graduate level construction students with a new knowledge set focusing on strategic management. The paper introduces the reasons for developing the course, the case study emphasis within the course, and the industry barriers that may deter the expansion of strategic management education.

Key Words: Graduate Education, Construction, Management

Introduction

The traditional philosophy of management in construction, both in academia and in industry, places great emphasis on the ability to plan and execute projects. Preparing individuals with project management competencies is viewed as a necessary role for university programs. Through the sharing of research, teaching and practice, the construction industry has evolved itself on a project management model. Professors, researchers and practitioners use project management indicators such as schedule and budget as the industry's standard of performance. Similarly, to succeed in academic programs focusing on construction management, the central focus for graduate students is to understand the fundamental skills of project management. In contrast, a similar emphasis on strategic management is noticeably lacking (Goodman and Chinowsky, 1997). Specifically, the analysis needed to solve diverse sets of problems which companies face as they struggle to create competitive organizations requires a distinct set of knowledge, understanding and skills.

Although the pressures of project performance can often obscure the broader social, economic, and professional context in which strategic management is undertaken, it is these broad contextual areas that make strategic management an essential issue for construction students. Rapidly changing social and technological issues are creating a professional environment that will look very different in the coming decades than that experienced in today's organizations. Specifically, three catalysts are converging to motivate construction programs to introduce strategic management concepts. First, the emergence of broad societal and professional issues are affecting core construction concerns including the acquisition of employees, the development of markets, and the use of information. Second, the project management tradition that has served

as the centerpiece of graduate construction education is being challenged as to its capability to address long-term issues. Finally, traditional assumptions of construction knowledge requirements are being challenged as nontraditional issues emerge in both the business and professional environments.

This paper introduces one approach to providing this new knowledge set to graduate level construction students. Specifically, the paper introduces a graduate level course focusing on the strategic management of construction organizations. Additionally, the paper summarizes the background research that prompted the introduction of this course, and the traditions in the construction industry that are setting potential roadblocks to the expansion of this area of education.

The Project Management Tradition

Technology, communication, and market advances are fundamentally changing the global perspectives of time, distance, and spatial boundaries. Two decades ago organizations could identify themselves as local, regional, national, or international in scope and expect that these definitions were clearly defined. However, with the rapid emergence of technological innovations, these boundaries have been blurred to the point where any organization could theoretically join a design or construction project in any location. Concurrently, the concepts of company loyalty, traditional competitors, and employee development are changing at a pace that has not previously been encountered in post-industrial times. It is the emergence of issues such as knowledge workers, new markets, and information technology that are forming the requirement for a broader, strategic management perspective by today's construction graduates.

The emergence of these issues related to the workforce, competition, and information technology represent a cross-section of the business environment. From operations to administration, underlying assumptions held by construction managers for decades are being threatened. In contrast to changes that have previously focused on narrow operations such as the introduction of computer-aided design systems to replace manual drafting, these new forces are focusing on organization-wide changes. However, examining these issues from a strategic perspective raises an issue concerning the appropriateness of the project management tradition as a basis for long-term organization success. The tradition of viewing business practices from the budget, schedule, and operations perspective must be challenged for its relevance to the construction curriculum of the 21st century.

The project management culture is one that runs very deep through the academic and professional construction communities. Current academic and professional practice provides strong indicators that the project management concept is the central focus for researchers, practitioners, and reporters. Topics that are considered "soft" by traditional academicians are often ignored or glossed over in today's classroom (National Science Foundation, 1995; Lih, 1997). Consider the following observations compiled from current literature, interviews with executives, professionals and their clients, and the personal experiences of the authors:

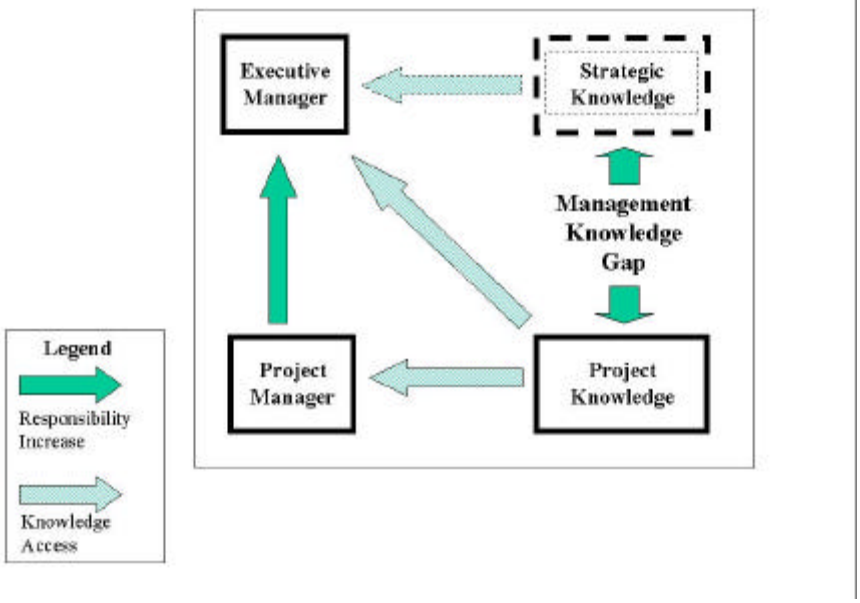

Figure 1: The management knowledge gap appears when senior managers rely on project management knowledge to make strategic management decisions.

1. in the construction-based literature, an overwhelming number of paper topics focus on the technical and managerial issues that affect project success;
2. in graduate construction programs, core courses are designed to teach a balanced combination of technical skills and project management techniques, and very few offer more than one course in areas such as company management or strategic industry analysis;
3. the research reports funded by the Construction Industry Institute, a leader in industry-focused research, indicate support primarily focused on improving the cost effectiveness of projects; and
4. in construction organizations, aspiring leaders are assigned a project-oriented career path, where extensive education and experience is provided in tasks that focus on the efficient planning, coordinating, implementing and controlling of projects.

The combination of these project management focal points has led to the development of a management knowledge gap (see Figure 1). In this knowledge gap, construction professionals are relying extensively on project management knowledge to perform strategic management tasks. Beginning with construction education, the continued emphasis on project management as the key to organization success reinforces a reliance on project management knowledge. A similar focus on strategic knowledge is downplayed as project management excellence is rewarded within the organization through increased responsibilities, and outside the organization through additional client projects. However, the justification often given within the construction industry to focus on project management is based on historical factors. The building boom and bust cycles have seen companies experience economic success and failure on a regular basis (Suhanic, 1997). Similarly, many company reputations have been damaged due to the inability to successfully control project schedules and budgets (Clough and Sears, 1991). Finally, the

attempt to predict building trends has led to both company failures as well as successes (Harrigan and Neel, 1996).

Given the impact of these economic issues on the construction industry, it is not surprising to see that construction management education has evolved with a similar emphasis on project-level budget and schedule controls. Specifically, the evolution of project management as the overriding focus of university programs has both followed and reinforced the management traditions as they have prepared each succeeding generation of industry managers (Goodman and Chinowsky, 1997). In an attempt to respond to industry requirements for specific educational skills, university programs have slowly emerged as a mirror image of the industry itself, instilling in students a strong belief that the successful planning and execution of a project is the fundamental key to professional success (Pries and Janszen, 1995). Reviewing the graduate courses offered by construction programs across the country today, only two programs were found to offer more than a single course on strategic management issues. As such, few students are exposed to more than a cursory introduction to areas related to managing construction organizations, such as creating corporate strategies, forecasting the impact of new technologies and enhancing client relationships.

