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The *Journal of Construction Education* (ISSN 1522 8150) was founded in 1996 by the Associated Schools of Construction, an association of 94 international colleges and universities with construction education programs. The purpose of the *Journal* is to provide an important process necessary for the preservation and dissemination of manuscripts that report, synthesize, review, or analyze scholarly inquiry. The *Journal* is an important way of our focusing international attention on and contributing to the understanding of the issues, problems, and research associated with construction education and training. The recognition of scholarly work within the realms of curriculum information, contemporary educational practices, educational research and instructional application development within construction departments, schools and colleges, and industry are the reasons for the *Journal's* existence. The *Journal's* mission is to provide construction educators and practitioners with access to information, ideas, and materials for improving and updating their understanding of construction education and training. It is also intended to help its constituency become more effective in developing the talents of learners within construction programs. This *Journal* is not only a living textbook of construction education, but also a perpetual and dependable learning source for construction professionals whether they are within academia or within industry. The *Journal* will be published tri-annually (Spring, Summer, and Fall issues). The divisions of the *Journal* include invited and editorially reviewed Book Reviews and Teaching Profiles, and blind peer reviewed Educational Practice and Research Manuscripts.

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Progressive Service-Learning: Four Examples in Construction Education

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This paper presents four diverse construction education experiences where the principles of progressive education were combined with service-learning methods to create a new learning environment. The examples presented in this paper might give construction educators some ideas where they can incorporate similar concepts into their curriculum to make the learning environment better.

Key Words: Progressive Education, Service-Learning, Curriculum

Introduction

All concerned educators dream of establishing a learning environment best suited for students gaining optimum knowledge. Many issues in education today deal with the need to align educational environments to fit real life applications that increase the motivation factors for students. Yet, many continue to administer education the same way it has been done for decades. As Cohen and Brawer (1989) put it:

> "It is reasonable to assume that in an institution dedicated since its inception to 'good teaching,' new instructional forms will be tried. However . . . traditional methods of instruction still flourish. Visitors to a campus might be shown mathematics laboratories, the media production facilities, and computer-assisted instruction programs. But on the way to those installations, they will pass dozens of classrooms with instructors lecturing and conducting discussions just the way they and their predecessors have been doing for decades" (p. 155).

It can be said that the foundations of progressive education developed by John Dewey reflect an instrumentalism philosophy, using a hands-on approach, and emphasizing that truth changes as one gains greater. Dewey observed what experience in real-life applications could do to enhance the quality of learning for his students (Lauderdale, 1981). Burr (2000) indicated that progressive learning methods require a departure from traditional, set, preconceived objectives because the learning will be student directed. Progressive education occurs as real-life applications are joined with a self-directed series of experiences that create unlimited possibilities. Dewey emphasized in his work that students should be able to "work out something specifically his own, which he may contribute to the common stock, while he, in turn, participates in the production of others… The (student) is born with a natural desire to give out, to do, and that means to serve" (1964, pp. 118-120). Kinsley (1994) stressed that, as our

educational goal, service learning is an education process – not a program – where the service experience is directly related to the academic subject matter while making positive contributions to individuals and community institutions. Kahne and Westheimer (1996) added:

> "Educators and legislators alike maintain that service-learning can improve the community and invigorate the classroom, providing rich educational experiences for students at all levels . . . Service-learning makes students active participants in service projects that aim to respond to the needs of the community while furthering the academic goals of students" (p.593).

The education examples presented in this paper depict a refreshing but not entirely new theory for learning. These examples combine progressive principles of education with service-learning principles. The two educational practices are highly related, and these examples provide evidence of success in learning when the two practices are administered collaboratively. Burr (1999) suggested that increased motivation for learning can happen with the collaboration of progressive education principles and service learning – *progressive service-learning*. Progressive service-learning methods help students learn and develop through active participation. Optimum progressive service-learning activities should coordinate in collaboration with an institution of education and should provide time for the student to think, talk, and write about what they experienced.

All of the following examples of progressive service-learning applications were developed from different social environments. One example occurred in the Western United States metropolitan area of Las Vegas, Nevada in a culturally diverse environment. Another example took place in the Mid Western metropolitan community of Oklahoma City, Oklahoma. A third example occurred in a smaller metropolitan Mid Western community of Guthrie, Oklahoma. The fourth example happened in a rural community in South Central Missouri. These examples included students from different age groups, genders, racial backgrounds, and cultural aspects. Some students were just beginning their formal education while others had all but finished. Despite these differences, each project similarly produced success – students who felt like they had gained applicable knowledge not available in the traditional classroom while also experiencing a sense of contribution in a valuable and meaningful way to their community.

Four Examples of Progressive Service-Learning Applications

Las Vegas, Nevada Homeless Transition Center Project

During the spring of 1993, the Architecture Club at the Community College of Southern Nevada began to investigate how to achieve their goal for becoming more active in the community. One of the main principles of architecture and construction is to be able to assist in the building of societies. The students decided to spend a few days researching current community needs or issues.

At the next meeting there were several issues that the students discussed as potential topics. One of the major issues was the problem associated with the Las Vegas homeless situation. The mild

climate along with a substantial urban base is appealing to the homeless population. This fact, compounded with the number of people who come to Las Vegas to seeking employment and do not find it, makes Las Vegas a city with a large homeless population. By the end of the meeting, all of the students agreed to concentrate on this issue. A special Building Technology course at the Community College of Southern Nevada was specifically created for those students who wanted to be involved in a special architectural study. Twelve members of the Architecture Club signed up for the "special topics" course that began in the Fall semester, 1993.

The students who participated in the Las Vegas, Nevada Homeless Transition Center project were enrolled into the Architecture Program at the Community College of Southern Nevada. Most were close to graduating with a good understanding of architectural procedures and techniques. The students ranged in age from eighteen to thirty-two and there were seven males and five females. Two were of Hispanic decent, one Native American, one African American and the rest were white Americans.

The students discussed strategies to accomplish needed research and began the collection of data to identify the direction of their project. Some students searched the libraries and past news coverage of homeless and transient problems in Las Vegas. Some of the students made appointments to visit with city and county officials. Two students elected to actually spend a week with the homeless gaining a personal perspective.

When the fieldwork was finished, the students discussed the collected data. They were interested in providing a solution that would be different from the unsuccessful attempts being tried by civic and other government organizations. From their inquiries the group identified that existing facilities did not seem to be effective in meeting the identified needs and recognized community interest to support a new center for the homeless. The students found that they were in need of a facility that would not only provide the physical needs of food and lodging but also an opportunity to gain education, proper hygiene practices, job preparation, employment ethics, and employment skills. The president of the CCSN architecture club told the local newspaper that, "The idea is to make this project part of our class at first, then make it a permanent activity of the club. We have some architectural ideas ready to present to people who want to participate in the project and they came from shoulder-to-shoulder research with homeless persons in the Las Vegas area."

One of the major elements learned by the students was the importance of research and its application to the architecture/construction field. The research provided identifiable direction in which to pursue for their proposal. The excitement and motivation of the students as they immersed themselves into the research demonstrated a true commitment to the project. Students became engrossed in a project that was real to them, a part of their community. A positive and motivated attitude existed among the class members that surpassed most traditional classes.

The students devised a proposal for a "Homeless Transition Center," to not only provide accommodations for the homeless but also to assist in the other educational and civic needs identified through research. They worked with civic groups and city organizations to incorporate essential aspects of the project. The structure of the class was considered loose and autonomous. The studio was open from 7:00 a.m. to 11:00 p.m. Students directed and created every aspect of

the class/project. The flexible environment accommodated the needs of the project. Involved in a new or exciting idea, students occasionally would work all night long in the studio. There were also times of the day when no one would be in the studio. The professor was more a facilitator and worked side by side with the students to facilitate the learning process and contribute to the proposal's completion. The students themselves were collectively responsible for the success or failure of the project proposal. The autonomous environment contributed to the motivation and eventual success of the project. The evolution of the project reflected the upward spiraling aspects of a purely progressive approach to learning.

At the end of the semester the completed proposal included presentation drawings that represented the facility's use and form and a written document explaining the results of the students' research and the direction of focus for the proposal. Several potential site locations were also identified in the proposal. These included ideal locations with new building design features that supported the research, another reflected retrofitting and remodeling existing structures. The proposal attracted substantial positive public and press interest and was credited with raising community awareness of this issue. The students were impressed with what they were able to accomplish. They were also happy that what they had done might have an impact for the better upon their community.

The Guthrie, Oklahoma Project

The Guthrie, Oklahoma Project took place during the summer of 1996. Guthrie, Oklahoma is a community of about twenty-five thousand residents located almost directly in the center of the state of Oklahoma. The city of Guthrie, Oklahoma did not have the economic resources needed to pursue an adequate architectural and historic preservation study. The city officials of Guthrie became excited as they were approached about the possibility of participating in an Oklahoma State University-OKC service-learning project. A special summer class entitled "The Guthrie Experience" was created. The student participants of the project consisted of architecture and construction majors representing OSU-OKC. The student group was to prepare an in-depth architectural study and make recommendations to enhance Guthrie's historic downtown business area.

Of the eight student participants working on the project, one was African American; two had Native American heritage; one was a native of Brazil; and the other four were white Americans. The group of students consisted of two females and six males. The age range of the group varied from the early twenties to the mid forties.

In April 1996, enrolled students met to decide how to approach the upcoming project. They all agreed that the best possible environment would involve setting up a home base or office at the project site in Guthrie. The city of Guthrie provided about 800 square feet of space in one of the historic downtown buildings for the group to set up an architectural office and also encouraged cooperation of local businesses. This progressive service-learning opportunity established a realistic working environment, simulating an architectural office that created a sense of real meaning for the project.

In one of the first group meetings, the students discussed what exactly should be included in the final presentation. The students discussed how to assess what the needs of the community might be and how to identify the valued concerns for the historical downtown business area. The students suggested doing a survey and asked how to effectively create one. At that time the instructor conducted an impromptu mini-seminar on how to develop a survey instrument from which they proceeded to develop two surveys, one for community members and another for the downtown business community. Identifying direction for the specific questions in the surveys, they spent substantial time at the library, in museums, and talking to community members. They noticed that over a hundred of the historic buildings in the area were registered with the National Historic Society. Historic preservation became one focus of the survey questions. Also, city officials had expressed a hope for increased tourism and that became a value for the surveys. The students developed the surveys then refined, scrutinized, and reformatted them until a satisfactory rendition evolved. To administer the survey some of the students went door to door in the downtown business area while others addressed local citizens at the grocery stores.

Desiring to make the best use of their newly gained information, the students were unclear on how to represent their design concepts. After concentrated discussion they decided a scale model would represent their ideas in a way that all citizens could interpret and understand. What they did not realize at that point, however, was the difficulty and complexity involved in creating such a visual aid, with adequate exactness, given limited time and experience. Learning truly began at this point. The area to be studied proved to be significant and would require a large model to visually illustrate the design concepts. The finished model ended up incorporating five sheets of 4'x8' plywood which encompassed an area of 8'x20'.

From the western most part of the historic downtown area to the eastern most part represented a significant change in physical elevation. The students decided that for the model to be a true representation it would need to reflect the actual elevation grade changes. Surveying equipment was brought in from campus and the students became involved in learning how to survey and establish actual elevation grades. Students participated in all of the aspects of shooting elevations. They took turns taking survey notes including setting up the instrument, running the rod, and taking shots for record.

They all speculated what the difference in elevation would be from the lowest point to the highest in the survey. The estimates were anywhere from thirteen to twenty feet of elevation difference. The professor stated that he thought it would be closer to fifty feet of elevation difference. Some students laughed, and said that they would be very surprised if that were the case. After the group was shown how to calculate the elevation differences, the instructor indicated the greatest difference in physical elevation was determined at +/- 46.00'. All of the students were surprised but learned from the results.

As the students wrestled with the best way to build the scaled model, they were faced with many progressive learning experiences throughout the process. One example occurred when the students were discovering the most efficient way to construct the bases for the model. It was decided that on the first and second of five bases, the second representing the greatest difference of elevation change, that layers of ¼ inch foamcore board could be used and staggered back by layers to represent elevation differences. Since the scale factor on the model was 1/8" = 1'-0",

each layer of foamcore would represent two feet of elevation difference. Then to smooth out the stepping effect of the layered foamcore board, applications of wall joint compound were used. By the time the second board was finished and moved out to a storage room, it was considerably heavy. Also, the students noticed that a great deal of foamcore board, which was expensive, had to be used to create the base. The students soon realized that the project budget was not going to allow for the purchase of additional foamcore board. They discovered that the bases were also very time consuming to create using this layering system. On the third base, two of the students went about engineering a better alternative to build the remaining bases. They did this by constructing tapered supports, representing elevation differences, and layering two layers of foamcore board on top of the tapered supports. This method proved to be much faster and far more conservative in the use of expensive foamcore board.

