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TABLE OF CONTENTS

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This is a Special Issue edited by Bala Maniam as a result of the Sam Houston State University conference held in April. We appreciate the opportunity to present the outstanding papers selected from the participants of that conference.

Balasundram Maniam
Special Issue Editor
Sam Houston State University

AN ANALYSIS OF COMMUNICATION CHANNELS IN A SOCIAL FRATERNITY

Kevin Sanford, Backlot Media, Inc.
Geraldine E. Hynes, Sam Houston State University

ABSTRACT

This paper describes the results of two communication audits performed on the Delta Tau Delta fraternity, Epsilon Zeta Chapter, at Sam Houston State University. The audits were conducted in 2009 and again in 2014 in an attempt to determine which communication channels used among members of the fraternity were working effectively and which needed improvement. A comparison of the communication audit results was made in order to determine whether changes in communication methods had occurred during the five years between the first and second audits, and, if so, whether the changes had affected member satisfaction.

The 2009 audit found that formal oral communications from officers to the members were effective and needed no improvement. Informal oral communications from officers to the members about activity updates were used 80% of the time. Furthermore, officers used email to update the members about 10% of the time. Members primarily used text messaging to communicate among themselves.

The 2014 audit found that formal oral communication from officers to the members was still effective and needed no improvement. However, Informal oral communication from officers to the members about activity updates had notably declined. Additionally, officers used email to update the members far less often than in previous years. Instead, officers primarily used a recently added third party bulk text messaging software mass notification system. Meanwhile, members still primarily used text messaging and social media to communicate among themselves.

BACKGROUND

"Effective leadership is still largely a matter of communication." (Alan Axelrod).

This paper describes the results of two communication audits performed on the Delta Tau Delta fraternity, Epsilon Zeta Chapter, at Sam Houston State University. The audits were conducted in 2009 and again in 2014 in an attempt to determine which communication channels used among members of the fraternity were working effectively and which needed improvement. The two audits' findings were compared in order to determine whether changes in

communication methods had occurred during the five years between the first and second audits, and, if so, whether the changes had affected member satisfaction.

The fraternity's current active membership of 30 members is involved with many volunteer activities on the SHSU campus and in the local community. With the number of obligations and required meetings that the members must attend, the researchers identified a number of problems in coordinating communication.

This paper identifies opportunities for improvement to ensure the charter officers and members are effectively communicating.

LITERATURE REVIEW

Although a social fraternity is not the same as a business, research conducted in business settings has relevance to this study because organizational communication flows in directions that are similar to the directions that communication flows in business– vertically and horizontally. That is, messages are passed vertically through the levels of the organizational hierarchy, and they are passed horizontally among people at the same level of the organizational hierarchy. Communication competency, therefore, is a key to any organization's effectiveness, whether it is a business or a social fraternity. Research has shown that when corporate CEOs and other senior executives in a range of industries and countries are asked to list the most important skills a manager must possess, the answer consistently highlights the importance of good communication skills. Managers spend most of their day engaged in communication; in fact, classic studies of how much time managers spend on various activities show that communication occupies 70 to 90 percent of their time every day (Mintzberg, 1973; Eccles & Nohria, 1991). This underscores how important it is to develop strong communication skills, in order to climb the leadership ladder (Barrett, 2013; Walker, 2008).

Communication skills not only benefit an organization's leaders, they are beneficial to all the members. In fact, communicative competency may be a more accurate predictor of personal and professional success than cognitive knowledge (Covey, 1996; Goleman, 1998a, 1998b). Thus, In the case of the fraternal organization that is the subject of the current project, developing members' communication skills not only improves internal communication, it also improves the likelihood of the members' future career success. Communication competencies can even translate into tangible workplace benefits such as higher performance evaluations and increases in merit pay and rank (Lopes, et al., 2006). Over the last quarter of a century, the expansion of the global marketplace, rapidly changing technologies, and workplace diversity with an increased emphasis on teams, have contributed to the demand for communication competency among employees. A number of recent studies indicate that employees with communication competency positively influence management/strategic processes (Samra-Fredericks, 2004; Sigmar, Hynes, and Hill, 2012; Huy, 2002).