The Strategic Management Course

In response to the gap in strategic management knowledge, a strategic management course has been introduced for graduate level construction students interested in organization management. The focus of the course is the study of strategic management issues through a combination of in-class lectures, case-study analysis, and field studies of construction, architecture, and engineering organizations. The initial offering of the course was limited to 11 graduate level construction students, with the second class limited to 15 students. The size of the course will be slowly increased over the next several years until it reaches an anticipated size of 35 construction graduate students in 1999. However, focusing on a broader impact, the concepts developed in the course will be made available to other educators to extend the strategic management concept throughout the construction education community.

Course Curriculum

The strategic management course curriculum provides students with two primary avenues to study strategic management concepts, classroom cases and field analysis (See Figure 2). Through this multifaceted approach, students obtain both a theoretical understanding of strategic management and a practical understanding of what company executives are currently doing to address strategic planning within their own construction organizations.

Classroom Cases

The central component of the strategic management course focuses upon providing students with an overall understanding of the concepts that underlie strategic planning and management. However, rather than relying on a traditional lecture format, this introduction is focused around Harvard Business School case studies. While these cases are traditionally associated with MBA

programs, the large number of cases and teaching materials available in the Harvard Press library (over 7,000) provide a diverse selection which cover cases from throughout the industrial spectrum, including engineering and construction. The selection of these materials provided a valuable benefit by serving as an added level of credibility for the course. In conversations with the students prior to the start of the course, many of them pointed to the Harvard connection as a primary reason for testing the course since they were familiar with the Harvard business methodology and its reputation for management studies.

Module 1: Strategic Planning
Case Analysis Technique, Introduction to Strategic and Business Planning, Current Construction Trends

Module 2: Mission Development
Company Organization, Vision Statements, Core Competencies
Case Analysis: Urban Restoration and Investment

Module 3: Company Organization
Hot Teams, Group Dynamics, Corporate Organizations
Case Analysis: Managing Dispersed Organizations

Module 4: Human Resources
Human Resources, Learning Organizations, Corporate Education Plans
Case Analysis: Managing Professional Intellect

Module 5: Market Analysis
Market Analysis, Opportunity Analysis, Emerging Markets
Case Analysis: Competition and Strategy Development

Module 6: Strategic Development
Long-Term Planning, Client Development, Strategic Marketing
Case Analysis: Client Response and Project Development

Module 7: Financial Analysis
Financial Analysis, Reading the Numbers, Economic Trends
Case Analysis: Land Development and Profits

Module 8: Project Presentation

Figure 2: Strategic Management Course Curriculum – The modules follow a basic business plan outline, giving students the opportunity to develop a strategic plan for a new business through the individual modules.

The use of the case studies in the course focused on weekly analytical papers. After an initial week of introduction to the case method of teaching, the students were introduced to the core of the case study method. In the twice-a-week course format, each week was devoted to the introduction and exploration of a new topic. The first lecture of each week was devoted to the discussion of readings selected from the Harvard Business Review articles. Following the pattern of a standard business plan, the articles introduced the students to the issues and requirements of starting and operating a construction company. Complementing these articles were a selection of case studies. In the second lecture of each week, the students were presented with a case study to read and summarize. Given one week to read and analyze the cases, each student was required to write a summary of the case and an analysis indicating how the case

relates to current construction management practices. To facilitate discussion of the cases, two students were selected each week to lead the analysis of the issues. This component of the course was critical to ensure that the students became active participants in the discussions. In contrast to traditional lecture formats, this focus on discussions and cases provided opportunities for students to engage in the process of self-discovery and communication that are currently being advocated by national research agencies (Committee, 1995).

Analysis Efforts

The second component of the strategic management course provided students with the opportunity to perform a field analysis of a construction company and obtain an understanding of how strategic planning is currently being done in the construction industry. In contrast to the overall perspective of the Harvard Business cases, the field analysis component challenged students to capture the strategic management process of an individual company within the context of a written case study and oral presentation. Of particular interest, were design and construction companies focusing on emerging markets and expansion programs.

An example of this field analysis effort is the study of a medium-size construction and development firm (approximately $250 Million annual revenues) in Atlanta. The firm under study decided to differentiate itself from its regional competition by focusing on the emerging market of urban restoration and loft development. The corporate decision to make a strategic emphasis of this area required the company to branch into several areas beyond its traditional general contracting strength including property management, restoration design and engineering, and real estate development. The entry into this market required a combination of management decisions ranging from marketing efforts and construction management to economic forecasting and the revision of corporate mission statements. This situation is an example of a corporate decision that could not be achieved through a traditional project focus. Rather, the students had the opportunity to observe the company as it attempted to take a strategic view of its new market focus, and begin to put into place the corporate level structures required to address an emerging market. Concurrently, the students had the opportunity to objectively analyze the positive and negative steps the company adopted within this process and place the analysis into the form of their own case study analysis.

The combination of this field effort with the weekly case analyses provides the students with both a theoretical and a practical exposure to the strategic management topic. Similar to the approach of having construction students observe field operations to enhance topics such as productivity and equipment, the two-phase approach reinforces the classroom concepts. However, of greater importance, is the opportunity to view first-hand the management knowledge gap that exists within many areas of the construction industry. By analyzing the attempts by companies to expand operations based primarily on project management justifications, the students obtain a context for obtaining strategic management knowledge. Additionally, the students have the opportunity to evaluate their own career aspirations in terms of breaking from the project management tradition. With a broader perspective on the construction industry, the students have a greater opportunity to evaluate the opportunities provided by owner organizations, consulting firms, or the development of their own businesses.

The field analysis efforts have proven to be a valuable benefit for both the students and the companies studied. Each of the companies participating in the analysis section has sincerely appreciated the recommendations for future strategic plans as made by the students. This success has provided the basis for recruiting new organizations to participate in future field analysis exercises. This commitment ensures that the field analysis component of the course will continue to be an integral learning experience as the course builds to a full enrollment level.

Student Follow-Up

The success of any course can be measured through a number of measures. The retention of material, course evaluations, and student demand are all indicators that have been used to benchmark courses. In the case of the strategic management course, a different benchmark was adopted for follow-up purposes. Specifically, the students were followed after the first course to determine the impact of the course on their career objectives. The hypothesis of the follow-up was that the strategic management course provided a broader industry perspective and thus altered the career objectives of a notable percentage of the students. This alteration was broadly defined for the initial study to include options such as changing focus from obtaining a position with a contractor to obtaining employment with an owner, opening a business, starting a new division within an existing company, focusing on consulting companies as employment preferences, or electing to remain in school to pursue a doctorate in the management area. The common thread throughout these options was a divergence from the preconceived vision that the students held upon entering the course that the general contracting field was the probable employment avenue upon graduation.

The follow-up process has tracked the career directions of the original 11 students through to their current employment or education status. Based on this follow-up study, the following data was developed:

Electing to remain for Ph.D. studies in strategic management:	3
Electing to work for owner organization:	3
Starting new business venture:	1
Electing to work for non-engineering consultant:	1
Electing to work for general contractor:	1
Remaining as Ph.D. student in non-management area:	1
Unknown status:	1

While it is difficult to make any definitive conclusions from an initial data set, clear trends are emerging from the follow-up study. First, the number of students electing to continue their studies in strategic management provides a clear indication that the topic has a graduate-level audience. Second, the focus on owner organizations and consulting opportunities indicates a strong interest in non-traditional employment opportunities. Finally, the overwhelming number of students that elected to follow non-traditional career paths indicates a strong need for construction management programs to address the changing construction profession. Although further follow-up studies are required to validate these initial findings, the data provides a basis from which to examine the potential industry barriers to breaking the construction education tradition.