By trial and error, the students experienced, conversed, pondered, and re-experienced to create a very expeditious and professional method of constructing the scaled model building replicas. The students used colored pencils to draw many of the decorative aspects onto the facades. In the beginning, the students had been cutting every detail into the facades. However, they learned by their experience and developed a scheme that was more time and material conservative.

Using their individual talents, each participant created a niche for themselves as to the areas in which they could competently give to the project. This created a cohesive group of important single entities working toward a common goal.

The students were able to learn about a wide variety of related architectural topics and could see the correlation between the topics. For example, on a typical day of the project any one student could be seen gathering dimensions of buildings, inputting information into the CAD system, assessing design criteria, consulting with other students, building on the model, visiting with the news media, conducting research, meeting with city officials, and administering information surveys. Understanding the connections between subjects taught in classes, creates a common void in the traditional method of learning for students.

The completed student project proposal gave the city of Guthrie, Oklahoma a professionally prepared list of recommendations and full-scale model of the proposal to enhance, preserve, and further develop the historic downtown business area. These recommendations were received by the city officials at a formal presentation on September 17, 1996. The model had been on display for about six weeks previous to the presentation for citizens and public officials to have the opportunity to view and consider the recommendations. At the conclusion of the presentation, the mayor of Guthrie read to the students Guthrie City Resolution #96-26 which honored OSU-OKC's efforts and gratefully accepted the service project proposal. The significance of what the proposal meant to Guthrie City was not fully realized by the students until this moment. Many of the students had tears in their eyes. One student said, "This has been the greatest education experience of my life." Another student wrote in his final entry of his personal journal, "I am grateful to have been able to participate in such a noble and interesting course." Yet another student wrote in his final journal entry:

> "I would like to take this opportunity to express the gratitude for this experience that I have had in working on this project. I have thoroughly enjoyed myself and I think the

knowledge that I have gained, the experience that I have gained, and the service I have given will be beneficial to me in the future, not only in business, but mostly in a personal sense of remembrance and delightfulness. I will truly miss seeing everyone every day or so. I seem to be at a loss for words, so I will just say thank you. We truly did make history!"

The Oklahoma City Memorial Design Competition Project

At 9:05 a.m., on April 19, 1995, the author was in his third floor office getting ready for his class at Oklahoma State University in Oklahoma City. Suddenly the entire engineering building shook as if an immense earthquake had just occurred. The rumble seemed to last for several seconds and then an eerie quite followed. After a few moments people began to emerge from their offices with quizative faces wondering what had just happened. Off to the east, a massive swirl of black smoke gradually rose upward to the sky, sirens began to scream, as did people, and thus began the horror which would forever affect the lives of those who experienced the bombing that day in Oklahoma City.

Life dramatically changed for everyone who lived in the Oklahoma City area after April 19, 1995. The magnitude of the tragedy could not have been possibly experienced by those watching on television as compared to those who lived it. The students in the architecture and construction program were not unlike many others in the OKC area. They all had friends or relatives who were killed that day. Many were involved in the rescue and humanitarian efforts. They too were trying to cope with the senselessness of that savage terrorist act and the tragedy deeply affected all of their lives.

It was a difficult year following the bombing for all the residents of the area, including the students at OSU-OKC. A lot of discussion in the community followed about converting the bombing site into a memorial that would appropriately remember the tragedy. Mayor Ronald J. Norick appointed civic leader Robert M. Johnson to lead a 350-member task force charged with the development of an appropriate memorial. An Advisory Committee of the Task Force worked to create a mission statement (1996, p. 5) that appropriately expressed the sentiment toward a memorial theme. It was unanimously adopted by the in March, 1996 . . . the opening four lines of the mission statement are:

We are here to remember
Those who were killed, those who survived and those changed forever.
May all who leave here know the impact of violence.
May this memorial offer comfort, strength, peace, hope and serenity.

Effective as of September 1, 1996, the Task Force was transformed into the Oklahoma City Memorial Foundation.

In September 1996, the Oklahoma City Memorial Foundation announced an International Design Competition. The objective was to capture a design for the site which best emulated and interpreted the mission statement identified by the foundation. Several members of the OSU-OKC Architecture Club expressed a desire to participate in the design competition. The students

were inspired by the opportunity to contribute their own feelings, ideas, and expressions about the bombing through a design proposal for the memorial. Their idea included creating a "special topics" course that would accommodate any students who would like to participate in the Memorial Design Competition. Eight architecture students, all white males between the ages of eighteen and twenty-six, enrolled into the special course conducted the fall semester 1996.

The criteria for the proposal were pre-established by the foundation and became a standard for all participants. All submittals were to be prepared on a 30"x 40" presentation board depicting original ideas and thoughts appropriate to the foundation mission. The pre-established criteria worried the students. There was so much that they wanted to do and say, yet they were limited to one, seemingly small 30"x 40" board to express it all on. The major concept the students learned was how to prepare a presentation that had definite limits. By struggling with this limitation, they learned to direct focus on the very most important aspects of their presentation. Therefore, an incredibly important part of their work became research. The students wanted to glean every essence of what was most important for the memorial to incorporate into their proposal. Each participating group was given an opportunity to visit the bombing site, soon to be memorial site, where the Murrah building had once stood. The day that was assigned to the OSU-OKC group was cold, wet, and as nasty as the gloomy aura that hovered over the site. The students listened to a preliminary description of the events leading up to the bombing given by one of the members of the foundation and then viewed pictures, looked at memorial items left at the site, listened to facts surrounding the bombing, and learned about the victims of the disaster. Then they were allowed to walk out into the guarded fenced-in area where the building had once stood. The students were visibly overcome as they absorbed the calamity. Drops of cold rain were driven by a colder wind, but the students remained -- their faces wet with not just rain but tears as they remembered. After some time, they left with a reverent understanding of the task at hand and an undaunting commitment to finish what they had started.

The site visit seemed to instill within the students a great motivation to find out all that they could about the disaster, the people involved in the rescue mission, the victims and their families, the community that they lived in and how all had been affected. There were a lot of stories, information, and news coverage on the Internet and the students were engulfed in getting as much information that they could to steer their ideas for a presentation. They needed to get as much data as possible in a relatively short time and they learned to establish a schedule for the completion of their proposal that included research, design and development, and the finishing stages. The professor's role would again be one of facilitating learning and assisting in the actual completion of the presentation. He worked alongside the group.

Upon completion of the research and the data collection stage, the students spent literally days interpreting the data and trying to identify a central theme to their proposal. One factor that emerged from the research was the ribbon that people wore pinned to their clothing that represented hope, strength, and solidarity. The students thought that the ribbon represented a significant community attitude.

The research also determined that there existed an overwhelming sense of gratitude in the community for those thousands of people who sacrificed their time and dedicated themselves to

the relief and sustaining efforts. They wanted to honor all those who helped and thought that this needed to be an important part of their proposal.

Finally, the students deeply felt that those who lost their lives needed to be reverently acknowledged including the nineteen children. This was the most difficult part for them. The difficulty came with how to appropriately and reverently address this part. Many hours of brainstorming, designing, and conceptualizing ensued as they worked painstakingly to convey the ideas and deep feelings that they possessed for the topic of the proposal. One of the students was a talented artist and he came up with the concept of Teddy Bears as a minor theme. His drawings of playful bears in a playground environment were well accepted by the rest of the students. Based upon this idea the students designed a children's memorial that included small statuettes of nineteen playful bears in a playground representing the children who lost their lives. One student was charged to develop the full site proposal as part of the submittal board, another rendered the ribbon monument in the surrounding fountain, other students worked on the memorial wall and meandering gardens to develop drawings that would appropriately depict the ideas. When all of these drawing concepts were finished, they were strategically placed upon the 30"x 40" presentation foamcore board and then colored. On the day all proposals were due to the foundation, the students placed their submittal among the other five hundred plus. It was a personal representation of countless hours, many tears and personal commitment to healing a city -- a country.

Upon their presentation board they inscribed the words:

> This proposal represents a simple yet profound statement depicting a memorial reflecting the significance of April 19, 1995. The focus of this proposal is represented by a structure of the ribbon that so appropriately symbolizes the hope generated from people by the disaster that would stand at the height of the pre-existing Murrah Federal Building. At the base of this structure would be a fountain with a garden at its center and five angels representing different races and depicting hope. Meandering paths with brick pavers would lead through naturalistic gardens where visitors could view several monuments honoring those who gave of themselves during the disaster and the survivor tree. These monuments would be made of artistically etched granite slab/eye slits into the bermmed gardens about four feet high. The sacred area, where the building stood, would be protected and the existing garage wall would become a memorial clad with granite and scattered with etched murals depicting epitaphs and artists' conceptions of hope, joy, community, love, and happiness. The mural would also honor those who died in the disaster. A children's memorial, also in the sacred area, depicting nineteen playful bears representing the nineteen children lost in the disaster.

Opportunities like the Oklahoma City Bombing Memorial hopefully will not be common. However, opportunities to enhance students' motivations through progressive service-learning are available in every community.

The West Plains, Missouri Project

In May of 1997, the West Plains City Chamber of Commerce collaborated with Southwest Missouri State University-West Plains in order to do an architectural research study to evaluate the possibilities for rejuvenation of the old town square business area. City officials were interested in knowing what could be done to enhance the old downtown area and bring life back to its once active commercial environment.

The circumstances for student participation in the West Plains project were unique. Unlike the students in the Guthrie project, the West Plains students were all citizens of that community. Eight students enrolled in the "Architecture on the Square" project and while all of them were interested in this area none of them had been involved in any previous architecture schooling, which was also unlike the students in the Guthrie project. Five had taken general drafting applications at the vocational/technical school. Three had no related education or experience. Most of the eight students in West Plains were interested in the course because they had an interest in learning further architectural expertise and also because they held a genuine concern for the betterment of their community. All were white male students between the ages of nineteen and forty-five.

Before the students actually enrolled into the course, the professor had the opportunity to discuss the class and what to expect in the learning experience with each student. They were told that this would not be a traditional course, but it would be a progressive service-learning experience, one that would identify objectives as the project evolved. The thought of participating in this type of educational experience seemed to excite the students as they expressed desires to get started with anticipation. Nation's Bank, located on the old city square, agreed to let the group use the second level of their building to conduct the research and prepare a proposal. Nation's Bank also donated many of the materials needed for preparation of the final proposal. It was important to the students to be at the site of the project, even though the geographical location of the architectural study was only a few blocks away from the campus. The space provided by Nation's Bank provided the students with a realistic work environment in which to do the study. To them, it was not a classroom but an architectural office. The students worked with each other collaboratively as business associates working toward a common goal and not just merely as students in a class. The central office location was also ideal for community visitors to the project. Many business owners and community members alike felt free to drop in and visit the office, look over the progress, and make useful comments. The students were presented with many opportunities to interact with the community.

The motivation for this class was naturally driven for the students. This was their community, the place where they had grown up. The town square had been a part of their lives since birth. They demonstrated a sincere concern for their community as they began to address the architectural issues related to the study. There was a true sense of pride in what they were doing. The progressive service-learning project took on a new meaning because it was already a part of them.

In the beginning they discussed what needed to be accomplished to find direction for the proposal. As they discussed, their topics became personal because the students knew the business and property owners, the history, and the sentiment of the community toward the square. Depending upon the background and their community ties, the students had their own

individual opinions about the architectural proposal. The West Plains students each felt that they already had an "ideal" understanding of the needs for the square. They believed that research was not necessary; however, the students realized that each of their personal understandings were different. They could not come to a clear agreement on a direction to pursue. Finally, they concluded that they would need to evaluate the community's interests as a whole. A survey instrument regarding community values of the square would be needed.

Issues for the survey included topics like safety concerns, traffic, and pedestrian flow, historical preservation, beautification, and marketing the square. From these base values, the group organized a series of survey questions to ask the public. The students realized early on that the responses of community members might be different from those of the town square business owners. To effectively observe the potential differences in survey answers, they copied the survey onto two different colors of paper, one for the general public and one for the business owners. Some of the students went door to door to square business owners while others visited local stores to survey the general public.

After the surveys had been collected and evaluated, the students were surprised to observe that the opinions and values of the square business owners greatly differed from their own views regarding the function and purpose of the square. The survey then gave direction for the architectural study, although not the direction that the students originally had anticipated.

Over the next period of about ten working days, they worked on defining the direction which was indicated through their research. Some of the students visited the city offices and obtained aerial maps of the square, topographical information, and other useful material. From the "topo" maps they were able to gain a bird's eye perspective of the entire geographical area of the square under consideration. Tracing paper was used as an overlay of the area and cycle upon cycle of brainstorming discussions ensued to address creatively the identified direction for the study and then the incorporation of them into an aesthetically appealing proposal.