Although some corporate training specialists have created and successfully marketed communication programs for business and industry over the last decade, training may be best accomplished "on-the-job" (Clarke, 2004; Van der Sluiss, Williams, & Hoeksema, 2002); that is, significant skill development can occur through leadership or participation in teams and in a range of practical experiences beyond the classroom (Baron et al., 1999, Blumenfield, Soloway, Marx, Krajcik, & Palincsar, 1991; Evered & Selman, 2001; Vince 2004). In short, an analysis of the communication practices of a social fraternity should reveal opportunities for improvement that may benefit not only the fraternity but also its members' future careers.

RESEARCH METHODS

For the first phase of the study, conducted in 2009, the primary source of information was a survey of sixteen questions, which was presented to all the members attending one of the fraternity's mandatory weekly meetings (Appendix 1). There were twenty-five members at the meeting. Eighteen members of the fraternity completed the survey and then it was immediately collected. Another source of information in 2009 was a limited informal discussion with two current active fraternity members. They were able to provide insights on some of the fraternity's methods of formal and informal communication.

For the second phase of the study, conducted in 2014, the primary source of information was a survey of sixteen questions, which was also presented to all the members attending a mandatory weekly meeting (Appendix 2). There were twenty-two members at the meeting, and thirteen members completed the survey. Additionally, a source of information in 2014 was a limited informal discussion with one currently active fraternity member and one fraternity alumni member. They were able to provide further insights on some of the fraternity's updated and current methods of formal and informal communication.

Secondary information was taken from business articles relating to effective communication recommendations.

RESULTS

A summary of the findings for both surveys regarding members overall satisfaction with their fraternity leaders' methods of communication is displayed in Table 1 below.

As Table 1 indicates, the percentage of survey respondents who rated their leaders' use of a number of communication channels as "excellent" or "good" increased between 2009 and 2014. In particular, only 50 percent of the 2009 respondents rated their leaders' use of text messaging as "excellent," compared to 85 percent of the 2014 respondents. Similarly, the percentage of respondents who rated their leaders' use of group and individual meetings as "excellent" increased substantially between 2009 and 2014.

Table 1. Member Satisfaction with Leaders' Methods of Communication								
	Excellent		Good		Average		Poor	
	2009	2014	2009	2014	2009	2014	2009	2014
Formal Emails		8*	72	31	11	46	17	15
Informal Emails			28	23	61	69	11	8
Fraternity Website					28	54	72	46
Text Messaging	50	85	39	15	11			
Group Meetings	44	46	39	46	28	8		
Individual Meetings	61	69	39	15		15		
News Letter								
Phone Calls			44	38	39	38	17	23
Announcement at Activities	44		28		28			
Social Media		38		54		8		

*scores represent percentages

The following sections describe and compare the findings of the 2009 and 2014 communication surveys in more detail. A summary of those findings is displayed in Table 2. The fraternity members' responses are reported for formal oral communication (meetings), informal oral communication (phone calls and face-to-face), formal written communication (email), informal written communication (texting and social media), and the website.

Formal Oral Communication

The fraternity's bylaws emphasize the importance of regular formal meetings of the membership. "The time and place of these meetings shall be determined by the chapter; these meetings are to be formal meetings and shall be in due ritualistic forum with full regalia and paraphernalia unless otherwise specified by president" (Delta Tau Delta Fraternity Bylaws, 2009).

From the 2009 audit, we discovered the primary function of these meetings is to provide a formal environment where fraternity members can discuss necessary issues. The fraternity's elected officers also use this time to inform the members of any pending updates to volunteer activities and any changes to updates from previous meetings. These two purposes of communication allow for an exchange of required information. Thus, formal oral communications from officers were found to be effective and needed no improvement.

Results of the 2014 audit indicate that formal oral communication from the officers to the members in group meetings appears to still be effective and needs no improvement (Table 2).

Table 2. Effectiveness of Communication Methods														
	Fraternity Website		Email		Text Message (SMS)		Formal Meeting		Phone Call		Face To Face		Social Media	
	2009	2014	2009	2014	2009	2014	2009	2014	2009	2014	2009	2014	2009	2014
Most common types of informal communication used within the fraternity					67*	100					78	31		100
Methods members receive formal messages from fraternity leaders			11	8		54	100	100			17	31		
Preferred sources for information about upcoming meetings			44		33	69					22	15		15
Least effective way leaders use to pass information		8	56	69					28	23				
Most effective way members communicate with other members					89	46			6		6			54
Most effective way members communicate with the leaders			11	8		62					89	31		

*scores represent percentages

Informal Oral Communication

One of the results of the 2009 survey was lack of good communication when it came to informing the members of changes to the schedule or updates on fraternity volunteer activities. Informal communications from officers about activity updates occurred about 80 percent of the time. The problem with the informal communication was that often reporting times were incorrect, and there were no notices of changes of location for meetings. These communication breakdowns resulted in frustration and missed events.