Industry Tradition: A Potential Barrier to Curriculum Expansion

Graduate programs provide an excellent opportunity to introduce construction professionals to the complex demands of today's business environment. However, an analysis of public data compiled by Dun & Bradstreet (Dun & Bradstreet, 1996) on construction executives reveals a potential barrier for construction educators who are interested in expanding current curricula to address these issues and better prepare future industry leaders: a tradition of field-oriented career paths by construction executives. The analysis of the data focused on the educational and professional statistics of 264 executives (vice-president levels and higher), from a broad spectrum of mid-size construction companies (100-2500 employees) throughout the United States. Although the services that each of the companies were involved in varied, all of them had significant involvement in professional project management. While these executives all had undergraduate degrees, the profile of the executives indicated a strong focus on traditional construction education and industry values. The size of the companies was limited to this domain since it represents the greatest consistency in management practices among construction organizations. Results may be different for larger organizations since they have the financial resources to develop executives within internal training programs. Similarly, smaller organizations tend to have less stability in their management structure due to project-level demands on each individual in the management hierarchy.

Graduate Degrees Held by Executives

The first finding of interest focuses on the extent to which industry executives hold graduate degrees. The data analysis found that sixty of the executives (23%) hold graduate degrees. However, only fourteen executives (5%) hold construction or engineering degrees, while forty-six executives (17%) hold non-construction or engineering degrees. The majority of these non-construction degrees being in business or management.

The disparity between the number of construction degrees and business degrees held by executives is an issue for several reasons. First, graduate construction programs are intended to provide the greatest opportunity to investigate the evolving issues in construction. Business school programs spend limited amounts of time discussing issues directly related to construction, focusing more on familiar manufacturing and service industries that have extensive teaching materials and case-studies. Secondly, the trend for executives to choose business schools over construction programs indicates that what is currently being offered in construction is of little value to their knowledge development. This perception, either real or imagined, represents a problem for educators in that before revised programs can begin to have an impact on the industry, industry leaders must see a value in either sending their employees to such a program, or in hiring students with such an expanded knowledge base.

Number of Years with Company

The second finding of interest focuses on the career paths that executives typically follow within a company. This finding is significant based on the traditional industry viewpoint that experience and loyalty are valued above advanced university training. The data analysis examined this issue based on the number of years each of the executives had spent with their

company and found that 63% of the executives had spent twenty years or more with their organization, and fewer than 10% had spent less than 10 years (See Figure 3). What this finding illustrates is that companies value an employee who charts a long-term career path within an organization. While these findings cannot conclude that all industry professionals necessarily follow a similar path to the executive level, this finding does reiterate the notion that the industry tends to create environments that facilitate slow, traditional career progressions, emphasizing the acquisition of established company processes and strategies.

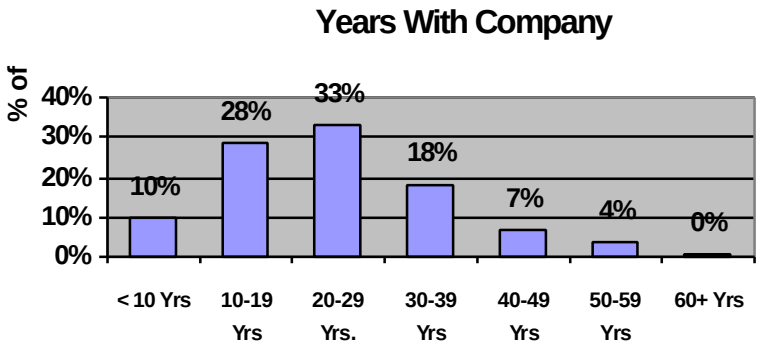

Figure 3. Number of years that executives currently have spent with construction company.

Additionally, this finding also suggests that little effort is being made to infiltrate new ideas from university programs into the upper levels of construction companies. Rather, companies appear to value long-held company processes and strategies. While there is merit in relying on proven strategies, the rapidly emerging world of construction requires companies to examine innovative ideas to remain competitive. Until industry companies understand and accept this need to obtain fresh ideas within the upper levels of the organization, this reliance on traditional company processes and traditional construction knowledge will be a barrier for educators to convince the industry that new curricula is required.

Conclusion

The identification of the management knowledge gap as a construction education issue represents a first step toward creating a solution for construction educators. Building upon this step requires the next major effort. The development of courses that diverge from traditional industry and program objectives is a major undertaking requiring the commitment of faculty and administrators as well as student interest. However, as the emerging construction issues illustrate, a need exists to introduce these concepts into formal curriculum offerings and thus to a greater student audience. While it is unreasonable to argue that educators should abandon their traditional approach to graduate education, it is reasonable to argue that graduate construction education must be augmented and expanded to address the emerging concerns of today's business world. Tradition is an important element in both education and industry; however, tradition cannot limit progress in the development of education curricula. It is time for

construction educators to break from tradition and start laying the educational foundation that will result in once again producing industry leaders.

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Limited - Resource Allocation in Construction Projects

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The limited-resource allocation problem arises in many construction projects when there are different limitations on the amount of resources available to the contractor. The scheduling objective is to hold project duration to a minimum while resolving the resource conflict by shifting the activities until the resource requirements do not exceed the amount of resource available. The objective is to minimize project duration using the resources available and increase the utilization of equipment and labor force available. Numerous computer packages have been developed for limited – resource management. Some of these packages assign priorities to the project activities based on measures obtained from the critical path calculations. The objective of this paper is to demonstrate the major difference between the approach taken by one commercial computer package and one of the priority ranking procedures developed in some of the heuristic techniques.

Key Words: Limited Resources, Project Scheduling, Resource allocation, Resource Leveling

Introduction

The most efficient method for developing a construction schedule is to use computer programs. The objective for a contractor is to create the most efficient schedule possible and maximize the usage of the available resources. Scheduling, allocating, and leveling resources for a project can be a time consuming task unless a computer program is used. In most cases, computer programs will give adequate solutions. However, when resource requirements exceed the amount of resources available, the computer programs do not provide the optimum scheduling solutions. The best solution is defined in this paper as the one with the shorter project duration.

When generating a schedule by hand, the scheduler uses his/her experience with similar projects to make decisions concerning time, resources available and cost involved to create a schedule. A set of preprogrammed procedures is used when generating and calculating the schedule using computer software packages like Primavera for Windows. Primavera generates a schedule based on the critical path (CP) calculations and assigns priorities to the project activities based on those CP calculations. These CP calculations are based on unlimited resources available. This paper will show that the default procedures used by Primavera when leveling project activities with limited project resources do not consistently give the best solution to the problem.

Theory and Background

Heuristic Priority Rules

The basic premise of most heuristic procedures for resource-constrained project scheduling is to use a priority rule to rank the activities, and then schedule the ranked activities such that the resource limitations are not violated and the shortest possible project duration is obtained. There are a large number of different heuristic priority rules proposed. Table 1 below lists eight rules proposed by Khattab and Choobineh, (1991).

Table 1

Khattab and Choobineh's Proposed Eight Rules

No.	Priority	Mathematical form
1	$\frac{\text{Activity time + time of all sons}}{\text{Activity resource + resource of all sons}}$	$\frac{T_i + \sum_{j \in N F_i} T_j}{R_i + \sum_{j \in N F_i} R_j} \forall i$
2	Total time of sons	$\sum_{j \in NF_i} T_j \forall i$
3	(Activity time + time of all sons) - (total time of parents)	$(T_i + \sum_{j \in NF_i} T_j) - \sum_{j \in P_i} T_j \forall i$
4	Activity time + time of all sons	$T_i + \sum_{j \in NF_i} T_j \forall i$
5	$\frac{\text{Activity time + time of all sons}}{\text{Number of immediate sons}}$	$\frac{T_i + \sum_{j \in IF_i} T_j}{\sum_{j \in IF_i} X_j} \forall i$
6	$\frac{\text{(Time of immediate sons / Resource of immediate sons)}}{\text{Activity resource / Activity time}}$	$\frac{\sum_{j \in IF_i} T_j \Big/ \sum_{j \in IF_i} R_j}{R_i / T_i}$
7	Activity resource	$R_i \forall i$
8	$\frac{\text{Activity time}}{\text{Activity resource}}$	$\frac{T_i}{R_i} \forall i$

Where:

i or j	Activity index, i=1, 2, ..., n
T_i	Time required to complete activity I
R_i	Resource required to complete activity I
NF_i	Set of activities that follow activity I
IF_i	Set of activities that immediately follow activity I
X_j	Number of immediate sons

The Critical Path Method (CPM) - based group of rules are used in most computer software packages developed for construction project management. Priorities are assigned to the activities based on measures obtained from the critical path calculations. Note that the calculations are made assuming unlimited resources are available. This paper will compare the CPM heuristic with priority rule 7 listed in Table 1 by scheduling and comparing four real projects. When leveling, priority rule 7 gives the activity with highest resource demand the highest priority.