After a lot of deliberation concerning the best mode to illustrate the proposal and similar to the Guthrie project, the West Plains students decided to build a scale model of the square incorporating the new concepts. They were eager to learn effective methods of architectural model building, and the instructor took the opportunity to discuss with the students several different methods. The students then decided that the most accurate and time efficient method was to build the model out of mat board representing the facades of the buildings. A logical scale factor was determined to build the model and work began on this phase of the project about three weeks into the class. The West Plains students had no prior experience in model building and struggled at first. They were unsure about themselves and hesitant toward their capabilities to perform quality work on the model. It was during this time that they became very teachable. The instructor was able to give directions on typical model building techniques. The students paid careful attention to the instructions and became excited to learn. They picked up on the model building techniques quickly. Over a short period of time, the students gained confidence in their work, and progress on the model began to escalate. One student said, "At first I was afraid to build on the model, but now it is fun!" One of the students, over-night, drew one city block of building front elevations on his CAD system at home. His elevations were used as a template for cutting out the front facades for those buildings. This pattern developed into a

tradition and the student, who didn't feel comfortable cutting, became the template maker for all of the other students doing the cutting

Creative concepts emerged and were incorporated into the proposal as the model progressed. What happened was a typical concept for architecture. It is called the "study model concept." By building study models, architects can effectively observe important issues pertaining to the project and then plan for solutions. However, the students would not have understood the "study model concept" without first experiencing the process that led up to the decision to build a model. They became aware for the first time of the important features and personalities of the buildings that they had walked passed for many years – but had never before really noticed. They became appalled at the degeneration and attempted modernization of these beautiful, historic, and architectural edifices. They became actively involved in a genuine process to enhance and preserve the square.

Each student collaborated and contributed their specific talents in the different areas of need. For example, one day while they were working to build and finish the second part of the four part model, one student created building replicas for the west side of Washington Avenue, another worked on the east side. One student worked on designing grade variations for the next model base, and two others built the frames for the remaining two model bases. The work required an awareness of the tasks that needed to be accomplished rather than simply a set of predetermined assignments established by an professor. The scene was a collaborative effort toward a common goal. Fear for grades or assignment deadlines were not the students' motivations.

About mid semester one student brought his mother to see the development of the model. Proudly, he showed her the concepts that they were developing to enhance the square. After he escorted her back to her car, the student returned and said that his mother, a lifelong member of the community -- approved. He also had some suggestions from his mother that they might consider. Some of her ideas were eventually incorporated into the proposal.

Differing from the traditional education classroom environment, this progressive service-learning project required students to identify problems and create acceptable solutions, grappling to grow from the experience. One example occured as the students were trying to attach the second part of the model to the first a significant problem arose -- they did not fit! Together they wrestled with the problem trying to come up with a solution that would preserve the integrity of the model but also conserve the time spent in building it. As they embarked upon the process, thinking critically, and then resolving to an action plan, they were able to adjoin the two base members to fit. This required a major retrofit of the first model base and the expertise of one student who was a sign erector by trade and possessed much of the needed equipment on his truck parked outside. This process also ensured that the mistake would not be repeated and extra precautions were taken from then on to adjoin the model base members prior to their development.

At midterm the group assembled to evaluate their progress and plan for the last half of the class. They seemed satisfied and comfortable with the progress of the model. One student was concerned about the upcoming formal presentation to city officials and community dignitaries. Another student asked if just one of them could be responsible for giving the presentation. They discussed these concerns and decided that since it was a collaborative project that the pattern

should not change for the presentation. This decision presented a fear to some of the students. They were apprehensive about giving a proper oral presentation. One student suggested that they would need some direction on how to give an informative persuasive speech. Another student suggested that they solicit the help of the coordinator of the communications department at SMSU to get instruction on how to effectively do a presentation. Without knowing it, they had realized the importance of proper communication skills in the profession. A session with the communications professor was scheduled at the end of April and their understanding in this area was increased.

The formal presentation to the West Plains Chamber of Commerce and city officials took place May 12, 1998. The students organized the presentation to provide each one of them with the opportunity to present a particular aspect regarding the recommendations.

This progressive service-learning experience became effective as the students were able to connect many aspects of the architectural field into one continuous learning line. The aspects of the project were global, connecting, and continual. The students did not realize the fullness of this aspect until after the formal presentation. One student stated that he "now understands what it means to do an architectural proposal . . . too many things that you just have to experience to know." Another student stated, "Who would have ever guessed at the beginning that I would know what I know now . . . "

Conclusions

Boyer (1994) indicated that higher education needs to reconsider its mission to be that of educating students for life as responsible citizens. Gregson (1995) stated that "To contribute to democracy, rather than hinder it, (educators) need to employ a pedagogy that is both concrete and transformative." These four examples revealed that progressive service-learning concepts can be successfully incorporated into construction education and provide concrete/transformative experiences that would direct students toward becoming better prepared members of society. The situations lent themselves ideally to career options. Traditional learning methods are mostly theoretical in nature, not realistic in application, and do not connect the various aspects of the field of study. They fail to allow the time element for students to make mistakes, solve problems, collaborate effectively, receive additional instruction, explore possibilities, and gain the intense intrinsic motivation for learning that naturally comes from giving service. If organized correctly, progressive service-learning can provide a more effective applicable learning environment for students involved in education. Progressive service-learning can be added to, combined with, or replace ineffective traditional learning methods. As with all change, the most difficult step is the first one. These examples represent some ways to begin.

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Cross-cultural Training of Project Personnel for Implementation of International Construction Projects by US Contractors

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The purpose of this study was to examine the correlates of cross-cultural training of project personnel involved with the construction of international projects by US contractors. It is indicated by a number of studies that cross-cultural training of the project personnel is an important factor for successful implementation of construction projects away from home. Some other studies, particularly related to international business, suggest that important issues for a meaningful cross-cultural training include an exposure to the prevailing environmental, economic, political, linguistic, political, and technological factors of the host country. The study investigated whether these factors are relevant for international construction with reference to the US contractors operating in an international environment. The study population consisted of US contractors who operate globally. Relevant data was collected by mail using a survey instrument. Sample size of the study was 35 contractors. The data was analyzed using multiple regression technique. The findings generated from the analysis of the data indicated that the importance of environmental, economic, linguistic, labor, and social issues were statistically significant for cross-cultural training of project personnel involved with international construction projects.

Key Words: International Construction, Cross-cultural Training, Graduate Education

Statement of the Problem

A major factor of success of any construction project is the quality of management. Cultural factor is an additional dimension of project management when the job is to be implemented away from home. Projects carried out abroad create special problems for managers in dealing with multiethnic work forces, operating with social, linguistic, political, economic, and religious traits of the host country. In other words, the project personnel have to manage the prevailing - perceived or real - cultural differences.

A significant number US construction companies are working on projects outside their national boundaries. Although the US contractors earned a total of $14.5 billion dollars in the international construction market in 1996, they were in the third position trailing behind the Asian and European regional groups (ENR, 1997). In order to remain competitive in the global construction industry and win a higher percentage of international works, rate of success of the projects undertaken in terms of completing the works in time and within budget should be very high. One of the important factors in the global construction industry is an in-depth understanding of the local environment (Kangari & Lucas, 1997). The project personnel must have a broader and deeper professional training than that is required to perform the similar works

in the familiar home environment (Choudhury, 1989). Challenges that managers face abroad are substantially greater than what they come across in the domestic arena. Failure rates for expatriates in lodging industry are roughly reported to be 30 per cent, mainly attributed to a lack of comprehensive cross-cultural training (Shay & Tracey, 1997). Literature indicates that socio-cultural mishaps affect the productivity of project personal engaged in the construction of international projects (Dadfar & Gustavsson, 1993). In order to help the project personnel toward appropriate, sensitive, and consistent behavior in their human interactions, most of the global corporations provide some cross-cultural training to their expatriates (Aschkenasy, 1997; Harris & Moran, 1993). It is, however, not evident from existing literature the extent of training provided by the international construction companies for their personnel slated for overseas assignments. One study done in the early 1980's found that only about 33 percent of the US international construction firms provide any pre-departure cross-cultural training to their expatriates (Maloney, 1982).

Issues related to cross-cultural training include physical, social, religious, linguistic, political, economic, and technological environments of the host country. While an exposure to all these issues may be important for the expatriate managers for successful completion of their assignments, it may not be possible to provide training encompassing the wide range of factors because of time constraint. Priorities may vary according to the nature of job to be performed. Professionals hired for developing health and safety programs in foreign countries, for example, are required to go through a language program on a priority basis (Petreycik, 1994). The objective of this study is to identify the factors perceived to be important by the US international construction companies with reference to overall cross-cultural training of their overseas project personnel.

Methodology

Study Population

The study population consists of a sample of 35 US international construction companies currently working in an international environment. The entities under study are the individual US international construction companies represented either by the Chief Executive Officers or their representatives.

Data Collection Procedure

A survey instrument was prepared to collect the data. It was mailed to a total number of 80 randomly selected US international construction contractors. The list of the contractors was obtained from the ENR (1997) and the International Construction Division of the Associated General Contractors of America. The number of responses received was 35, the rate of response being 43.75 per cent.

Variables and their Operationalization

Overall Cross-cultural Training (TRAINING)

It is the reported importance of overall cross-cultural training on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Physical Environment (ENVIRON)

It is the reported importance of the knowledge of the physical environment of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Indigenous Technology (TECHNLGY)

It is the reported importance of the knowledge of the indigenous construction technology of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Language (LANGUAGE)

It is the reported importance of the knowledge of the native language of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Political Environment (POLITICS)

It is the reported importance of the knowledge of the political environment of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Economic Environment (ECONOMIC)

It is the reported importance of the knowledge of the economic conditions of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Labor (LABOR)

It is the reported importance of the knowledge of skilled, semi-skilled, and ordinary construction labor forces of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Social Environment (SOCIAL)

It is the reported importance of the knowledge of the social environment of the overseas country on the perceived productivity of the project personnel. It was operationalized using a single-item measure on a seven-point Leikert scale.

Geographical Region

It is the geographical region in which the overseas country is located. The geographical regions are (1) Africa, (2) Asia, (3) Europe, (4) Latin America, and (5) Middle East. Four dummy variables (*AFRICA*, *ASIA*, *LAMERICA*, and *MEAST*) were created from this category variable using dummy coding as shown in Table 1.

Table 1

Coding of Geographical Region

Category of Geographical Region	***Africa***	***Asia***	***LAMERICA***	***MEAST***
Africa	1	0	0	0
Asia	0	1	0	0
Europe	0	0	1	0
Latin America	0	0	0	0
Middle East	0	0	0	1

Results

A multiple regression analysis was performed in order to ascertain the relationship between overall cross-cultural training and the factors that are perceived to be important with respect to productivity of the project personnel engaged in international construction. Regression analysis is a modeling technique for identifying a function that describes the relationship between a dependent variable and one or more independent variables. The following model was used for the analysis:

$$TRAINING = \beta_0 + \beta_1 ENVIRON + \beta_1 TECHNLGY + \beta_2 LANGUAGE + \beta_3 POLITICS + ?_4 ECONOMIC + \beta_5 LABOR + \beta_6 SOCIAL + \beta_7 AFRICA + \beta_8 ASIA + \beta_9 LAMERICA + \beta_{10} MEAST + e \quad (1)$$

where β_0 = Intercept
β_1, β_2, etc. = regression coefficients, and
e = error term.

Results of the analysis are shown in Table 2.

Based on the results of the analysis, the regression equation can be written as follows:

$$TRAINING = -0.5 + 0.22*ENVIRON - 0.03*TECHNLGY + 0.11*LANGUAGE - 0.04*POLITICS + 0.15*ECONOMIC + 0.19*LABOR + 0.26*SOCIAL + 0.30*AFRICA + 0.18*ASIA + 0.49*LAMERICA + 0.14*MEAST \quad (2)$$

The F-value of the model used for the multiple regression analysis was found to be statistically significant at the 0.0001 level. The F statistic basically tests how well the model, as a whole, accounts for the dependent variable's behavior. The predictive efficacy of the model was found

to be moderately high with an R^2 of 0.70 and an adjusted R^2 of 0.67. R^2 value is the coefficient of determination of the model. It measures how much variation in the dependent variable can be accounted for by the model. The larger the value of R^2, the better the fit of the model, and the higher is its predictive efficacy.

The results indicated that physical environment and language of the country where the construction project is located were related to the overall cross-cultural training at the level of significance of 0.1. Economic environment, labor conditions, and social environment of the country were related to the overall cross-cultural training at the level of significance of 0.05. The findings suggest that the US international construction contractors perceive these factors as important enough to be included in the cross-cultural training curriculum of their project personnel recruited for overseas projects.