By 2014, Informal oral communication from officers to the members about activity updates had a notable transition, and the survey results indicate that reliance on face-to-face conversations was down from 78 percent to about 31 percent of the time (Table 2). Similarly, when members wanted to communicate informally with their leaders, their reliance on face-to-

face conversations declined from 89 percent in 2009 to 31 percent in 2014. The overall lack of informal oral communication between leaders and members of the fraternity is remarkable.

Formal Written Communication

"E-mail technology is quite different from other forms of communication media, such as telephones, meetings, and letters. Managers use E-mail to bridge the gap between widely dispersed corporate personnel, thereby extending their span of control. Employees also find this an exciting communication medium, mixing personal and business information in communications sent both horizontally and vertically" (Glassbern, Kettinger, & Logan, 1996). The 2009 communication audit found that the fraternity's leaders relied on email almost exclusively when sending and receiving written messages.

In 2009, most of the electronic communications from the officers to the members of the chapter were by e-mail. Seventy-two percent of the members rated their leaders' use of formal email as "good" (Table 1). Unfortunately the problem was that the members did not regularly check their emails. Also, when they did check their emails, they did not reply to the emails or use the information as a source of direction because they were often out dated by the time they received them. The officers were using email for electronic communications, but were sending messages concerning updates only 10% of the time.

In 2014 the fraternity's officers were using email to update the members less than 10% of the time. The members' satisfaction with their leaders' use of formal email correspondingly decreased, with "good" ratings declining from 72 percent to 31 percent (Table 1). A large majority of the members considered email to be the least effective way that leaders pass on formal information in both 2009 (56 percent) and in 2014 (69 percent) (Table 2). Officers now primarily use a recently added third party bulk text messaging software mass notification system more than 50 percent of the time.

Informal Written Communication

Instead of emails, several respondents to the 2009 survey mentioned that text messaging was frequently being used by the members. As a result of not getting timely updates, and because the members used text messaging so frequently, the researchers suggested that the officers and member distribute updates by text messaging. The researchers argued that the benefits would be instant delivery with the potential for instant response. This would be especially useful for last minute changes of time or locations. This would allow for a more efficient and consistent dispersion of updated information.

In 2014 the survey results indicated that 100 percent of the members still primarily use text messaging with a significant addition of social media, like Facebook and Twitter, to communicate among themselves (Table 2). The fraternity's recent addition of mass text messaging SMS software is most impressive. It apparently has made a huge difference in members' overall satisfaction with information dissemination.

Website

According to the 2009 audit results, other forms of communication rarely used by officers included the fraternity's website. The researchers concluded that the website could be a better utilized tool for information distribution and communication. The officers would be able to save a lot of time of individual distribution or updates if they were posted on a page of the website that had been set aside specifically for updates and changes to upcoming events.

The researchers concluded that the 2009 website would need to be updated and a page added with restricted access. The members and officers would be able to use the current sign-in feature and have a private pass code that would take them to a calendar or message board.

The 2009 fraternity website had lots of information, but according to the members of the fraternity the biggest complaint was lack of updates. There was a calendar on the website, but due to restricted access to input information onto the site, individual updates were impossible. Here are the options on the 2009 website:

History
Recruitment
Charitable organizations
House building campaign
Event Calendar
Photos
Alumni
Bylaws
Member Responsibilities