Resource Leveling vs. Resource Allocation

Resource Allocation and Resource Leveling are the two basic categories for scheduling resources. Resource allocation is used when there are definite limitations on the resources available. When leveling using resource allocation techniques, both the non-critical and critical activities are shifted with the objective to extend the project duration as little as possible beyond the original critical path length. Resource allocation depends on a list of criteria for how to allocate limited resources within a specific period. The available resources need to be compared to the resource demanded by a given activity.

When there are insufficient resources available, the activity has to be rescheduled to free necessary resources. In the case where two activities require the same resources simultaneously and there are insufficient resources to start both activities as planned, the activity with the highest priority will get the scarce resource first.

Resource leveling is used when there are enough resources, but the fluctuations of resource usage need to be leveled. The project duration calculated by the critical path initially remains fixed. The leveling process is accomplished by shifting only the non-critical activities within their floats.

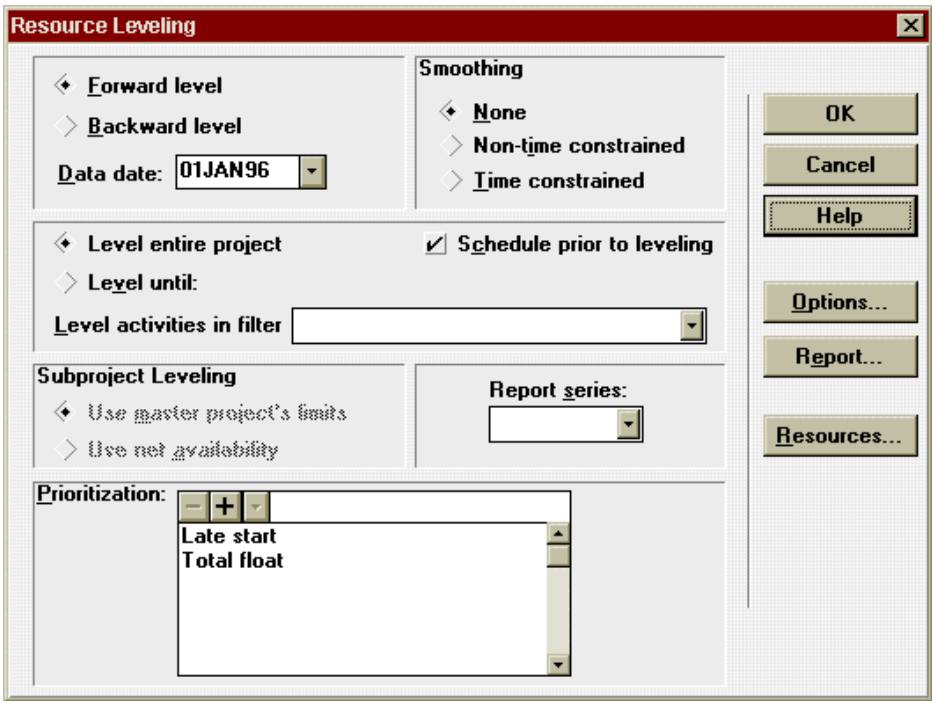


Figure 1. Primavera Resource Leveling Options.

Primavera for Windows (P3) was used for scheduling and leveling the example projects described later in this paper. Below is a brief description on how P3 levels a project. Note that P3 first schedules and calculates the Critical Path.

P3 needs the following data to level a project. Start Dates, End Dates if a fixed end project, normal and maximum resource usage (money, labor, equipment), and resource usage for each activity. There are several options to select before leveling a project. The most important options are described in the Primavera Reference Manual, (1993) and are summarized below:

Forward level/Backward level
Forward leveling schedules a project using early dates. Predecessors are leveled before their successors. Primavera levels from the first activity with no predecessors to the last activity with no successors. Backward leveling schedules a project based on late dates. Leveling begins with the last activity in the network with no successors and ends at the beginning of the network.

Smoothing
The purpose of smoothing is to obtain a more uniform profile of resource usage. During leveling, P3 checks whether the resource requirements exceed the normal limit. If they do, P3 delays the activity as long as positive float is available. There are three options to choose from, 1) None, 2) Non-time constraint, and 3) Time constraint smoothing.

When smoothing is not used (when None is selected) and an activity cannot be scheduled and cannot be delayed any longer because all float has been used, the available quantity jumps from the normal limit to the maximum limit.

Non-time-constrained smoothing is a process that changes resource availability from the normal limit to the maximum limit using a series of steps rather than a single leap. P3 divides the difference between the normal and maximum limits into 10 increments. If the normal limit is exceeded, P3 increases the maximum limit by the first increment and tries to schedule the activity. If the normal resource requirement still exceeds the limit, P3 increases the limit again by the next increment.

Time-constrained smoothing is used when the end date of a project is rigid, and additional resources must be sought to meet overload conditions. Time-constrained smoothing assumes a doubled maximum limit of resource availability so you can schedule as many resources as possible during leveling for activities that are constrained by time. P3 does not increase availability past the activity's late finish.

Prioritization
During resource leveling P3 establishes a list of activities in topological sequence. As resources are leveled, if more than one activity can be leveled at the same time, the prioritization codes are used as a tie-breaker. P3 levels the activity having the highest priority code before the ones with the lower priority codes.

Default Layout

P3 suggests a default layout for the leveling procedure that will be used unless the user changes the default parameters. The most important feature in the leveling process is Prioritization. By default P3 suggests using "late start" as the first parameter to level by, if two activities can be leveled at the same time the "total float" will decide which activities start first.

Primavera suggests an extensive list of parameters that can be used to prioritize activities. Fig. 2 shows the default list. "Activity Description" and "Activity ID" are the first two options Primavera lists for the user. No projects should be leveled using these and the majority of the options given since they have no significance to the leveling process.

Discussion of Results

To compare P3 for Windows with priority rule number 7, four real projects were scheduled. The projects varied in size, complexity and resource availability. Each project was scheduled using information given from the contractors involved in the project.

Figure 2. Prioritization Options.

Priority Rule using Primavera

To use the priority rule with P3 we assigned each activity a number from "1" to "10" by defining an extra field using the command "activity codes". This number reflects the activities total resource need. The activities using the highest number of "man hours" are assigned the number "1". When leveling the project the "priority rule" has to be selected as the first priority. Second priority was chosen to be "total float". Four construction projects were selected for this study.

Project 1: Lincoln Northeast High School addition

The project is an approximately $3 million dollars addition and remodeling of the Lincoln Northeast High School. The three story addition is constructed of masonry exterior walls with interior steel column and steel joist decking system. The new addition consists of a media center,

new classrooms, library, and teacher's work stations. The project consists of two phases. Phase 1 has a one year duration. Then phase 2 overlaps with phase 1 during the summer vacation. The project consists of 80 activities and must be completed by December 1996, for a total duration of 19 months.

Project 2: First Data Resources

The project consists of constructing a 144,000 ft^2 output service facility. The building is to be constructed using a steel framing, open web steel joists, precast exterior panels and a concrete slab flooring system. The owner has requested the building to be completed in six months. The project consists of 71 activities.