The geographical region variables were included in the model in order ascertain whether the perceived importance of overall cross-cultural training differed by region. Only one variable, Latin America (LAMERICA), was found to have an effect on the response variable at the level of significance of 0.1. The results indicate that cross-cultural training is perceived to be more important for the Latin American countries than that for countries located in other geographical regions. Figure 1 shows the mean values of the perceived importance of overall cross-cultural training for different geographical regions.

Table 2

Multiple Regression Analysis of TRAINING

Variable	Intercept	Regression coefficient	*T*	*p*>|*T*|	Critical Value of |*T*|
Intercept	-0.50		-1.13	0.2616	1.29
ENVIRON		0.22	1.95	0.0534	
TECHNLGY		-0.03	-3.79	0.7055	
LANGUAGE		0.11	1.69	0.0944	
POLITICS		0.44	0.53	0.5977	
ECONOMIC		0.15	2.20	0.0302	
LABOR		0.19	2.55	0.0123	
SOCIAL		0.26	2.11	0.0377	
AFRICA		0.30	1.12	0.2673	
ASIA		0.18	0.70	0.4882	
LAMERICA		0.49	1.89	0.0615	
MEAST		0.14	0.50	0.6327	
Model F = 21.45	$p>F$ = 0.0001	Critical Value of F = 2.00	Model R^2 = 0.70	Adjusted R^2 = 0.67	

Discussion

It can be concluded from the results of the study that a broad spectrum of issues pertinent to a host country were perceived to be important by the US international contractors in relation to the overall cross-cultural training of their project personnel. The factors included (1) physical environment, (2) language, (3) economic environment, (4) labor conditions, and (5) political environment of the host country.

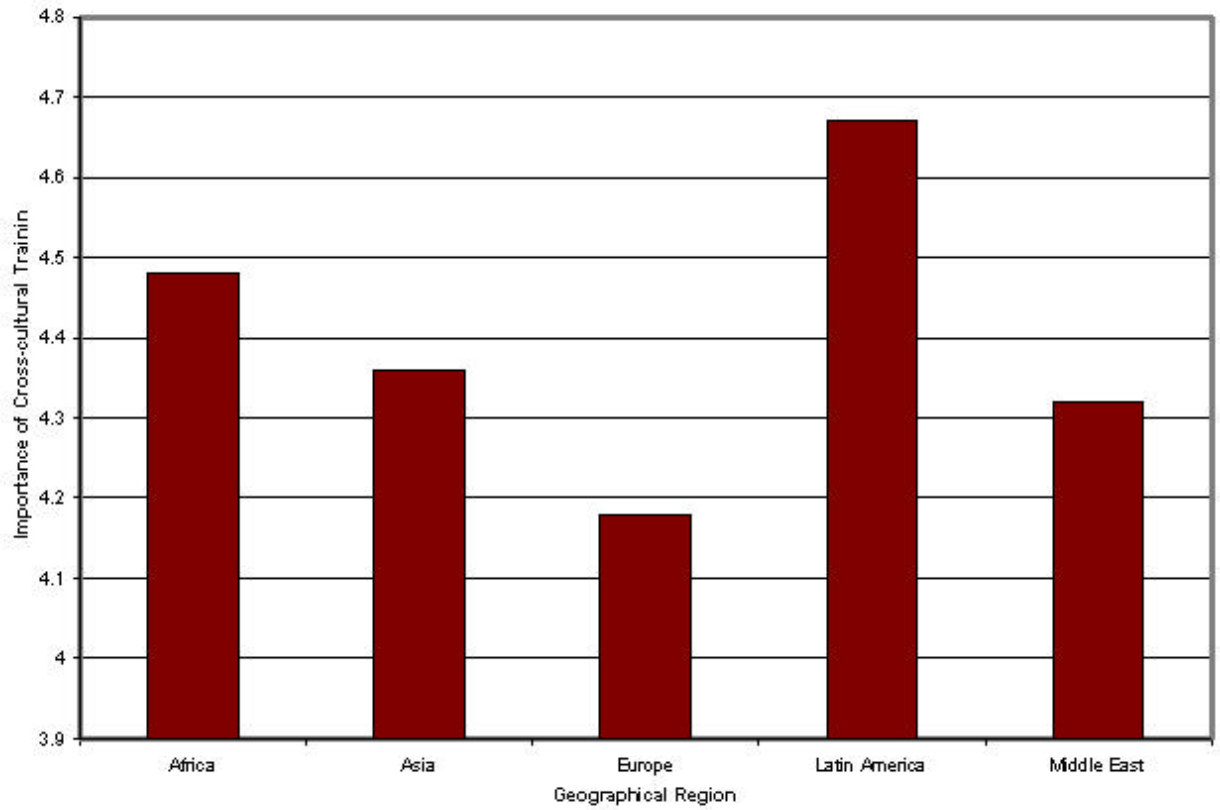

Figure 1. Mean values of the importance of cross-cultural training

An in-depth understanding of the physical environment of a country is particularly important to a person assigned to implement a project in that region. A successful implementation of any construction project requires detailed information about the climatic, hydrologic, soil, and other environmental conditions of the site of construction.

A multiplicity of languages in a work force causes numerous integration problems. It is often difficult to translate exact meanings of concepts, particularly if they are technologically based. One of the most important issues to be addressed while working abroad is the language of the host country (Clark, 1999). Literature (Terpstra & David, 1991) suggests the appointment of bilingual project managers to facilitate communication and expedite progress of works on international projects.

Factors such as economic growth, exchange rate, rate of inflation, etc. of a country are likely to influence international construction. The impact of these factors on construction may vary from country to country. Knowledge of the economic environment will definitely help the contractors to identify the issues they are likely to confront while working abroad and formulate strategies to handle them.

Labor forces are an integral part of any construction project. Proper project planning requires an in-depth knowledge of the work forces available to implement the project. In some countries, human resources are plenty but may not be suitable for doing certain types of construction work;

in some others, suitable labor forces may not be available at all (Enhassi & Burgess, 1991). In order to ascertain the quality and quantity of the labor forces available in the host country, it is necessary to analyze this factor before taking up any international construction assignment. A knowledge of the prevailing labor conditions in the host country will help the contractors to implement the projects successfully.

An understanding of the social and cultural values prevalent in the host country is essential for successful implementation of international projects. Dadfar & Gustavsson (1993) accredit high success rate of the Swedish contractors in Saudi Arabia to their rigorous pre-departure training on the social values of the Arabs. Harris & Moran (1993) suggest that cross-cultural training curriculum should include cognitive studies involving the knowledge of other peoples and their social institutions.

In the light of above discussions, it seems only logical that there would be a positive relationship between the perceived importance of overall cross-cultural training and the importance of the knowledge of physical environment, language, economic environment, labor conditions, and social environment of the country where the project is to be implemented.

The results of the study, however, did not indicate any relationship between the response variable and both political environment and indigenous technology. All international business ventures are exposed to political risk to a greater or lesser extent; international construction is no exception (Ashley & Bonner, 1987). Political risk is defined as the probability of occurrence of some events that will change the prospects for profitability of a given investment (Haendel, 1979). Detailed information about the prevailing political environment of the host country may provide some guidelines to the contractors for preparation of a political risk analysis framework.

Indigenous methods may sometimes be more economic for a region where they are applied. Even if they may not be applied for certain types of construction, an analysis of the indigenous methods may provide some direction toward the transfer of traditional skills for the effective use of contemporary methods and materials. Further studies are necessary to investigate these two factors using a larger sample size.

The US construction firms prospered for many years on international construction projects. About fifty percent of the values of contract award to the major US international construction companies are accountable to international construction (ENR, 1997). Competition for international projects is increasing. It is coming both from the established international contractors as well as from new contractors from the developing countries. In order to retain and improve the competitive edge of the US construction companies on the global construction market, it is necessary for the companies to recruit professionals with a motivation for foreign assignment and proper training to carry it out successfully. Identifying the issues that are required to be included for cross-cultural training of these professionals would be a right step in this direction.

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Agricultural Disposal Method of Construction Site Gypsum Wallboard Waste

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Over two million tons of gypsum wallboard waste is created each year. Traditionally this material ends up in landfills. The wallboard waste takes up considerable amounts of space since it is difficult to compact. Also the potentials exist for elements in the wallboard to be acted upon by bacteria in municipal solid waste and create harmful concentrations of hydrogen sulfide that can escape from the landfill. Additionally, disposal costs at both municipal sanitary landfills and construction and demolition landfills are very high exceeding $300.00 per ton in some areas. This paper explores an alternative to landfill disposal. The reuse of the gypsum wallboard scrap in agricultural uses may be a suitable best method to be used for the disposal of these materials. The paper presents the results of an experiment that investigates the agricultural use of scrap gypsum and it's effect on soybeans.

Key Words: Gypsum Wallboard, Drywall, Recycling, Tipping Fees, Disposal, Agricultural Uses

Introduction

In 1993 over 22.5 billion square feet of gypsum wallboard was manufactured in the United States. Of that amount about 10% ends up as scrap. This amounts to an addition of over 2.1 million tons of material that enters the waste stream of our society. Currently, most of this material ends up in municipal sanitary landfills or construction and demolition landfills, costing construction firms millions of dollars in disposal fees. Other options exist. These currently include reusing the waste material in the construction of new wallboard, dumping at sea, incineration, and agricultural uses. Each of these alternative disposal methods can reduce the cost of disposal and reduce the burden on municipal sanitary landfills.

Currently, contractors in British Columbia must return drywall scrap to be recycled into new wallboard. Recently, legislation requiring some form of recycling of gypsum wallboard products has been proposed in several states. In Oregon, proposed legislation would have required that all waste wallboard be recycled into new materials. Other proposed legislation in Texas would have required that all materials must be returned to a recycling facility if one exists within a radius of fifty miles. Neither of these bills passed, but this does not prohibit future legislation in these and other states.

Chemical Composition

Gypsum has been used for agricultural purposes for nearly 250 years. Its use began in Europe in the mid 18th century and was possibly introduced into the United States by German farmers. Benjamin Franklin, after returning from France in 1785, applied gypsum to a field in a pattern that read "This land has been plastered". This message was clearly visible from the pattern of enhanced growth of the clover in the soil where the gypsum was applied. Since wallboard is chemically the same as gypsum the only difference between the two is the paper cover on the wallboard. It should be an economical replacement for agricultural gypsum. (This is true for most products. Some wallboard has additives introduced into the manufacturing to increase the moisture and fire resistance of the products. These materials may not be suitable for agricultural use.)

During the manufacturing of the wallboard the gypsum, hydrous calcium sulfate (CaSO, o 2H,O is strip mined, cleaned of impurities such as shale and limestone, and crushed into small particles. These particles are then heated to remove water chemically trapped in the gypsum to alter the gypsum chemically to become anhydrous calcium sulfate (CaSO, '/21-120), commonly know as plaster of Paris. Water is the reintroduced to create a slurry (some manufacturers also introduce waste newspaper and cornstarch) that is molded between paper. The water chemically bonds to the anhydrous calcium sulfate to form crystals of hydrous calcium sulfate. The crystals of gypsum bond to each other and to the paper to from the sheets of wallboard.

Material Safety Data Sheets from various manufactures of wallboard indicate that wallboard does not contain any materials that possess a health hazard. To confirm this, a local laboratory performed a chemical analysis of four samples of wallboard (table 1). The results of the tests confirmed that no heavy metals or toxins existed in the samples that could create an adverse effect on the environment. The tests did indicate the presence of boron that can, in some soils, reach levels that can hinder plant growth. This does not affect most soils, but testing of the soils prior to application is recommended.

Table 1

Chemical Composition of Ground Gypsum Wallboard

Chemical Characterized	Quantity (%)	Chemical Characterized	Quantity (ppm)
Dry Matter	96.19	Sodium	161.2
Ash	82.89	Manganese	114.4
Nitrogen	0.15	Phosphorus	85.5
Sulfur	17.6	Boron	48.1
Calcium	23.	Zinc	40.2
Magnesium	7.4	Chromium	21.7
Potassium	0.1	Copper	10.3
		Lead	3.6
		Mercury	1.2

* Values are mean of four replicate samples of gypsum wallboard.

Soil amendment uses

The application of gypsum provides nutrients for plant growth, increases the infiltration of water into soil, can reduce salt concentrations in soils, and can improve the physical properties of clay soils. The calcium and sulfur in the gypsum are essential for plant growth. The application of these elements is beneficial to many crops including peanuts, alfalfa, and clover. Ironically, since the introduction of the Clean Air Act in 1970, concentrations of sulfur in soils have diminished and the need for fertilizers containing sulfur is increasing. Water collects in basins that naturally occur in some areas of the coastal plains of the eastern United States. The application of gypsum to these soils can increase the infiltration rate of water into the soil improving the soil for agricultural uses. When applied to soils contaminated by road salts or soils in western states that have high salt concentrations the gypsum reduces the sodium concentrations in the soil. Gypsum also adds needed calcium to acid soils increasing their productivity. Gypsum when introduced into clayey soils improves its structure and tilth, allowing it to be broken up into smaller pieces again improving the agricultural potential of the soils.