As can be seen from Fig. 1 below, there was already a place on the website for members to log in with a username and password. That should already have been set up to allow the member to see any necessary restricted information that was unavailable for public view or access.
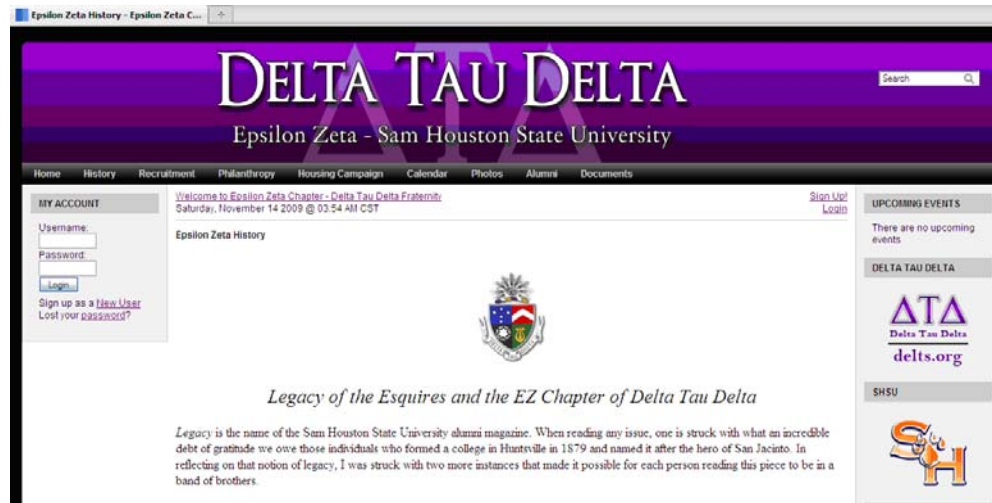
Figure 1 – Delta Tau Delta Website - 2009

The 2009 research results implied that the benefits of upgrading the website would be the option of increased access to updates and the ability for members and officers to post comments or suggestions for various programs and activities.

As can be seen from Fig. 2, there have been significant changes to the previous version of the fraternity's website. The 2014 website still requires members to log in with a username and password. Additionally, links to social media sites (Facebook and Twitter) have been added and there is also a space provided to enter text messaging information to receive mass text message SMS (short message service) updates.

These changes in the website between 2009 and 2014 may explain the difference in satisfaction ratings by survey respondents. In 2009, 72 percent of the members rated the website as "poor," while in 2014 only 46 percent of respondents rated it as "poor" (Table 1).

DISCUSSION AND IMPLICATIONS

The communication audit conducted in 2009 identified serious communication breakdowns between the charter officers and members of the chapter. The 2009 survey indicated that there was definitely unhappiness with the formal written and informal written communication channels, specifically due to the lack of updates and information on events that had changing times and location. The problem that was reported with oral communication was the possibility to lose or alter details that might be important to prepare for any upcoming activities or meetings.

The 2014 audit found that the incorporation of new forms of electronic communication had greatly improved the officer and member satisfaction with overall informal communication channels.

Figure 2 – Delta Tau Delta Website – 2014

The 2009 survey showed a need for improvement in the usage of inefficient avenues of communication within the organization. On the other hand, the 2014 survey showed an apparent increase in a more efficient notification system with a trend towards more informal means of electronic communication. Therefore, it would be easy for the researchers to conclude that during the five years between surveys, the chapter's leaders had listened to their members' complaints and taken steps to institute contemporary technological channels that provided more frequent updated information. However, a 2014 interviewer pointed out that there is a problem with any attempt to improve communication in an organization like the fraternity that is the subject of this study, because plans to improve are often lost due to high turnover of fraternity members and officers. That is, if the current regime may have a plan to "make things better," but then all of them graduate or move on, so their plans or information may not get passed on to the next leaders. This is also a common problem in business and in the military, and it causes information, time, money, etc. to be lost when the leaders leave.

Therefore, the causes of the changes in communication channel usage that were indicated in this longitudinal study remain unknown.

This study had several important limitations. The results of both surveys were limited to a small number of participants and with the acknowledgement that there has been a significant change in members in the five year period. However, with a large percentage of the respective members, at the time of each survey, a sufficient amount of data was collected and a future survey would most likely witness a gradual trend towards increased member satisfaction, as more technological options of communication distribution is available.

CONCLUSIONS

In conclusion, the main forms of communication used by the Delta Tau Delta fraternity members in 2009 were text messaging and informal oral communication. The fraternity officers mainly used formal oral communication at the weekly meetings and occasionally used email for providing activity updates. The heavy reliance on informal oral communication outside the weekly scheduled meetings had caused problems with poor communication, inconsistent updates, and delayed responses. The use of the fraternity's website was very limited and updates were rarely posted. The researchers suggested that using the fraternity chapter's website as a formal electronic communication tool would benefit the fraternity and the organizations that they support.

The 2014 audit revealed, after five years, some forms of communication remained the same and others had significantly changed. The main forms of communication now used by the fraternity members are text messaging, informal oral communication and social media. The fraternity's website has been significantly improved, but it remains very limited with updates and they are still rarely posted by the officers and the members. The fraternity officers continue to mainly use formal oral communication at the weekly meetings and occasionally send updates via emails. Additionally, the members and officers are now satisfied with the impact of the recent implementation of the fraternity's mass notification SMS texting system, which finally allows for a more efficient communication distribution through the use of third party bulk text messaging software. With the increased use of smart phones and Internet access, using the chapter's website as a formal electronic communication tool would still be the best course of action for the fraternity and the organizations that they support.