Project 3: Southeast Community College, Cafeteria/Bookstore addition

The project has a 12-month duration and consists of constructing a new Cafeteria and Bookstore for the Southeast Community College. The project consists of 45 activities.

Project 4: Dr. Gewain Office Building

The project is an $800,000 dollar construction of a two-story office building. The construction duration is approximately six months. The scheduling started in the middle of the period. The project had a fixed end date for completion of the first floor, because of a tenant's need. The project consisted of 58 activities.

Comparison of the Projects

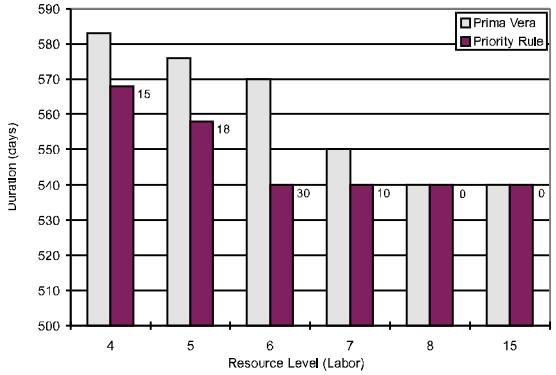
Depending on the preference and experience of the scheduler, the projects could be leveled based on any of the resources used with the project. The four projects described in this paper were leveled based on the resource "general labor".

The comparison between the CPM-based rule P3 uses and the Priority rule is charted in Fig. 3. The data indicate that the priority rule performs significantly better than the CPM-based rule. Project 1, for example, shows that with a resource level of 5 people the priority rule gives a completion date 18 days (as indicated on the graph) earlier than the CPM-based rule. With a resource level of 6 the priority rule gives completion of the project 30 days earlier than the CPM-based rule. Note that for all the projects the priority rule performs better than P3 when there are resource limitations.

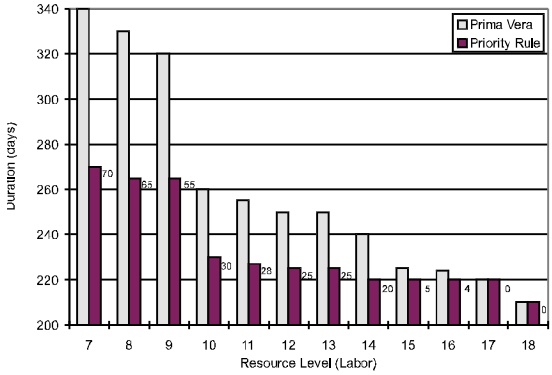
Also, P3 does not give the user the option to specify the minimum resource level needed to schedule an activity and therefore this is not taken to account when leveling the projects.

Conclusion

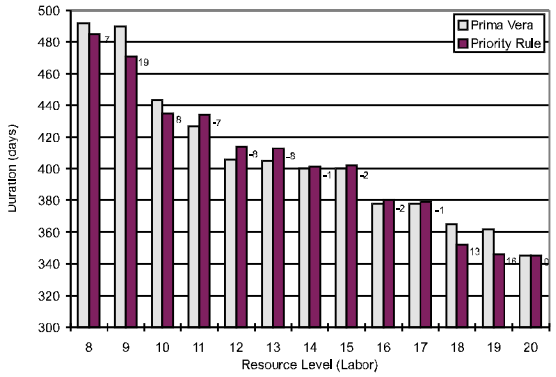
The priority rule performed significantly better than the CPM-based rule when leveling the four projects described in this paper. The priority rule performed best when leveling projects with



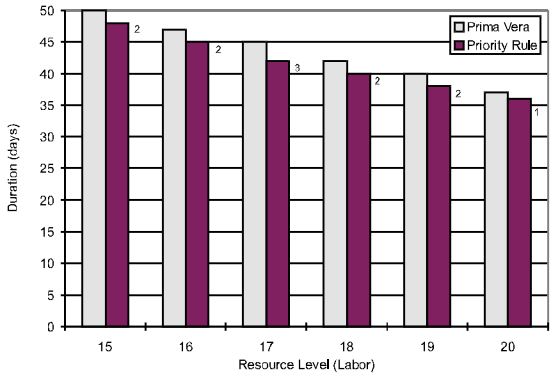
Project 1: Lincoln Northeast High School



Project 2: First Data



Project 3: Southeast Community College



Project 4: Dr. Gewain Office Building

Figure 3. Graphical presentation of the Resource Level vs. Project Duration. (Note: scale is not identical in the four plots.)

resource limitations. Other priority rules might perform better when other constraints govern the project. The experienced user of a scheduling software would not accept the default leveling procedure given by Primavera. The scheduler would need to level the project using different heuristics in order to find the best solution, which is a time consuming task. It would be advantageous to any project manager to have a computer software equipped with the option of testing the behavior of his/her project under limited resources using a set of priority rules that would result in the best duration possible for the project. This will eliminate the time consuming process of testing each rule individually.

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The Uniform Commercial Code: How it Effects Construction Contracts

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There are two types of contracts. A different set of laws applies to each. The common law of contracts governs a contract for services. The Uniform Commercial Code (UCC) applies to the sale of goods. However, many construction contracts are a mix of both goods and services. This type of contract is a hybrid contract. When a claim is in litigation, the court applies either common law or the UCC to a hybrid contract. The outcome of the case depends on whether the court interprets the contract as either predominately for services or for goods. This paper will highlight the major disparate rules applicable for each type of contract. It will also explain the different tests the court system uses to determine the contract type in dispute -- a services contract or a goods contract. Most cases involving construction contracts are service contracts and governed by common law. However, in 1974, the court applied the UCC to a hybrid contract in *Bonebrake v. Cox* developing the predominate thrust test and has since set precedence in many such cases. A study of court cases from the State of Georgia yields data on the hybrid contract issue with a sample of 12 cases. The qualitative survey resulted in the gravamen test and divisibility test as most used by the court system of Georgia. The character of the agreement itself must provide much defense as to the type of contract. Therefore, contractors should use several tests to advance their argument. This study will assist a contractor to develop a beneficial agreement that the legal system will support under interpretation.

Key Words: Construction Contracts, Hybrid Contracts, Predominate Thrust Test, Uniform Commercial Code

Introduction

Construction is fraught with contract claims because of the risky nature of the industry. The amount of risk in each construction project correlates directly with the number of involved variables. Variables within the project that produce risk include the owner, architect, contractor, subcontractors, and vendors; the weather; the economy; and the land where the project stands. All of these entities can be a variable or "fickle and inconsistent" (Webster's Collegiate Dictionary, 1996). These variables can lead to expensive claims and litigation. A thorough contracting process established at the onset of each construction project can limit some of these variables and avoid many potential claims.

One aspect of contracting involves determining the type of contract. There are two types: a) a contract for services or b) a contract for the sale of goods. Different laws govern each type of contract. The Uniform Commercial Code (UCC) Article 2 controls contracts for goods. The UCC defines goods as "all things (including specially manufactured goods) which are movable at the time of identification to the contract for sale" (UCC, 2-105, 1995). The UCC defines sale

as "the passing of title from the seller to the buyer for a price" (UCC, 2-106, 1995). Alternatively, general contract or common law as outlined in Restatements 2nd governs contracts for services.

Construction contracts are classified as service contracts; meaning the contract is typically labor intensive. Many construction contracts, however, are actually a hybrid contract -- a mix of goods and services. For example, a hybrid is a subcontract by a mechanical contractor to supply both material and labor. A mechanical subcontract includes both the procurement and installation of the Heating Ventilating Air Conditioning (HVAC) system. Understanding that an agreement is a hybrid is important because the resolution of a dispute over a contract will differ depending on the nature of the agreement.