Materials and Methods

This study used residential drywall scrap run once through a "Gypchipper" commercial chipper. This process was extremely slow and dusty. The "Gypchipper" could only accept one piece at a time with a maximum width of 24 inches. The average particle size of materials produced by running one pass through the "Gypchipper" is given in Table 2. The ground material was applied at three rates, 0, 5.38 and 10.75 metric tons/hectare (0, 14.7 and 29.4 tons/acre). Each treatment was replicated four times in a randomized complete block design on a Fitchville silt loam soil (Fine-silty, mixed, mesic Aeric Ochraqualf). The material was surface applied over cornstalk residue from the previous crop in plots 3 by 10 meters, and 'Bicolor' sweetcorn was no till planted on May 16, 1995. Because of wet, cold soil conditions the stand was unsatisfactory and the plots were rototilled on June 9, 1995, to kill the corn seedlings, incorporate the gypsum 7.5 to 10 cm (3-4 inches deep) and prepare for seeding of 'Edison' soybeans in 75-cm (30-inch) rows. The soybeans were growing nicely when the plots were sprayed with Sencor herbicide. For some reason this normally safe herbicide caused 80% of the plants to die within two weeks. Edison soybeans were replanted on June 26 again in 75-cm (30-inch) rows. Weed control was excellent and no further Sencor injury was noted. The plots were hand harvested on October 19, 1995. Two row segments 10 meters long were harvested from the interior of each four-row plot. Plants were tied in bundles, transported to the Ohio Agricultural Research and Development Center (OARDC) and run through a small plot combine. Grain moisture, bushel weight and yields were measured. Yields were low because of late planting, wet conditions early and inadequate moisture late in the growing season.

The upper trifoliate leaves were collected in August at early flowering for determination of Ca and Mg in the tissue by dry ashing, HCI extraction of the ash and determining the Ca and Mg by atomic absorption spectroscopy. Soil samples were collected from the 0-20-cm (0-8-in) depth on October 2, 1995 and taken to the Research Extension Analytical Laboratory (REAL) at the OARDC Wooster, Ohio where they were analyzed by Recommended Chemical Soil Test Procedures for the North Central Region. Ground samples of drywall were analyzed by the

REAL Lab to characterize its chemical composition. The average composition is reported in Table 2. The impact of the ground drywall on soil tilth was assessed by doing soil cone penetrometer readings in the plots the following spring (4-18-96). At least 10 probes were performed per plot down to a depth of 12 inches in hills created by chisel plowing with a "Dickey John" soil penetrometer. The maximum pressure noted in each 12 inch deep probe was noted in p.s.i. units. The data were statistically analyzed using ANOVA and calculating the linear regression between the soil and plant factors and the application rate of the drywall (graded variable).

Table 2

Particle Size Distribution of Pulverized Waste Drywall

Size Range	Sample Mean (%)	Sample Std. Dev. (%)	Coeff. Of Variation (%)
Paper & Particles	7.8	5.4	69
> 6 Mesh	41.5	3	7
6-8 Mesh	7.8	1.3	17
8-35 Mesh	16	2.2	14
35-60 Mesh	16.3	4.6	28
< 60 Mesh	10	4.6	46

* Means and associated statistics from sieving four samples of drywall after one pass through the Gypchipper.

Results

The principal results are presented in Table 3. Items are reported as the sample mean +/-sample standard deviation. The level of significance by linear regression is given as the probability of "F" for regression in the last column of Table 3. The drywall itself was quite high in calcium, magnesium and sulfur (Table 2). There were a number of trace elements present in the drywall, but only boron at 48 ppm looked high enough to be of any potential concern. Each ton of drywall applied would be applying 0.096 lbs. of boron. At rates of 75 or more tons/acre the level could build up and damage B sensitive crops. That did not happen in this study. Note grain yield and test weight were not significantly related to the rate of drywall applied although there was a slight positive trend for both. The soil exchangeable Ca and % Ca on the soil cation exchange capacity was significantly and positively correlated to the rate of drywall applied at the P(<0.05) level. Magnesium levels were not greatly reduced on the soil CEC or in the soybean plant tissue (Table 3). There was a modest but significant (P<0.0 1) decrease in soil penetrometer resistance readings with increasing rates of ground drywall applied when measured on the plots the following Spring, from 187 for the check plots to 171 lbs/in' for the 10.7 metric tons/ha plots. The backing paper from the shredded drywall was observed to be completely decomposed by April 1996, 11 months after application of the material in 1995.

Table 3

Effect of Drywall on Soybeans and Soil Test Results

	Rate of Drywall (Metric tons/ha)*			
0	5.37	10.7		
Grain Yield(Bu/a)	13.5 ± 2.0	14.5 ± 3.0	14.0 ± 3.6	0.807
Grain Test wt.(Lbs/Bu)	54.2 ± 37	54.3 ± 1.1	54.9 ± .37	0.269
Leaf Ca (%)	0.716 ± .12	0.739 ± .11	0.559 ± .05	0.066
Leaf Mg	0.225 ± .03	0.237 ± .02	0.230 ± .06	0.886
Soil pH	6.6 ± 0.3	6.7 ± .02	6.4 ± .03	0.332
Soil Bray P (ppm)	52 ± 10	62 ± 6	54 ± 17	0.822
Soil Exch. Ca (ppm)	1360 ± 182	1474 ± 152	1619 ± 189	0.026
Soil Exch. Mg (ppm)	310 ± 39	302 ± 14	283 ± 44	0.659
Soil CEC (meq/100g)	10 ± 0.8	10.3 ± 1	11.3 ± 1	0.074
Soil Ca Saturation CEC (%)	68 ± 1	70 ± 2	73 ± 4	0.029
Soil Penetrometer Readings (lbs/in2)	187 ± 23	180 ± 27	171 ± 31	0.004

*Numbers presented are sample means ± sample std. deviations.
**Describes plant measurement data or soil test data fit to rate of drywall by linear regression.

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An Initial Look at Voice Recognition

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The author looked into the potential of voice recognition technology as a possible alternative to the traditional keyboard. His experiences with this new technology, along with the determination of baseline typing speed for construction students, are presented. In addition, the potential for the use of this technology in the construction industry, and the strong need for further study is discussed.

Key Words: Voice Recognition, Speech Recognition, Information Technology, Construction

Introduction

Periodically, departmental faculty members meet with representatives from construction companies to review issues that are of interest to the industry. Historically, these meetings have been interesting and informative, and have helped faculty keep in touch with problems facing the industry.

In August of 1996, a small group of faculty members had a series of meetings with contractors in the region. A recurring theme in these discussions involved problems contractors had regarding communications from the field to the home office. Almost all the contractors mentioned problems involving daily reports and other forms of periodic communications.

Another problem frequently mentioned involved the continually increasing paperwork required of project managers and construction executives. The contractors discussed the importance of written communication skills in construction students, and emphasized the surprisingly large percentage of their workday that required written correspondence.

After the meetings with the contractors, the faculty members met to summarize the meetings, and to decide what course of action (if any) needed to be taken by the department. The general consensus of the faculty members was that voice recognition software could potentially alleviate the two problems mentioned by the contractors.

Literature Research

A literature search indicated promising developments in speech recognition. The United States Government has invested heavily in this technology (Weinstein, 1995). Several industry analysts along with the heads of large corporations addressed voice recognition in editorials and reviews.

Greater affordability, along with enthusiastic industry and governmental commitment, were common threads in the discussions and articles.

There are occasional references in the literature to some of the problems that exist with current voice technology (Mehm, 1996), and one author that predicts that progress will be "painfully slow" (Levinson, 1995), but the overwhelming majority of articles exhibit an aura of optimism and commitment A sampling is listed below. (Machrone, 1996 and Mayor, 1996)

The dream of being able to talk to your computer and have it respond intelligently is an old one. But for years, the technology was relegated to the high end of the marketplace, with PC applications initially nonexistent and then too expensive and bulky to capture much of the business market. Now an improved breed of out-of-the-box, PC based software is attempting once again to seed corporate offices with the voice commanded PC. (Mayor, 1996)

Industry analyses are equally enthusiastic regarding the future of voice systems. Some of the major impediments of the past, such as RAM availability and processor speed, we rapidly falling away, making what some refer to as the voice typewriter a near-term reality (Machrone, 1996).

> “In at least the 10-year time scale, that there will be widespread voice recognition. You will talk to your computer. And once we can do that, it won't be tong before your computer will talk back to you with the information you want.” Gordon Moore, -- author of Moore's Law and co-bounder of Fairchild Semiconductor and Intel. (Schmit, 1996)
>
> Q: So in five to 10 years, what kind of company will Microsoft be?
>
> A: "...In 10 years, a lot of that will be speech recognition, speech synthesis and vision. We our second-biggest business and probably still will be. "Bill Gates, founder and CEO of the Microsoft Corporation (Maney, 1996)

Selection of Voice Recognition Software

As a result of a literature search and subsequent discussion among faculty, a decision was made by the department head to fund the purchase of voice recognition software. A faculty member would be charged with looming the software and reporting whether further investigation and investment of resources was warranted.

The software chosen for the project was DragoaDictate for Windows 2.5 - Classic Edition. The cost of the software (for use with a broad range of applications) was approximately 500 dollars, but the same company is now offering application specific software for as little as 100 dollars. (Vardlamudi, 1996)

The software is based on discrete dictation, which requires the user in insert a slight pause between dictated words. Speech is analyzed using both an acoustic mode (where a word is compared with speech samples from thousands of other people) and a contextual mode where the software attempts to place the next word in proper context. Continuous speech recognition

products (which recognize normal speech patterns, and require no pauses) are becoming available, but are generally regarded to lack maturity, and are usually applicable to a very specific profession, such as radiology. (Schwartz, 1996) Several recent comparisons of voice recognition software me available in the literature. (Mehra, 1996)

Informal Interviews

As software was being evaluated and purchased, the author conducted several informal interviews with people in various occupations about the importance/relevance of direct electronic dictation. Each person was asked what he or she was most interested in teaming about electronic dictation. In the course of the discussions, several people voiced some form of one or both of the following questions:

1. Is electronic dictation more efficient than typing?
2. How many hours of warning are required to achieve competency?

One of the individuals interviewed opinion that "people will use electronic dictation only if it is faster and easier than the form of data input that they currently use." Obviously, voice input is of high interest in a person suffering from cereal tunnel syndrome or some other disability involving the hands or arms, while a person capable of typing 75 words per minute may be content with the traditional keyboard. It was noteworthy that most of the people interviewed were not satisfied with their keyboarding skills, and seemed very interested in other forms of input.

Initial Evaluation Parameters

Although a statistically significant study was not considered, certain anecdotal information was gathered to serve as a basis for decisions regarding further study/investment into construction applications of voice recognition technology.

The determination of the average typing speed of construction students is obviously an important variable in any discussion regarding the merits of voice recognition systems in construction. Additionally, a reporting of the experiences of an individual in teaming and using the technology would be of interest, and would serve as background for future decisions. Similarly, a compilation of industry reviews and commentary would also bolster future decisions.

Typing

Thirty construction students were asked in participate in a five minute typing test. The text for the rest came from a commonly used college textbook on reinforced concrete. Students used Microsoft Word for the word processing software. The students were instructed to correct errors as they trade them (although they did not always do so), and to try to hand in a perfect paper. The

students were in their third or fourth year of college. The results of the typing test are compiled in Table 1 and Table 2.

Table 1

Typing Data

Student Number	Gender	Year	Instructor	Time (in)	# of Words	# of Errors	WPM
1	M	3	Love	5	116	2	22.8
2	M	4	Love	5	90	0	18
3	M	3	Love	5	122	0	24.4
4	F	3	Love	5	92	0	18.4
5	F	4	Love	5	82	0	16.4
6	M	4	Love	5	103	0	20.6
7	M	4	Love	5	109	0	21.8
8	M	4	Love	5	102	0	20.4
9	M	3	Love	5	121	0	24.2
10	M	4	Love	5	95	0	17
11	M	4	Love	5	82	0	16.4
12	M	4	Love	5	77	1	15.2
13	M	4	Williams	5	79	1	15.6
14	M	4	Williams	5	100	0	20
15	M	4	Williams	5	100	0	20
16	M	4	Williams	5	84	0	16.8
17	M	3	Williams	5	78	0	15.6
18	M	4	Williams	5	105	1	20.8
19	M	4	Williams	5	117	0	23.4
20	F	6	Corely	5	105	0	21
21	M	3	Hein	5	84	0	16.8
22	M	3	Hein	5	135	4	26.2
23	M	4	Hein	5	154	3	30.2
24	M	4	Hein	5	98	1	19.4
25	M	4	Hein	5	83	0	t6.6
26	M	4	Hein	5	128	1	25.4
27	M	4	Hein	5	103	1	20.4
28	M	3	Hein	5	178	0	3 5

Table 2

Typing Test Summary

Average Words Per Minute	20.27
Mean Words Per Minute	20.00
Minimum Words Per Minute	13.20
Maximum Words Per Minute	35.60
Standard Deviation	4.83

Voice Dictation

After determining average typing speeds, the author set up a dictation test using the same text the students used. At this time, the author had approximately twenty hours of practice with electronic dictation. The author had never "practiced" on this particular text in advance. The author

intended to correct all errors as they occurred, but later analysis of the test yielded 2 to 4 errors in each trial. The dictation test was conducted in a quiet classroom. Since one of advertised feature of voice recognition software is its capacity to "learn," the author repeated the test five times to see if a teaming trend was evident. The results are reported in Table 3, and a comparison of voice and keyboard speeds is shown in Figure 1.