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APPENDIX 1 – 2009 SURVEY

Communications Survey by Kevin Sanford, Sam Houston State University MBA Student

Thank you for participating in this survey. Each survey completed is strictly confidential and will be combined with the responses of your members and will only be submitted in group form.

Purpose

I am conducting research for my Management Communications course. This survey is designed to review some of the communication methods used by the members of the Delta Tau Delta Fraternity chapter at Sam Houston State University and provide suggestions to improve communications.

Distribution

Surveys will be distributed directly to individual members of the fraternity and immediately collected. For any reason, immediate response is not possible; please notify me and we can correspond via email: krs036@shsu.edu

Confidentiality

The completion of this survey indicates you understand the purpose of the information collected and that this survey is voluntary and confidential. You are also consenting to participate in this research and giving the authorization to use your answers in my report.

Instructions

Please DO NOT write your name or identification number anywhere on this survey. Questions 1 through 14 should be answered by marking the circle provided. Questions 15 and 16 should be answered in the space provided. If additional space is required, please use the back of the paper. Your confidential answers should be based on your own knowledge and opinion. When the survey is completed, please turn it face down and put it in the legal sized envelope provided.

Fraternity Participation:

1.   Are you currently a member *Delta Tau Delta - Sam Houston* State University - Epsilon Zeta Chapter

        ○ a. Yes

        ○ b. No

2.   How many fraternity meetings do you usually attend in a month?

        ○ a. 1-2

        ○ b. 3-4

        ○ c. 5-6

        ○ d. 7-8

        ○ e. more than 8

3.   How many semesters have you been a member of the fraternity?

        ○ a. 1-2

        ○ b. 3-4

        ○ c. 5-6

        ○ d. 7-8

        ○ e. more than 8

4.   How frequently do you receive messages or reminders about upcoming meetings or activities?

- ☐ a. Per Day
- ☐ b. Per Week
- ☐ c. Per Month
- ☐ d. Per Semester
- ☐ c. Per Year
- ☐ d. Never

Methods of Communication:

	Email	Text Message	Meeting	Phone Call	Face To Face	Grapevine (Gossip/ word of mouth)
5. What are your most common types of informal communication you use within the fraternity?	☐	☐	☐	☐	☐	☐
6. What method do you receive formal messages from the fraternity leaders?	☐	☐	☐	☐	☐	☐
7. From which of the following sources of information do you prefer to get most of your information about upcoming meetings in the fraternity?	☐	☐	☐	☐	☐	☐
8. What is the least effective way that the fraternity leaders use to pass information?	☐	☐	☐	☐	☐	☐
9. What is the most effective way you communicate with your fellow members?	☐	☐	☐	☐	☐	☐
10. What is the most effective way you communicate with your fraternity leaders?	☐	☐	☐	☐	☐	☐

Effectiveness of Communication:

11.   When fraternity leaders are communicating with the members of the fraternity, how well would you say they are using these methods of communications?

	Excellent	Good	Average	Poor	Not Applicable
a. Formal Emails	☐	☐	☐	☐	☐
b. Informal Emails	☐	☐	☐	☐	☐
c. Website	☐	☐	☐	☐	☐

	Excellent	Good	Average	Poor	Not Applicable
d. Text Messaging	⊙	⊙	⊙	⊙	⊙
e. Group Meetings	⊙	⊙	⊙	⊙	⊙
f. Individual Meetings	⊙	⊙	⊙	⊙	⊙
g. News Letter	⊙	⊙	⊙	⊙	⊙
h. Phone Calls	⊙	⊙	⊙	⊙	⊙
i. Announcement at Activities	⊙	⊙	⊙	⊙	⊙

In your opinion:

	Excellent	Good	Average	Poor	Not Applicable
12. How is the overall communications process of the fraternity?	⊙	⊙	⊙	⊙	⊙
13. How well do the fraternity leaders listen to the concerns of the members?	⊙	⊙	⊙	⊙	⊙
14. How well do the fraternity leaders follow up or remind members of upcoming meetings?	⊙	⊙	⊙	⊙	⊙

Recommendations for Improvement:

15.   If any, what are some suggestions you have for the fraternity to improve communication between the leadership team and the members?