This paper will highlight the major disparate rules for each type of contract. It will also explain the different tests the court system uses to determine what type of contract is in dispute -- a services contract or a goods contract. This study will then provide examples of how the court utilizes these tests while construing when a hybrid construction contract is a valid Uniform Commercial Code (UCC) agreement and not a services agreement under Restatements 2nd and how these different rules effect the outcome of a claim. The result of this analysis will assist construction project managers in making informed decisions about contract offering and acceptance. It will place them in a better position to affect a contract breach.

Importance of the Study

As the construction industry becomes more prone to claims and litigation, legal scholars turn their attention to how the court system rules on these cases. Most cases involving construction contracts are service contracts and governed by common law (Soehnel, 1981). However, in 1974, the court applied the UCC to a hybrid contract in *Bonebrake v. Cox* and has since set precedence in many such cases. The application of the UCC in hybrid construction cases is now at the forefront of discussion.

One author states because a hybrid contract always involves a sale of goods, the addition of services in the contract muddles the definition. Therefore the court has a difficult time defining when and how the UCC applies to these types of contracts. This author believes the transfer of title should be removed as the definition of "sale" in the UCC. The words "vend", "vendor" and "purchaser" would provide a broader use of Article 2 in hybrid contract cases (96 Harv. L. Rev. 470, 1982). McAlpine and Breuch (1995) argue that "contractors ...need predictability in standard contracts, both in terms of content and interpretation. This is particularly true given the fact that contractors often do not have enough time to formulate bids, much less time to examine and determine the enforceability of each new variant contract clause. The greater the predictability of a contractual risk, the more accurately contingencies can be determined at the time bids are submitted." To add to the confusion, McLaughlin (1993) declares the UCC does not define its key terms and therefore the court relies on state common law to define such words as "offer", "acceptance" and "possession", mixing the two types of law in one ruling.

Hawkland (1995), one of the leading scholars on the UCC, states "...a large grey area exists in which contracts involving provisions of both goods and services do not readily fall into one category (of law) or the other." This paper will outline the points of law that differ between a contract for goods and a contract for services and how the court applies them in a hybrid contract. In this way, contractors may determine for themselves how the court might rule on a dispute.

Review of Literature

The result of this literature search yields much discourse on how the rules of law apply to hybrid contracts. Several authors espouse regarding various tests the court system applies to determine if a hybrid contract is predominately for goods or for services. Many attempt to analyze Karl Llewellyn, the primary architect of the UCC, to try to make some sense of how he intended the court system to interpret UCC rules. However, this researcher found no evidence of a statistical analysis of the tests or any other theories that might assist in outlining the applications of the UCC. The following is some historical background on the UCC and delineation of the differences between common law of contracts and the UCC. This section concludes with details of seven tests and how the court applies them to hybrid transactions.

History of the UCC

Whitman (1987) writes that the philosophy behind the development of the UCC is traceable back to the Romantic era in Germany when the "group" became more important than the "individual" after the turn of the century. The concept of merchant law began to form, as a jury of peers became the prevalent thought of the day. They felt that a panel of fellow merchants should judge a merchant. Karl Llewellyn, chief author of the UCC, was an American legal scholar, schooled in Germany as a boy, who later returned as a visiting professor during this period. Whitman believed Llewellyn saw that common law did not protect the mercantile industry and determined that scholars should proffer separate legal rules. By the time Llewellyn returned to the US with this novel philosophy, the Depression had gripped the economy.

Kamp (1995) alleges that Llewellyn brought these theories back to this country at a time when the leaders of this nation were looking for anything that would bring the economy out of the Depression. Industry had changed from being entrepreneurial to being primarily led by the corporation. The economists of the time blamed the collapse of the economy on the greedy large corporation who paid low wages and undercut all competition. Therefore, purchasing power became non-existent. The development of the UCC intended to even the hands of competition and give decision-making power back to all merchants. The thought was that if both the buyer and the seller had the ability to control the outcome of a contract, then purchasing power would be restored to the buyer and the economy would be able to rebound. Kamp believes Llewellyn led the UCC development to rules that allowed both sides of a transaction equal power.

The development of the UCC began in the late 1930's, led by Llewellyn, and presented to various committees in the early 1940's. After much debate and editing, Congress formalized and adopted the UCC in 1952. It has since received further editing and was re-issued in 1962 and

again 1977. Most recently, scholars clarified the language in the UCC and re-published the Code in 1995.

General Contract Law vs. the Uniform Commercial Code

As previously stated, the common law of contracts and the UCC produce different outcomes when litigating a claim. The differences are as follows:

Contract Formation
The contractual process of offer and acceptance differs in general law and in the UCC. Under common law, to form a contract, the offeree must accept the exact form of the offer. The offeree prompts a counter-offer if acceptance differs in any way from the original understanding. Additionally, the offer must outline the means of acceptance. Actual acceptance requires strict adherence to the means. Conversely, reasonable formation of a contract under UCC Article 2-206 and 207 (1995) is by a mere expression of acceptance followed by a written confirmation even if the terms differ. The differing terms become an addition to the contract. No longer is the "mirror image" necessary when contracting for goods. The offering party accepts the differing terms unless they give 10 days notice of objection.

Contract Terms
The UCC rules differ from common contract law in outlining the terms of an agreement. Under common law, a contract must set out all terms. Otherwise, the contract is null and void. UCC Article 2-204(3) (1995), however, states that a contract will not fail due to the lack of definite terms. The quantity is the only term necessary in a goods contract. When the quantity is difficult to set, the contract invokes the reasonable requirements rule; i.e., the supplier will try within reason to meet the requirements of the contractor (UCC, Article 2-306, 1995).

Risk of Loss
Responsibility for the contracted merchandise differs between the UCC and common law. In case of damage, if a construction contract outlines which party is to bear the loss, these rules will prevail. When it does not and the contract is for services, there is no prevailing rule and frequently, court action ensues. Conversely, when the contract is for goods and the UCC prevails, Article 2 delineates who bears the loss. Under UCC Article 2-510 (1995), in the event of a breach, such as nonperformance, the breaching party bears the loss. Under UCC Article 2-509 (1995), where there is no breach and shipment is by common carrier, the responsibility of the shipment lies with the controlling party. The Free on Board (F.O.B.) designation names the controlling party. Should the contract state "F.O.B. Seller's Location", the risk of loss becomes the buyer's when the carrier takes possession of the materials. This is a "shipment" contract. Should the contract state "F.O.B. Jobsite", the seller bears the risk of loss until delivery of the goods to the jobsite. This is a "destination" contract. When there is no F.O.B. designation, the contract implies shipment (Robey, et al, 1986). When transportation is not by common carrier, the seller bears the burden until delivery of the goods to the buyer or to the buyer's warehouse.

Right to Assurances of Ability to Perform
The UCC treats performance assurance differently from the general rules of contract law. Article 2-609 (1995) of the UCC provides a right to assurance of ability to either deliver or pay for any goods sold. Reasonable grounds for the insecurity must exist. "Commercial" standards such as a financial statement or letter of credit furnish adequate assurance of full performance. The common law of contracts, however, does not provide such rights unless stated specifically in the agreement. Under common law, a breach of contract claim is the only retort to a "repudiation", an unwillingness to perform.

Implied Warranties
The UCC and common law also differ on warranty issues. The UCC provides for an implied warranty whereas the common law of contracts does not. Article 2-314 (1995) of the UCC "...provides that the goods will be fit for ordinary use and is considered a part of all contracts regardless of whether it is written in the contract" (Robey, et al, 1986). Article 2-315 (1995) states "...when the seller has or should have knowledge of the buyer's out-of-ordinary needs, this implied warranty arises regardless of when it is written in the contract" (Robey, et al, 1986). Conversely, in a contract for services, plaintiffs must claim negligence if the contracted item does not perform as agreed. They must show a duty owed to the injured party and a violation of the appropriate standard of care. A claim of breach of express warranty (written guarantee) is also an option. In either case, the subjective burden of proof lies with the injured party (Marshall, 1979).