Table 3

Voice Data

Trial #	Time (in)	# of Words	# of Errors	Dictated Words per Minute
1	5	76	2	15.2
2	5	134	2	26.8
3	5	152	4	30.4
4	5	165	3	33
5	5	182	2	36A

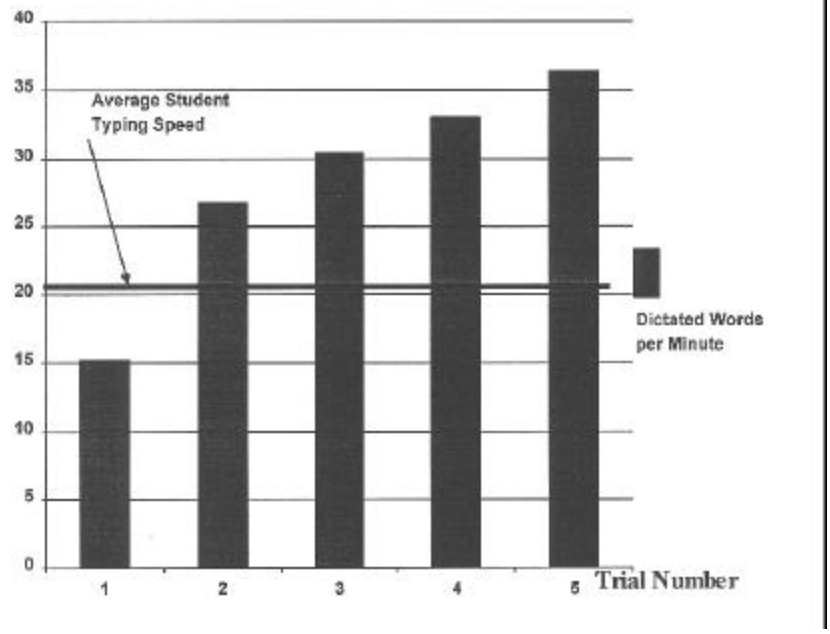

Figure 1. Comparison of voice and keyboard speed.

Discussion of Typing and Voice Tests

The average typing speed for the construction students tested was about 20 words per minute. The first electronic dictation yielded a speed of 15 words per minute, or about 75 percent of the average typing speed of the students.

The voice recognition software demonstrated ability to "team." By the third repetition the initial voice dictation speed was doubled. This increase is significant because it indicates that the speed of all electronic dictation will increase as a function of usage. Dictation speeds continued to increase as a function of the number of trials, with a period of diminishing returns noticeable in the fourth and fifth repetitions.

Conclusion

The author's initial experience with voice recognition suggests strong potential for voice recognition and a need for further study regarding construction applications. The literature indicates that the quality of the software is rapidly evolving, and that the price of the software is rapidly decreasing. The literature bather indicates that leaders of major information technology corporations see voice recognition as a prominent pan of their business within the next ten years. Using commercially available software with minimal training, the author was able to approach the average typing speed of a group of thirty construction students the first time the text was dictated. Further repetitions yielded significant increases in speed, indicating that dictation speed would increase as the software "learned" the user's voice patterns.

Other than occasional editing, the entire body of this document was electronically dictated using DragonDictme for Windows, Version 2.5, Classic Edition.

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Appendix I

Journal Describing Early Lemming Process

Note: Entries in this journal contain spelling, usage, and grammar errors. In the spirit of retaining original thoughts and opinions, no subsequent editing was done.

Entry I - Tuesday, October 1, 1996
This journal is being dictated rising Dragon Dicame. I installed the software this morning, I dictated most of a letter of reference for a colleague the same afternoon. I also went through the tutorial after software was installed.
My initial reaction is mixed. It is fun to dictate letters. The software does seem to be a little slow to me. I am running it on a Pentium 90 computer, with 16 megabytes of RAM.
I need to go back and review some of the correction features. When I make a mistake that occurs about three words back, I have trouble fixing it.
I have spent about three hours with the software.

Entry 2 - Wednesday, October 2
1 got up early this morning and answered my e-mail using Dragon Dictate. It seems the software is already beginning to recognize my voice. I am really bothered that the word display does not keep pace with my speaking voice. I wonder if a faster computer would reduce this problem.
I returned home in the afternoon and answered e-mail with dictated responses. I felt much better about my own skill level and about the voice recognition software ability to understand my words. I spent three hours dictating on this second day. This stuff may work!

Entry 3 - Thursday, October 3
1 got up early again this morning and answered my e-mail via voice. I did compose a long message the be technology committee and when I changed to command mode and told the program to hit send, the program shut down and my long message was lost. That was frustrating.
I also read an article in InfoWorld that rated dictation systems, Of the three systems rated, Dragon Dictate was third. I need to remember to get an electronic copy of that article and pat it in my files. I told a friend today that I thought I was getting as fast at voice dictation as I using the keyboard.

Entry 4 -Tuesday, October 8
I have been remiss in my Journal writing for the last few days. I dictated a letter this morning and looked at the statistic's section for the first time. I dictated 17 words per minute at an accuracy rate of 91 percent. I need to read from the newspaper soon so that I will get a feet for how fast I can go. I am suit very optimistic about the technology, I need to get better with the error correction. I do feet like I can dictate as fast as I can type. One of the things that I have noticed is how comfortable (physically) it is to dictate as opposed to typing. I sit with my hands behind my head and my feet propped up on the desk when I dictate. I have accumulated about 11 hours training so far.

Entry 5-Thursday, October 10
I continue to team. I called typical support for the fast time yesterday. They were friendly and competent. I am having trouble with the file save command, especially when used with my e-mail system. I am going to call them again this morning. It will be interesting to see what Ashley (a graduate student also working with voice) thinks about product.
It definitely takes some time and some patience to learn. You really have to be committed to learning to use the dictation system. T am a little discouraged today, but I am going to keep plugging,

Entry 6--Friday, October 11
I took a typing test yesterday. I took an article out of USA Today and read to the computer. I really had a hard time. I typed only 10 words per minute and my accuracy was only 76 percent. There were difficult words in the article but I was disappointed that speed and accuracy were so low.

I was able to talk to Keith Byerly at Dragon Systems. We had a great discussion about the future of voice recognition systems. Keith told me that he dictated 90 words per minute at Comdex last year. We got along very well and I plan to talk to him again. I have about 15 hours invested so far.

Entry 7--Tuesday, October 15
My wife and I had a race yesterday. She was able to type at a rate 60 words per minute. I was able to dictate at a rate of fifty-one words per minute. I am getting more comfortable every day with the software. I find that it is helpful if I enunciate very carefully. I will be giving a short presentation this Friday for the industry advisory counsel. I want to make sure that I understand voice macros before I give the presentation.

Entry 8--Monday, October 21
I gave my presentation to the Industry Advisory Council last Friday. I felt like it went very well. Ashley and I practiced a good bit. We used some voice macros to enhance what we showed them. Voice macros are really slick. I can see a professional doing some very impressive things with them. All in all, I felt like they were impressed. I need to remind myself to dictate more frequently, I have invested about 20 hours so far.

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Qualitative Correlates of Private Outside Space Satisfaction

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The purpose of the study was to identify the predictors of satisfaction with private outside pace surrounding a single family detached dwelling. A sample of 198 households were randomly selected from residential communities in Bryan-College Station, Texas. Relevant data related to the qualitative attributes of private outside space were collected through both face-to-face interview and observations. The data was analyzed using stepwise, response surface, and multiple regression analyses. Results of the analyses suggested that private outside space satisfaction is indeed affected by privacy, perceived level of yard maintenance, and territorial personalization.

Key Words: Maintenance. Private Outside Space Satisfaction, Privacy, Residential Design, Single-Family Detached Dwellings, Territorial Personalization

Statement of the Problem

Residential satisfaction is a measure of the adequacy of the living environment as evaluated by the resident. The literature shows that a dwelling unit by itself is not the only determinant of residential satisfaction. It is only a part or sub-system of the whole system that constitutes residential habitability (Onibokun, 1974; Amerigo and Aragones, 1990). Residents, through the process of interaction, come into contact with various components of this environment that affect their satisfaction. Private outside space, defined here to include all the spaces between the doorsteps and property limits, is an important component of this system.

A vast majority of American housing consists of single-family, detached dwellings on private plots of land (Moudon, 1986). The private outside space of these dwellings is a too in the hands of residents for maintaining, adapting, and modifying the immediate surroundings in ways that are personally satisfying to them. Behaviors such as gardening and landscaping are considered to be traditional American vehicles for achieving individuality and uniqueness, on one hand, and for reflection of community identity, on the other (Ahman and Cheaters. 1989).

In order to have a better understanding of private outside space and incorporate it meaningfully within the residential environment, it is necessary to identify the predictors of satisfaction related to this important component of a single-family dwelling. It is hypothesized that satisfaction with private outside space is affected by the qualitative attributes such as perceived privacy, level of maintenance, and territorial personalization of the space.

Delimitations of the Study

The study was limited to a sample population of randomly selected households in Bryan-College Station, Texas.

It was treated as a pilot shady without my attempt to generalize the results beyond Bryan-College Station, Texas.

The random samples of households were confined only to Afro-Americans, Anglo-Americans, and Hispanic Americans living in single-family detached dwellings.

Methodology

Study Population

The study population consists of a sample of 198 households living in single-family detached dwellings, either owned or rented, in randomly selected residential communities in Bryan-College Station, Texas. The entities under study are individual households in these communities. The unit of analysis is the head of a household.

Data Collection Procedure

Face-to-face interview procedures were adopted to collect data relating to: 1) private outside space satisfaction, 2) privacy of private outside space, and 3) maintenance of private outside space. The literature indicates that this procedure elicits a higher response than mail surveys (Bobbie, 1979). An interview instrument was developed for the purpose. It was pre-tested for validity using 20 randomly selected households from the sample population. Some in minor readjustments were done in the final instrument based on the results of the pretest.

Uses of various territorial markers were then observed and recorded to measure the degree of territorial personalization. Photographs of the private outside spaces were also taken in order to supplement the personal observations.

Variables and their Operationalization

Private Outside Space Satisfaction (PSAT)

Private outside space is the reported satisfaction of the head of household with private outside space including front and back yards. It was operationalized in the same manner as overall residential satisfaction.

Maintenance of Front Yard (MFYRD)

This is the reported state of maintenance of the front yard. It was operationatized by measuring the reported level of maintenance on a seven-point scale ranging from 1 (very poorly kept) to 7 (very welt kept).

Maintenance of Back Yard (MBYRD)

This is the reported state of maintenance of back yard. It was operationalized by measuring the reported level of maintenance on a seven-point scale ranging from I (very poorly kept) to 7 (very well kept).

Privacy of Front Yard (PFYRDX)

This is the reported degree of freedom from visual and acoustical intrusion of the front yard by people other than members of the household. It was operationalized using a summary index overstating the following items:

- Visual privacy from neighbors
- Visual privacy from passers-by
- Acoustical privacy from neighbors
- Acoustical privacy from passers-by

The items were measured on a seven-point scale ranging from I (strongly disagree) to 7 (strongly agree). Privacy of front yard was the sum score of these items.

Privacy of Back Yard (PBYRDX)

This is the reported degree of freedom from visual and acoustical intrusion of the back yard by people other than members of the household. Tt was operationalized in the same manner as privacy in front yard.

Territorial Personalization (TPX)

Territorial personalization is the observed modification, demarcation, and/or adornment of private outside space by a household. It was operationalized through identification of both explicit and symbolic territorial markets used by the household in the private outside space. The presence or absence of the following items in the front/back yard was observed:

1. Well-trimmed grass,
2. Flowerbeds against home,
3. Potted plants on yard,
4. Shrubs on yard,
5. Hedges against home,
6. Hedge along approach path,
7. Flowers along path,

8. Vegetable garden,
9. Immune,
10. Water fountain,
11. Birdbath,
12. Figurines/garden elves,
13. Pet house,
14. Barbecue grill,
15. Deck,
16. Flowerbed at boundary,
17. Hedge at boundary,
18. Decorated mailbox,
19. Family time on mailbox,
20. Decorated gate, and
21. Family name on gate.