16.   If any, what are some suggestions you have for the fraternity to improve communication among the members in the fraternity?

Thank you for participating in this survey. Once again, to make sure that your survey remains anonymous, please place this survey face down in the envelope provided. Thank You.

Appendix 2 – 2014 Survey

Communications Survey by Kevin Sanford, MBA

Instructions

Please DO NOT write your name or identification number anywhere on this survey. Questions 1 through 14 should be answered by marking the circle provided. Questions 15 and 16 should be answered in the space provided. If additional space is required, please use the back of the paper. Your confidential answers should be based on your own knowledge and opinion. When the survey is completed, please turn it face down and put it in the legal sized envelope provided.

Fraternity Participation:

1.   Are you currently a member of *Delta Tau Delta - Sam Houston* State University - Epsilon Zeta Chapter?

⊙   a. Yes

⊙   b. No

2.   How many fraternity meetings do you usually attend in a month?

⊙   a. 1-2

⊙   b. 3-4

⊙   c. 5-6

⊙   d. 7-8

⊙   e. more than 8

3.   How many semesters have you been a member of the fraternity?

⊙   a. 1-2

⊙   b. 3-4

⊙   c. 5-6

⊙   d. 7-8

⊙   e. more than 8

4.   How frequently do you receive messages or reminders about upcoming meetings or activities?

⊙   a. Per Day

⊙   b. Per Week

⊙   c. Per Month

⊙   d. Per Semester

⊙   c. Per Year

⊙   d. Never

Methods of Communication:

	DTD Website	Email	Text Message	Meeting	Phone Call	Face To Face	Social Media (Facebook/ Twitter)
5. What are the most common types of informal communication you use within the fraternity? (select all that apply)	☐	☐	☐	☐	☐	☐	☐
6. What methods do you receive formal messages from the fraternity leaders? (select all that apply)	☐	☐	☐	☐	☐	☐	☐
7. From which of the following sources of information do you prefer to get most of your information about upcoming meetings in the fraternity?	☐	☐	☐	☐	☐	☐	☐
8. What is the least effective way that the fraternity leaders use to pass information?	☐	☐	☐	☐	☐	☐	☐
9. What is the most effective way you communicate with your fellow members?	☐	☐	☐	☐	☐	☐	☐
10. What is the most effective way you communicate with your fraternity leaders?	☐	☐	☐	☐	☐	☐	☐

Effectiveness of Communication:

11.	When fraternity leaders are communicating with the members of the fraternity, how well would you say they are using these methods of communications?

	Excellent	Good	Average	Poor	Not Applicable
a. Formal Emails	☐	☐	☐	☐	☐
b. Informal Emails	☐	☐	☐	☐	☐
c. Website	☐	☐	☐	☐	☐
d. Text Messaging	☐	☐	☐	☐	☐
e. Group Meetings	☐	☐	☐	☐	☐
f. Individual Meetings	☐	☐	☐	☐	☐
g. News Letter	☐	☐	☐	☐	☐

	Excellent	Good	Average	Poor	Not Applicable
h. Phone Calls	⊙	⊙	⊙	⊙	⊙
i. Social Media (Facebook/Twitter)	⊙	⊙	⊙	⊙	⊙

In your opinion:

	Excellent	Good	Average	Poor	Not Applicable
12. How is the overall communication proce of the fraternity?	⊙	⊙	⊙	⊙	⊙
13. How well do the fraternity leaders listen to the concerns of the members?	⊙	⊙	⊙	⊙	⊙
14. How well do the fraternity leaders follow up or remind members of upcoming meetings?	⊙	⊙	⊙	⊙	⊙

Recommendations for Improvement:
15.	If any, what are some suggestions you have for the fraternity to improve communication between the leadership team and the members?

16.	If any, what are some suggestions you have for the fraternity to improve communication among the members in the fraternity?

Thank you for participating in this survey. Once again, to make sure that your survey remains anonymous, please place this survey face down in the envelope provided. Thank You.

COMMUNITY DEVELOPMENT COLLABORATION SERVICE AS A CYBER-INFRASTRUCTURE FOR RESOURCES/NEEDS MAPPING

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ABSTRACT

The primary goal of this paper is to share our work in the development of the community development collaboration service (CDCS). In this paper, we describe the background and technical needs for CDCS and our approach to use open-source software for the design and development of CDCS. Next, we showcase our successful development of the first CDCS Module: Community Resource Mapping and discuss the result of our preliminary survey on users of CDCS. At the end, we highlight the expected benefits and broader impacts of CDCS.