Statute of Limitations
General contract law and the UCC differ on statute of limitation issues. In all but six states, the statute of limitations under the common law of contracts is five years or more. Additionally, the statute of limitations begins upon discovery of the breach of warranty. Whereas, under the UCC, the statute for the sale of goods is four years from the cause of action. The "cause of action accrues when the breach ...should have been discovered" (UCC, Article 2-725(2), 1995).

Acceptance of the Work
The UCC and common law connect acceptance and conformance differently. Under general contract law, the work can be accepted and paid for and not conform to the contract documents. Hence, rejection of the work may be in whole or in part. Antithetically, under the UCC Article 2-606 (1995), acceptance of and payment for the goods does imply the compliance of the goods to the contract and rejection is not possible.

Unconscionability
General contract law and the UCC apply damages differently in the case of unconscionability. Where the court finds that enforcement of a contract or any clause in a contract was unconscionable, the UCC Articles 2-302 and 2-719 (1995) will not limit damages to the equivalent of the commercial loss. The UCC will allow additional compensation. This is not a defense allowed, however, under the common law of contracts (Gary, 1994). Contract law limits damages to a reasonable liquidated damages clause that approximates material loss or an actual documented loss.

Excuse for Nonperformance

The UCC and common law set different standards in determining non-performance. Under UCC Article 2-615 (1995), "non-performance may be excused if performance as agreed upon has been made impracticable by the occurrence of a contingency, the non-occurrence of which was a basic assumption on which the contract was made. Under general contract principles, performance is excused only when performance of the contract is impossible" (Gary, 1994). Performance must occur no matter how difficult, even as the result of unforeseen changes (Calamari and Perillo, 1990).

The Tests

As demonstrated, the UCC and common law produce different results in a dispute regarding a contract breach. How a court interprets a hybrid contract, either as one for goods or for services, will alter the outcome of an action. Harris and Squillante (1989) state the appellate system applies one of seven tests to determine if a contract is predominately for services or for the sale of goods. The most commonly used measure is the predominant thrust test. This theory relies upon the intent of reasonable-minded persons and is as follows:

> whether their predominate factor, their thrust, their purpose, reasonably stated, is the rendition of service, with goods incidentally involved ...or is a transaction of sales, with labor incidentally involved

The second test, predominate service, looks "to the evidence regarding the intent of the parties to the contract, the purpose for creation of the contract by the parties and which of the hybrid transaction aspects (sales/service) forms the basis of the bargain between the parties" (Harris and Squillante, 1989). The third test is for goods supplied. This test focuses on the definition of "goods" as outlined by the UCC. For example, a court applies the "movable at the time of contract" definition to determine whether or not the goods were a significant part of the contract. The court applies the policy test by considering the circumstances surrounding the making of the transaction as more important than the goods/services mix. When the buyer has no knowledge of the intricacies of the instrument and relies solely upon the skill and expertise of the seller, this test particularly applies.

Used infrequently is the divisibility test. In this application, the UCC applies to only that part of the contract that concerns goods. General contract law applies to the services portion. The contract language test relies upon the verbiage in the contract. The words buyer and seller indicate a contract for the sale of goods. Owner and contractor indicate a contract for services. Finally, the gravamen test focuses on the action at the center of the case. When the case is before the court because of a mechanical failure then it is a goods contract. When the claim is for defective workmanship, then it is a service contract. In all actions, the burden of proof falls upon the plaintiff to show which the contract is, a contract for goods or for services, by using any or all of the above tests.

Miller (1984) addresses the hybrid contract dilemma and postulates her own theory of appropriate tests. She claims the court system uses four tests to determine if a contract is for goods or for services. Each test, predominate thrust, predominate service, goods supplied, and

policy, she states, is flawed. These tests raise more questions then answers. Therefore, she proposes a "three tiered" test. This involves a combination of the predominate service, policy and gravamen tests. She believes the use of this type of test would allay any subjectivity the other tests create.

Gary (1994) states that the Georgia court system uses the predominate thrust test and the gravamen test to determine if a mixed contract is for goods or for services. He supports using both tests yet states that neither test is reliable. The predominate thrust test is so subjective that predetermining a court response would be impossible. Gary further deliberates that the gravamen test applies only to cases where quality is in question and does not address contract issues. He does not offer a resolution.

Hawkland (1995) states "the evolving test for characterizing a mixed sales service contract for the purpose of determining whether or not it is governed by Article 2 has been made to depend on whether one aspect or the other is dominant. ...it might be more sensible and facilitate administration... to abandon the "predominate factor" test and focus on whether the gravamen of the action involves goods or services".

Other Applications

Recently, the courts in strict liability suits began using the tests to determine which rules apply to a claim. The cases involve transactions that are unclear as to whether it is a service or a sale. Cantu (1993) discusses the use of the predominate thrust test and the gravamen test. The court uses the tests to determine if the contract is for a product and strict liability applies or a service that requires proof of negligence.

Research Methodology

Many of the articles yielded in searches of Westlaw 6.0, a legal library database and other literary sources cited applicable cases. Additionally, a search of the UCC citations section of Westlaw using the key words "UCC", "hybrid transactions", "Bonebrake" and "construction" produced further results. Finally, a survey of court cases from the State of Georgia yielded primary data on the hybrid contract issue.

The primary data includes case profiles of those claims involving construction issues and are hybrid in nature. This researcher chose those cases that best fit this profile through a close reading of each case using a questionnaire to delimit the sample. The use of a questionnaire assisted in determining whether or not a court case fit the profile. The questions require open and closed responses. The Appendix includes the sample responses.

Results

In practice, the results of the use of the above tests by the court system vary in construction-related cases. In Bonebrake (1974), the case involved the sale and installation of bowling alley

equipment and the question of implied warranties and rights of assurance of ability to perform. The court determined that the contract's predominate thrust was for the sale of goods. The court based its decision partly on the language of the contract that referred to equipment and materials. Additionally, the court stated that the goods sold were movable at the time of contract as outlined by the definition of "goods" in the UCC. Therefore, the UCC did apply and an implied warranty for fitness of ordinary use did exist as did the right for assurances.

In *Meyer v. Henderson Construction Company* (1977), the cause concerned the statute of limitations on the procurement and installation of overhead doors. The court ruled the predominant thrust of the contract was for the sale of goods, although the materials required labor to be useful. The court noted that in the UCC section defining "goods", "there was no exemption for goods which require servicing before they could be used". Consequently, the statute of limitations was four years from the cause of action as outlined by the UCC.

In contrast, in *Cork Plumbing Company v. Martin Bloom Associates, Inc.* (1978), the plumbing contract in question was also for labor and materials. In this case, however, the court stated that the plumbing contractor "...took specific materials and apparatus, manufactured by various dealers, and assembled and connected them into a completed plumbing system. In construction of such a system the labor predominates, with the materials being merely an incident thereto". The court applied the predominate service test; i.e., they studied the purpose of the contract, and ruled it predominately a service agreement. The UCC did not apply. The court denied the requested rights of assurance for the ability to perform.

Like the case above, *Al Bryant, Inc. v. Hyman* (1975), involved labor and materials with the installation of carpet and the statute of limitations. Here the court could not decide if the contract was predominately for services or for goods. The court determined that construction contracts did not fall under the jurisdiction of the UCC because they involved the assembly of many different parts that became a whole. Further, the court stated that many construction contracts concerned such items as brick, wood, plumbing pipes, etc. which lose their individual identity when construction is complete. Carpet, conversely, would not lose its individual identity when installed. Therefore, the court concluded that the contract was not for construction and the UCC might apply to this action. Here again, the court applied the predominate service test by examining the purpose of the agreement. The appellate court sent the case back for trial.