A "yes" was assigned if an item was observed to be present and a "no" was assigned if was not present. A total count of 'yes's" measured the degree of territorial personalization.

Analysis and Interpretation

Results

A stepwise regression was first performed to determine the relative importance of the qualitative attributes with respect to their contribution in explaining variance of PSAT. It was performed using a forward-selection procedure setting the significance level of entry at 1. The following model was used for the analysis:

PSAT - b 0 + b I TPX + b2*MFYRD* + *b* 3 *MBYRD* + *b* 4 *PFYRDX* +b 5 *PBYRDX* + *e*

where PSAT= private outside space satisfaction,
b0= intercept,
b1, b2, etc.= regression coefficients,
TPX = index of territorial personalization of private outside space,
MFYRD= maintenance of front yard,
MBYRD = maintenance of back yard,
PFYRDX= index of privacy of front yard,
PBYRDX= index of privacy of back yard, and
e = error term.

Results of the analysis are shown in Table 1.

Table 1

Summary of forward selection procedure for PSAT using qualitative attributes of private outside space

Variable	Step	Partial R^2	Model R^2	Model F	*p>F*	Critical value of F
MBYRD	1	0.38	.38	120.13	.0001	2.74
TPX	2	.13	.51	49.35	.0001	2.74
MFYRD	3	.02	.52	6.98	.0089	2.74
PFYRDX	4	.01	.53	4.54	.0344	2.74
PBYRDX	5	.00	.54	1.43	.2333	2.74

After determining the sequence of the independent variables in order of their strength, a response-surface regression was performed. This analysis was done to find out whether regression equations using quadratic and cross product terms were significant. The results of the analysis are shown in Table 2.

Table 2

Regression analysis for PSAT using linear, quadratic, and cross-product terms of qualitative attributes of private outside space

Regression	*duff.*	Model R^2	Model F	*p>f*	Critical value of F
Linear	5	.54	45.13	.0000	1.89
Quadratic	5	.02	1.34	.2478	1.89
Cross product	10	.03	1.10	.3648	1.64

The results indicated that a regression analysis using only linear terms was statistically significant at the .10 level. Based on these results, it was decided to retain only linear terms in the model.

A multiple regression was then performed entering the independent variables in the order obtained earlier through forward selection procedure. Results of the analysis are shown in Table 3.

Table 3

Multiple regression analysis for PSAT using qualitative attributes of private outside space

Variable	Intercept	Regression coeffecient	T	p>?T?	Critical value of ?T?
Intercept	0.70	-	1.97	.0506	1.65
MBYRD	-	0.30	4.11	.0001	1.65
TPX	-	0.18	5.88	.0001	1.65
MFYRD	-	0.19	2.52	0.0125	1.65
PFYRDX	-	0.04	1.82	.0628	1.65
PBYRDX	-	0.02	1.20	.2333	1.65

Model $F(5,192)=44.50$ *p>F.001* Critical value of $F = 1.88$
Model $R^2 = 0.54$ Adjusted model $R^2 = 0.52$
Based on the results of the analysis the regression equation can be written as follows:
PSAT = 0.70 + .30**MBYRD* + 0.18**TPX* + 0.19**MFYRD* + 0.04**PFYRDX* + 0.02**PBYRDX* (1)

Interpretation of Results

The F-value of the model used for multiple regression analysis was found to be statistically significant. This provides evidence that a relationship exists between PSAT and the qualitative attributes of private outside space used in the model. The predictive efficacy of the model was found to be quite satisfactory with an *R2* of 0.54 and an adjusted *R2* value of 0.52.

Four qualitative attributes of private outside *space--MBYRD, TPX, AIFYRD,* and *PFYRDX*--were found to have statistically significant effects on PSAT at the. 10 level. *PBYRDX* did not seem to have my statistically significant effect on PSAT.

PSAT seemed to have a positive relationship with the qualitative attributes. Satisfaction with private outside space increased by 0.30 unit for every unit increase in *AATYRD,* by 0.18 unit for every increase in TPX, by 0.19 unit for every unit increase in *MFYRD,* and by 0.04 unit for every unit increase in *PFYRDX*.

It is apparent from the results that perceived level of maintenance of private outside space had a significant effect on satisfaction. Jackson (195 1) suggests that private outside space is a national institution in American society; it not only provides a place for outdoor enjoyment, but also indicates social standing. People feet a sense of accomplishment when their yards look equal to or better than their neighbors' (Altinm and Chomers, 1989). It, therefore, seems likely that a positive correlation would exist between PSAT and both *MFYRD* and *MBYRD.*

Territorial personalization using physical and symbolic markets have psychological consequences of stress reduction and individuation (Taylor, 1988). Personalization of immediate outdoor environments also serves to express identity and solidarity with one's community and neighborhood (Taylor, 1988). General modification of one's immediate outdoor environment enhances the levels of pride and, consequently, satisfaction with one's residential environment, The positive relationship between PSAT and TPX was, therefore, not unexpected.

The positive relationship PSAT and *PFYRDX* may apparently seem to be contradictory to the American attitude of making the front yard readily visible, reflecting an open display of the family to outsiders (Altman and Chemers, 1989). This attitude, however, does not preclude a resident’s desire to have mechanisms and devices in order to maintain a desired level of interaction. If the social interaction exceeds an optimal level, the condition may be regarded as an intrusion of privacy (Altman, 1975). Attaining a desired level of aural and visual privacy of yards results in producing a higher level of satisfaction (Francescato at al., 1979).

Summary and Discussion

Results of the study suggest that qualitative attributes of private outside space have an effect on satisfaction with private outside space. The attributes which were indicated to be important predictors of satisfaction with private outside space included territorial personalization of the

immediate outdoor environment (TPX), maintenance of both front *(MFYRD)* and back yards *(MBYRD),* and the privacy of the front yard *(PFYRDT).*

The findings related to the effects of qualitative attributes of private outside space on satisfaction will have significant implications for architects, planners, residential developers, and other professionals engaged in the design and delivery of housing, If the important predictors of satisfaction with private outside space are identified, then it becomes easier to immolate a general guideline for the design of single-family, detached dwellings that meet the socio-cultural and functional needs of the residents

Territorial personalization (TPX) is an important predictor of satisfaction with private outside space. It implies that the immediate outdoor environment should be organized in such a manna that offers opportunities to residents for alteration and modification of this environment to reflect their personal tastes. It should be possible for residents to provide territorial definition to this environment.

Maintenance of yards *(MFYPD* and *MBYRD)* is directly related to satisfaction with private outside space. Both front and back yards, therefore, need to be designed so that they can be maintained property. Marcus and Sarkissan (1986) indicate that people with smaller yards we likely to maintain them more attractively than those with larger yards. They also suggest that long and narrow yards be avoided from the point of view of maintenance. It is, however, difficult to specify optimum yard sizes, particularly in view of the finding that no relationship exists between quantity of private outside space and satisfaction.

Privacy of front yard *(PFYRDX)* is mother predictor of private outside space satisfaction. Privacy of this space, therefore, should be reasonably assured. This may, however, be difficult to achieve due to the dialectic interplays between closed and open characteristics of the front yard (Altman and Charters, 1989). This space, on one hand, is a public display area of the family to the outsiders and, on the other hand, a buffer between "public" outside world and "private" interior residential settings. It is, therefore, advisable not to fence the front yard, but to provide opportunities for the residents to achieve the degree of privacy they require either at by adding symbolic fencing or planting.

Satisfaction with private outside space was measured in the study without making any distinction between front and back yards. Use of territorial markets, generally, was found to be higher on the front of the dwelling than on the back. It may, thus, be possible that territorial personalization is a more important predictor of satisfaction with the front yard than satisfaction with the back yard. A logical extension of this research may, therefore, be to conduct studies on satisfaction with front and back yard separately.

People attach importance to various attributes of a residential environment based on their goals, needs, expectations, and aspirations (Cutter, 198 1). It may, therefore, be beneficial to introduce a dimension of importance of various attributes of private outside space for conducting further studies on private outside space satisfaction.

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Inadequate Capitalization of the Construction Firm: Piercing Corporateness Under the Alter Ego Theory

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Piercing the corporation veil is the most litigated issue in corporate law. Although a corporation is recognized as a legal entity having limited liability to the individual shareholder, officer, and director, there are many instances when the court will ignore corporateness, and hold the shareholder, officer, and director liable. One particular area that is most litigated is the question of proper capitalization of the firm. For the newly formulated construction organization, the issue of adequate capitalization has significant ramifications in terms of personal liability shielding.

Key Words: legal fiction, corporation, piercing the veil, alter ego

Introduction

The term *incorporate* means to create a legal body (Black Law Dictionary, 1979). A corporation is a legal entity that is strictly a creation reserved by the state (Berle, 1947). In essence, unlike the sole proprietorship and the partnership, one has no authority to create a corporation without first having the state of proper jurisdiction sanction its existence (Revised Model Business Corporation Act, Sec. 1.28, 2.01, 2.02, 2.03, 1999). Justice Marshall gave further definition to the construct corporateness and its creation by stating... "a corporation is an artificial being, invisible, intangible, and existing in the contemplation of the law...it possess only those properties which the character of its creation confers upon it" (*Trustees of Dartmouth College v. Woodward*, 17 U.S. 4 Wheat. 636 ,1819).

The character referred to by Justice Marshall is the "articles of incorporation" filed with the appropriate state officials having jurisdiction. Expanding the operational definition of corporateness further, a corporation is a collective association of equity investors (shareholders) having separate legal personality from the equity individuals (shareholders). Thus, the rights, duties, and other legal relations arising out of the enterprise are adjusted as though the corporation were a separate legal entity. As a result, the law perceives, in apparent recognition, that the corporation is a *fictional entity* that is coordinated and directed by equity investors (Klein, 1982). The shareholder, in theory, has only an *indirect interest* in the assets of the corporation. In the event of liquidation, this indirect interest is a function manifested by the right to receive corporate dividends, and distribution of corporate assets (Clark, 1986).

Owing to the notion of *fictional legal entity* and *indirect interest*, regulatory statutes (state statutes of incorporation) create limited liability for the shareholder of the corporate entity. In essence, what limited liability is construed to mean is that the corporation is unlimitedly liable

for all debts and obligations of the business while the shareholder is not, since in theory, the transactional debt is a contractual function of the fictional or artificial entity (*Lyons v. Lyons*, 340 So. 2d 450 ,1976; *City of Keil v. Frank Shoe Mfg. Co.*, 14 N.W. 2d 164, 1944; *Sampay v. Davis*, 342 So. 2d 1186,1977; *Rosenthal v. Leaseway of Texas, Inc.*, 544 S.W. 2d 180, 1976). In short, the equity investor (shareholder) is at risk for only that proportional capital amount contributed to the corporate capital stock formulating the capital base of the corporation (*Charter Air Ctr. Inc. v. Miller*, 348 So. 2d 614, 1977). Nonetheless however, a court may interpret the statutory scheme as superseding corporate limited liability so as to serve the overriding proposal of the statute. In essence, the principal legal issue is whether the court will recognize the limited liability inherent in corporateness and, thus either inculpate or exculpate the shareholder from personal liability. Essentially, the separate existence of fictional corporateness is at question and may be ignored by the court by using the metaphor "piercing the corporate veil" (*Barlle v. Home Owners Coop.*, 127 N.E. 2d 832, 1955). The court oftentimes uses other metaphorical descriptors such as "alter ego" or " mere instrumentality" (*Dewitt Truck Brothers v. W. Ray Flemming Fruit Co.*, 540 F. 2d 681. 1976). In essence, each of these legal doctrines raises the same questions: whether or not the reviewing court will recognize legal separation between the corporation and the shareholder. At the core of this question is the thin divide between the fictional legal entity, and the shareholder's indirect interest. Thus, this paper shall explore this question of corporate law so that an owner/manager of the construction organization can further understand the import of their managerial decisions vis-à-vis the creditor, corporate liability, and their own personal liability.