INTRODUCTION

The advance of information technology, in particular the pervasive use of networking, enables people, tools, and information to be linked in ways that reduce barriers of location, time, institution, and discipline (Revolutionizing Science and Engineering, 2003). When such technology is leveraged appropriately for advancing community developments, the benefits could be tremendous especially at a time of economic downturn and financial difficulty.

This vision underlies the motivation for this paper. Our primary goal is to share the work that we have done in the conceptualization, design and development of a comprehensive computer-based community development collaboration service (CDCS). Our paper is organized as follows: The next section describes the background and technical needs for CDCS and our open-source approach for the design and development of CDCS. The third section provides the detailed account of our successful development of the first CDCS Module: Community Resource Mapping. The last section concludes the paper with expected benefits and broader impacts of CDCS.

BACKGROUND AND TECHNICAL NEEDS

The Report of the NSF Blue-Ribbon Advisory Panel on Cyber-infrastructure clearly lays out a basic framework for the types of facilities and services to be provided in an integrated way by a cyber-infrastructure layer (shaded). As shown in Figure 1, cyber-infrastructure should allow research communities/projects to tailor efficient and effective application-specific, but

interoperable, knowledge environments for research and education. A vision was set for the creation of new types of environments where communities can foster, encourage, and accelerate collaboration in order to maximize common benefits, minimize redundancy, and overcome barriers to interdisciplinary research (Revolutionizing Science and Engineering, 2003).

Figure 1: Integrated cyber-infrastructure services to enable new knowledge environments for research and education. Adapted from Revolutionizing science and engineering through cyberinfrastructure: report of the National Science Foundation blue-ribbon advisory panel on cyberinfrastructure, 2003, Figure 2.1, page 13.
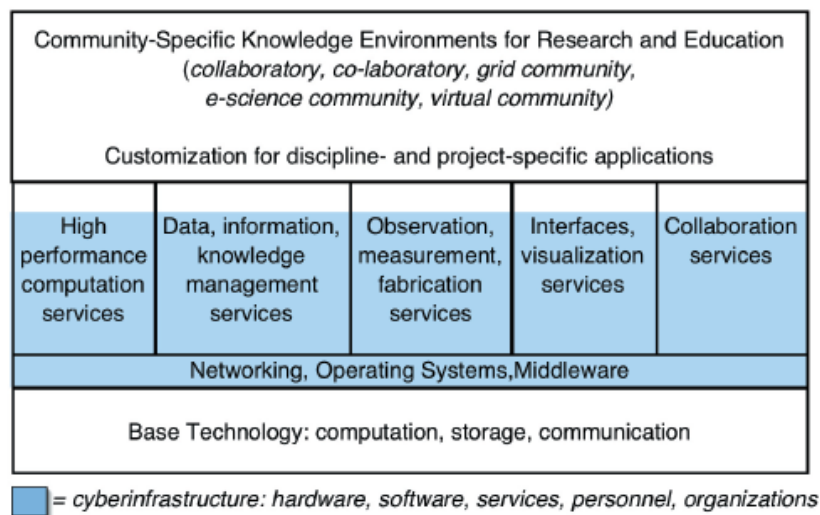
This CDCS project represents one of the responses to the call for the development of specific applications and services to utilize cyber-infrastructure to create an environment for collaboration. The focus of this project is to create a flexible platform that brings together community members including local governmental agencies, non-profit organizations, small and large business enterprises, educational institutions, citizens, students, and faculty for collaboration to drive community development.

Our design and development of CDCS is an open-source approach. This project is an effort to utilize the capabilities of current open-source software to develop the collaboration service for the purpose of facilitating, supporting, and enhancing the community development process with information technology. Most important is this project's goal: to integrate different modules into a coherent collaboration service that will be delivered for free and made widely accessible through open-source development and distribution channels.

One of the strategies used in the design and development of CDCS is to avoid proprietary software by embracing an open-source platform. Open-source software refers to computer software that is developed and distributed under an open-source license. Such a license allows free access to the source code and imposes no licensing fee. Anyone can study, change, and improve the software for distribution. Open-source software has been increasingly recognized

and eagerly embraced by businesses and organizations interested in an alternative to proprietary software. Its wide adoption has been, in part, fueled by the availability of successful and popular software such as Linux, Ubuntu, the Firefox web browser, OpenOffice suite, MySQL, PostgreSQL, and most importantly, the web server software Apache (Conlon & Hulick, 2006; Conlon, 2007). A report from ComputerWorld shows that a growing number of companies are embracing open-source software because of its quality -- not just cost savings, as open-source software matures (Collett, 2010).