Employment of the goods supplied test to the definition of "sale" under UCC Article 2 (1995) had opposite effects for contract claims involving concrete and steel. *Port City Construction Company v. Henderson* (1972) was a case where a company furnished all materials and labor for a concrete slab. The court applied the UCC because the contract met the contract for sale provisions where only the quantity needed definition. Whereas, in *Schenectady Steel Company v. Bruno Trimpoli General Construction Company* (1974), the UCC did not apply to an action involving the furnishing and erecting of structural steel for a bridge. The court stated that the transfer of the title, a necessary part of the definition of a sale in the UCC, was incidental to the agreement and was, therefore, not a contract for goods. The contractor had no rights of assurance of the steel erector's ability to perform.

The court utilized the policy test in *Riffe v. Black* (1977). This action involved an implied warranty of a swimming pool judged not fit for ordinary use. The court determined that the UCC provided relief even though the service portion was the defective aspect of the contract. It stated that the UCC applied "to services when the sale is primarily one of goods and the services are necessary to insure that the goods are merchantable and fit for ordinary purpose."

The court invoked the divisibility test in the implied warranty case of *Franklin v. Northwest Drilling Company* (1974). The court stated that the UCC only applied to that portion of the contract that concerned materials which were not defective. General contract law applied to the service portion of the agreement. The services were defective. The only action available was a case of negligence. A breach of contract would apply if the case had fallen under the rules of the UCC.

Frequently, the court applies the language test**.** In *B&B Refrigeration & Air Conditioning Service, Inc. v. Haifley* (1978), the contract was for the sale of goods because it referred to the "purchaser" and the "seller". The court applied the four year statute of limitations. Similarly, in a case involving the procurement and installation of resilient flooring, the agreement referred to the "subcontractor". Therefore, the court determined the contract was for services and the flooring contractor had no right to assurances of performance (*Ranger Construction Company v. Dixie Floor Company*, 1977).

In *Van Sistine v. Tollard* (1980), the divisibility test and the language test applied. The UCC did not govern, the court noting that the use of the terms "contractor", "install", and "move" indicated a service contract and that the bill from the contractor was predominately for labor. Therefore, although paid for, rejection of the work was possible. Similarly, in a case involving engineering and construction, the contract was for a fixed fee. It did not break down the price between engineering and construction services and material costs. The material costs were less than half the contract price. Therefore, the court concluded that the contract was predominately for services (*Lincoln Pulp & Paper Company v. Dravo Corporation*, 1977). Here, the court would not apply the liberal UCC rules of unconscionability and consequential damages.

The gravamen test applied in *Dixie Lime & Stone Company v. Wiggins Scale Company* (1977). The contract involved the sale and installation of a truck scale where the action before the court was because of the service and installation, not the scale itself. Since the alleged defects were in the service portion of the contract, the court determined that the UCC and notice as a condition precedent to an action for damages would not apply.

Finally, as stated previously, the burden of proof lies with the plaintiff. The entity bringing the action must use any of the above means to prove to the court the contract is either predominately for goods or for services. In *Air Heaters, Inc. v. Johnson Electric, Inc.* (1977), the owner had failed to meet its burden of proof showing that the contract was for the sale of goods. The court determined that the UCC could not apply. In a case involving the sale and installation of school chalkboards, tackboards, and lockers, the court would not apply the UCC because the supplier could not maintain its burden of proof that the primary purpose of the agreement was for the sale of goods (*Glover School & Office Equipment Company v. Dave Hall, Inc.*, 1977).

The Qualitative Survey

A qualitative survey of Georgia cases produced a sample size of 12. This researcher synthesized the results in Table 1 and performed a visual analysis of the outcome to determine frequency counts of the tests utilized by the court. The following table outlines the results of this case study:

Table 1

Survey of Construction Cases in Georgia

Case Name	Date	Construction Related	Hybrid Contract	UCC Rules Applied	Test Applied
US Ind v. Mitchell	1979	no	no	yes	n/a
Clow v. Metro	1977	yes	no	yes	n/a
Lamb v. G-Pacific	1990	yes	no	yes	n/a
Fram v. Crawford	1971	yes	no	yes	n/a
Romine v. Sav. Steel	1968	yes	no	yes	n/a
Decatur v. Glass	1986	yes	yes	no	gravamen
Gregory v. Scand.	1993	yes	yes	yes	divisibility
So. Tank v. Zartic	1996	yes	yes	yes	divisibility
PPG/Hardin v. Genson	1975	yes	yes	yes	none applied
Space v. Atlanta BS supplied	1977	yes	yes	unknown	goods
F-CC v. Air Door	1981	yes	yes	Yes, in part	gravamen
AAPCO v. Binswgr	1990	yes	yes	no	gravamen

Of the sample of 12, 11 cases are actually construction-related. Of those, seven are hybrid contracts. Of the tests applied by the court, three are gravamen, two are divisibility, one is goods supplied and one had no test applied.

Discussion

The survey found that the gravamen test was most often used by the Georgia court system, although several cases cite the *Gregory v. Scandinavian House* case using the divisibility test as setting precedence in Georgia. A larger sample size may provide different results. Additionally, this researcher found that cases where a hybrid contract is an issue are less frequent than anticipated. Two actions may resolve this potential problem. First, expand the term search of the databases to include "Gregory" and "mixed". The court will cite Gregory in whatever case is at hand if it truly sets precedence. "Mixed" cites more frequently than "hybrid" when referring to contracts that include labor and materials. The term "hybrid" often produces cases on wheat and corn. Second, expand the case search to beyond the State of Georgia to the southeastern region. In this way, the increased population size should yield a larger sample. Finally, a statistical analysis would be invaluable in reliably determining which test(s) the court uses most often.

Conclusion

Much of the UCC expands legal actions for a purchase of goods. Contract formation is easier to prove. There is a simplification of quantified terms. The contract promulgates the risk of loss.

Rights exist that ensure performance. Implied warranties exist to guarantee of merchantability. Damage awards are not as limiting. Nonperformance has a defense of impracticability. Each of the aforementioned issues is more difficult to argue under common law.

Paradoxically, some of the UCC articles limit actions in the sale of goods. The statute of limitation commences and terminates earlier than in common law. The UCC also delineates conformity by the acceptance of the goods, whereas common law does not. Llewellyn intended to distribute the power evenly between the buyer and the seller. The dilemma lies in how the contractor wishes to have an agreement interpreted. Will the UCC rules benefit or injure the project in case of breach of contract?

Once the contractor determines the direction of the agreement, the character of the agreement itself must provide much defense as to the type of contract. The tests outlined above provide many examples of ways to promote the contract as one of services or one of goods. Legal scholars state the court system most often uses the predominate thrust test, even though it is subjective. A survey of Georgia cases indicates the gravamen test and divisibility test are used most often. Each author states that the use of the various tests to resolve the sales/services dilemma leaves much open to interpretation and reinterpretation. The historical researchers claim that this was also the intent of Llewellyn as he developed the UCC. However, all agree that the legal system would be less convoluted if the court developed more concrete rules for determining whether a contract was for goods or for services. Some have even postulated a new code similar to the UCC aimed at just construction contracts (McAlpine and Breuch, 1995).

Until the legal system defines these uncertainties, contractors should use additional tests to advance their argument; such as the language test, the divisibility test and/or the gravamen test. Claims are costly. This research will assist a contractor in developing a beneficial agreement that the legal system will support under interpretation. Forethought to contract formation and the use of specific language will save expenditures in contract disagreements, lower risks and increase profits in the construction industry.

The dilemma of hybrid contracts is certainly not limited to construction. The computer software industry and the mechanical repair industry, for example, also face legal disparities caused by the mix of goods and services. A broader survey of court cases outside the construction industry might enhance the argument of further definition of the laws applicable to hybrid contracts.

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