Exception to Limited Liability

As noted herein, the principal advantage of the corporate business form is that each shareholder's potential loss is limited to the amount invested in the construction entity. Unfortunately, this is not always the case (*Thomas v. Southside Contractors, Inc.*, 543 S.W. 2d 917,1976). In fact, the questions whether corporate veil should be pierced and, thus hold the corporate shareholder liable is the most frequently litigated area of corporate law (Thompson, 1991). In theory, the economic norm of corporateness is contractual risk transfer. Under this construct, the limited liability regime creates a risk paradigm, whereby risk of business failure shifts directly to the creditor and not the shareholder. This risk paradigm however, is reversed in certain circumstances. The key question for a construction corporation is, when will the court pierce the veil of limited liability and transfer the risk back to the shareholder. There are several factual constructs that move a court to legally disregard the shield of liability protection offered by corporateness - these are: (1) undercapitalization, (2) fraud, (3) debt structure, and (4) commingling of funds and assets. In conjunction with these factors giving impetus to piercing the corporate veil, the court typically gives great deference to the type of creditor. The court generally defines two principal types of creditors as: (1) voluntary creditor, (2) involuntary creditor - tort victim (Clark, 1986). In short, these factors give issue to shareholder liability by virtue of their ownership interest (indirect interest) in the corporation. The balance of this writing shall write to the voluntary creditor paradigm.

Piercing the Corporate Veil

The court will only pierce the veil of a closely held corporation or corporate group (Thompson, 1991). Thompson's study identifies profiles and characteristics of closely held corporate organizations and found the following: (1) the stockholder professionally manages the business, (2) the stockholder functions as a member of the board of directors, and (3) the stockholder makes asset risk decisions. Thompson's (1991) study points out that there exists a consistent predictable pattern by the court in piercing the corporate veil cases. Most frequently the court typically looks to shareholder's "domination" or "absolute control" (Thompson, 1991). In *DeWitt Truck Brothers v. W. Ray Flemming Fruit Co.*, 540 F.2d 681 (1976), the court set forth a list of tests available to pierce the corporate veil by identifying a closely held corporation as ... " a facade for the operation of a dominant stockholder, thus there is not a closely held corporation that does not flunk one of the test." To understand this area of law more fully, the following written discussion shall examine case law where the factual construct undercapitalization in relation to shareholder dominion and control vis-à-vis the voluntary creditor is at issue.

Inadequate Initial Capitalization

The reason most often given for the court to pierce the corporate veil is inadequate capitalization of the corporation (Thompson, 1991). The test is applied at the time of incorporation, and seeks to balance the amount of capital base contribution in relation to the nature of the risk the corporation will encounter (*Minton v. Caveney*, 364 P.2d 476, 1961). This test must be applied on a case-by-case basis (*Platt v. Billingsley*, 281 P.2d 267, 1965). In *Carlesimo v. Schwebel*, 197 P.2d 167 (1948), the court answered the question whether undercapitalization was a matter of deception? The Carlesimo court responded in the affirmative, but however, concluded that a deception was not practiced nor perpetrated by the defendant. In the Carlesimo matter, the court enunciated the test of *alter ego* in undercapitalization cases as whether the shareholder, director, or officer represented oneself as an individual or distinguished themselves as representatives dealing with a corporation. In such instances, under the "alter ego doctrine," the court disregards the corporate entity and thus holds the individual personally liable for acts knowingly and intentionally done with disregard for corporateness (*Ivey v. Pyler*, 246 Cal. App. 2d 678, 1962). Thus, the alter ego doctrine does not create additional assets for the corporation, but instead fastens liability to the individual who uses the corporation as an instrumentality in the alter ego conducting business for personal gain (*Garvin v. Mattews*, 74 P.2d 990, 1938). In a case similarly factual to Carlesimo (*Harris v. Curtis*, 8 Cal. App. 3d 837, 1973), directors and stockholders were personally sued for undercapitalization. The court articulated that undercapitalization was ground for piercing the corporate veil, however, the court declared that undercapitalization was not a per se rule (automatic) and, therefore liability would not automatically accrue to the shareholder, officer, or board director. Here too, similar to the Carlesimo court, the Harris court looked to the business conditions, and circumstances of the parties and declared no deception, or fraud. The court simultaneously examined the question of control and dominion. In this instant case, the court concluded that undoubtedly the corporation was under financed, however, the stockholder, director, and officer at no time took direct control of the corporate entity or held themselves out to the alter ego of the corporation. Thus, the court

did not disregard the corporate entity, thereby exculpating the stockholder, director, and officer of direct personal liability.

The antithesis occurs however, when the court finds purposeful, and or continued undercapitalization (*DeWitt Truck Brokers, Inc., v. W. Ray Flemming Fruit Co.,* 540 F.2d 681, 1976). In DeWitt, the court looked to how the individual defendant conducted operations with creditors and the corporation in applying the "instrumentality", "alter ego" doctrine. The DeWitt court citing to *Automotrig Del Golfo De Cal. V. Resride*, 306 P.2d 1, (1957), states capitalization begins with incorporation and remains a continuous obligation thereafter during business operations. The court further articulates that undercapitalization must be viewed in light with other factors necessary to pierce the corporate veil. In the instant case, defendant Flemming purposefully siphoned down the original risk capital stock, and deliberately operated the company at a financial loss. During this period, in conjunction with operating at zero level capital stock, Flemming took excessive personal compensation as a salary by not paying transportation fees owing and due voluntary corporate creditors. Plaintiff DeWitt (voluntary creditor) subsequently sued Flemming under the alter ego theory. Flemming countered the suit with the defense that the Flemming Co. was insolvent, and that Flemming was only personally liable for the amount of his original capital stock investment. The DeWitt court, similar to the Carlesimo and Harris courts cited herein, spoke to the issue of deception and fraud. The DeWitt court citing to *Anderson v. Abbot*, 64 5. Ct. 531 (1944), explained fraud is a ground for disregarding the corporate veil, however, the DeWitt court concludes absolute proof of fraud is not a necessary element in disregarding the corporate entity. In short, the DeWitt court concludes that something less than fraud, in conjunction with other corporate violation, serves as adequate reason to employ the alter ego doctrine as a remedy for a corporate creditor. The court articulates that a court must... "necessarily vary according to the circumstances of each case...every case is *sui generis*... decided in accordance with it own underlying fact." Here the court exhaustively examined money violations in the management of the corporation, but the court finally concludes that disregard for the corporate entity was appropriate in this case owing to the fact that Flemming personally abused credit extensions made to the Flemming Co. The abuse and causality factor took place when Flemming induced corporate creditors to continue extending credit to the Flemming Co., by making bold and personal statements giving assurance that he personally would pay the debt of the Flemming Co. In the instant case, the court views such assurance was given to the corporate creditor for the obvious purpose of promoting a personal advantage to Flemming himself. On this basis, in addition to the origination and continuation of inadequate capitalization, and the deliberate and purposeful control in reducing the capital stock of the corporation, the court pierced the corporate veil, thereby disregarding the separate corporate entity paradigm and the construct of limited liability and, thus holding and inculpating Flemming personally liable for Flemming Co's, outstanding debt to voluntary creditor DeWitt. (See also *Weisser v. Mursam Shoe Co.*, 127 F.2d 344, 1942; *Bobby Jones Garden Apartments, Inc. V. Suleski,* 391 f. 2d 172, 1968; *Newberry v. Barth Inc.*, 252 N.W. 2d, 1977).

In a similar action, *Sea-Land Services, Inc., v. Pepper Source*, 941 F.2d 519 (1991), the court laid down the Van Dorn test for ascertaining corporate veil piercing as articulated in the *Van Dorn Co. v. Future Chemical and Oil Corp*., 753 f.2d 565 (1985). The Van Dorn court held:

> *A corporate entity will be disregarded and the veil of limited liability pierced when two requirements are met: First, there must be such unity of interest and ownership that the separate personalities of the corporation and the individual [or other corporations] no longer exist, and second, circumstances must be such that adherence to the fiction of separate corporate existence would sanction a fraud or promote injustice.*

The Sea-Land court citing to *Macaluso v. Jenkins*, 420 N.E 2d 255 (1981) for testing whether the corporation is controlled by another to justify disregarding corporate separateness list a four factor test: (1) the failure to maintain adequate corporate records or comply with corporate formalities, (2) commingling of funds or assets, (3) undercapitalization, and (4) one corporation treating the assets of another corporation as its own. Here one can see the confluencing of the Garvin and DeWitt cases by the Sea-Land court. First, in the Garvin case, piercing the veil for undercapitalization is one factor however, the court made it clear that this was not a per se rule (automatic) in and of itself. In fact, the Garvin court strictly examined and tested whether the stockholders, directors, and officers exceeded their indirect interest as equity holders, thereby separating themselves from the legal fiction of corporateness. Similarly, as with the DeWitt court, the Garvin court stated, there must be a conjoining or unity of interest exhibited by the stockholder, and the undercapitalization issue does not necessarily need to rise to the level of fraud, in fact, under the Van Dorn test, it can be something less than fraud such as precluding an injustice.

The facts in the Sea-Land case are similar to the DeWitt matter except the defendant stockholder (Gerald Marchese) is a single stockholder of five business entities all qualifying as separate corporations, with Pepper Source Corporation maintaining no assets (Corporation's veil being sought to be pierced). Like DeWitt, the Pepper Source Corporation incurred debt to plaintiff, a voluntary creditor (Sea-Land), in the amount of $87,000. Further, defendant Marchese also borrowed large sums of money from Pepper Source interest free, used Pepper Source's bank accounts to pay personal expenses including alimony and child support, during this period. In addition to the above, Pepper Source had no origination capital at the time of incorporation, nor did Marchese ever attempt to grow the capital stock base of Pepper Source once business operation commenced. Sea-Land sued Pepper Source and received a judgment against same for debts outstanding. However, because Pepper Source had no assets, Sea-Land could not recover under the judgment against Pepper Source. Sea-Land then sought suit to pierce the corporate veil of Pepper Source and, thereby render Marchese personally liable on the judgment owed Sea-Land. The court held that all five corporations were not only the alter egos of Marchese, but more importantly of each other.

The Sea-Land court, in applying the first part of the Van Dorn test, concludes that the "shared control/unity of interest and ownership" of the Van Dorn test had been met because Marchese had commingled personal funds and assets with those of the corporation, and deliberately and purposefully undercapitalized the corporation by moving and borrowing funds without regard to their source. In short, the court's analysis concludes that under the first part of the Van Dorn test, the nexus between each corporation and Marchese was so close that corporateness, and separateness, and indirect interest were ultimately indistinguishable. As a result Marchese was found to be operating as the alter ego of Pepper Source.

Under the second part of the Van Dorn test: "would sanction fraud or promote injustice", the court explicitly states, unlike the implicit statement made by the DeWitt court, that the analytics vis-à-vis "promote injustice" is something less than an affirmative showing of fraud. The Sea-Land court held that there must be a showing of unfairness to the creditors, or a wrong that invokes injustice, or a standard of fraud. On remand the district court rendered a verdict in favor of Sea-Land finding Marchese had made personal assurances to Sea-Land representatives that he would pay the corporate debt knowing that he had deliberately and intentionally manipulated Pepper Source's funds so that no such funds were available. The court found Marchese had perpetrated a fraud on Sea-Land and other creditors by receiving the benefits of credit extensions at the expense of creditors including loans and salaries paid to him. Thus, the court concluded both parts of the Van Dorn test were present and, therefore pierced the corporate veil holding Marchese personally liable for all five corporate debts.

Conclusion

Piercing the closely held corporation raises the issue of whether the individual stockholder, officer, and director will be imputed with personal liability. The most often cause cited for justifying a piercing action by the court is that of undercapitalization or deliberate siphoning off of adequate capital to manage the organization. The court in such an instance applies the alter ego metaphor to pierce corporateness, and thereby hold the individual liable. In this instance, the court typically applies the Van Dorn test. Under Van Dorn, the court looks to the unity of the action between corporation and the party or parties managing same, and whether the adherence to the fiction of legal separateness of corporateness would sanction a fraud or promote injustice. It seems, when both prongs of Van Dorn test are met, the court ignores the legal fiction of corporateness and, thus pierces the veil. If, however, the court finds facts whereby one prong is met, yet the other is unsatisfied, then the court is less compelled to pierce the veilness of the corporation.

End Notes

1. Business Corporations are of two types: publicly held and closely held. For further exposition regarding the significant differences see Soderquist, *Reconciling Shareholder's Rights and Corporate Responsibility: Close and Small Public Corporations*, 33 Vand. L. Rev. 1307 (1980).

2. Closely held corporation is a corporation that does not publicly trade stock, and the stock is generally subject to restrictions on transfer.

3. Alter ego means "other self" or "second self." *Ivey v. Pyler,* 246 Cal. App. 2d 678 (1962).

4. Fraud: an intentional perversion of the truth for purposes of inducing another to surrender a legal right. *Delahanty v. First Pennsylvania Bank, N.A.*, 464 A.2d 1243 (1973).

5. The instrumentality rule is applied to parent and subsidiary corporation relationship, and should not be considered in the present context of this discussion. *Taylor v. Standard Gas & Electric,* 96 F.2d 693 (1938).

6. See Thompson, *Piercing the Corporate Veil: An Empirical Study,* 76 Cornell L. Rev. (1991), a study setting forth other matters considered by the court as predictable legal constructs employed when piercing the veil.

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