SUCCESSFUL DEVELOPMENT OF THE FIRST CDCS MODULE: COMMUNITY RESOURCE MAPPING

Software and Hardware Requirements

Since CDCS is based on client-server architecture, the first requirement for its setup is a server computer. We purchased a DELL PowerEdge T410 to run as a dedicated server with an Internet connection. On the DELL PowerEdge T410, we installed Ubuntu 10.04 Long Term System (LTS) as the operating system for CDCS. The server edition of Ubuntu is an open-source linux-based operating system developed and maintained by Canonical LTD (c.f. http://www.ubuntu.com/). In addition to the basic operating system, we also installed other needed components including: the web server Apache, the program language PHP 5.2.3 or later, and the database server MySQL. All of these components were available as options to add to the operating system during the Ubuntu installation.

The next important piece of software that we chose for developing CDCS is Mediawiki. Although there exist quite a few choices, we pick Mediawiki because it is widely used around the world and has a strong community support. As the developing environment for the well-known Wikipedia, Mediawiki provides not only a stable environment but also many powerful extensions for the development of a web portal. Some extensions used in the development of CDCS include Edit own, Confirm user accounts, Menu Sidebar, Semantic Forms, and Tetherless map. Edit own, Confirm user accounts, Semantic Forms were used to allow CDCS users to do self-editing and to secure their information. Tetherless map was used to provide users access to maps. In addition to plotting on the map and filter, Tetherless map also provided link to pages associated with each organization.

## DESCRIPTION OF FEATURES IN THE COMMUNITY RESOURCE

CDCS is currently hosted at: http://cob.cdcs.selu.edu. Figure 2 displays the major features in the current version of the community resource mapping (CRM) module which is the first module developed successfully for CDCS. As shown in the Navigation panel, the CRM

module consists of (1) Map of Local Organizations, (2) List of Agencies, (3) Opportunities/Needs, (4) Student Organizations sorted by College, Type, etc.

Figure 2: Major features in the current version of the community resource mapping (CRM) module

Map of Local Organizations represents a map of community resources. The method that we used to organize the collected information is geo-targeting, where the resources identified are linked to the actual location and the result is displayed on a map. This way, users can search for resources according to a specific location. Icon markers are used to indicate the location of specific organizations on the map as indicated on Figure 3.

Figure 3: Map of community resources filtered by type of organizations
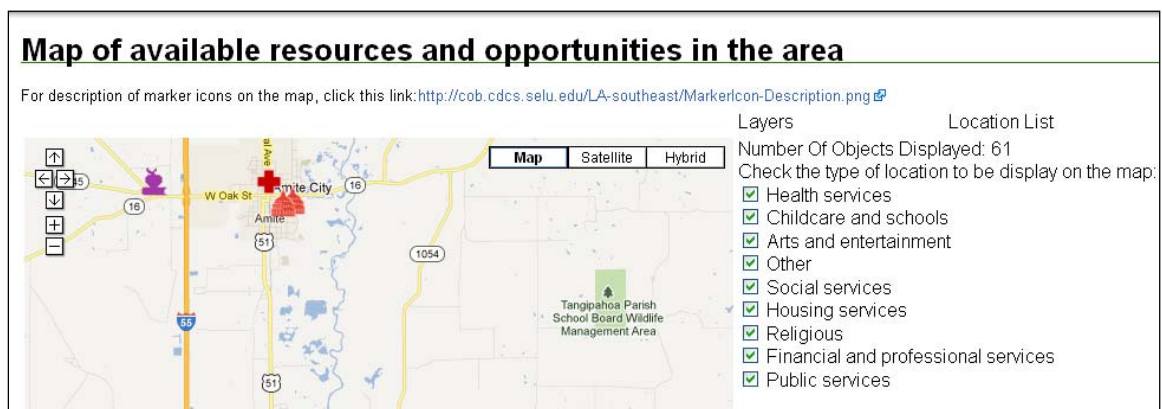
Drill-down capability is also built in to provide more detailed information from each point on the map as shown in Figure 4.

Figure 4: A snapshot of the community resource map showing a cluster of icon markers with links to an organization's name and type
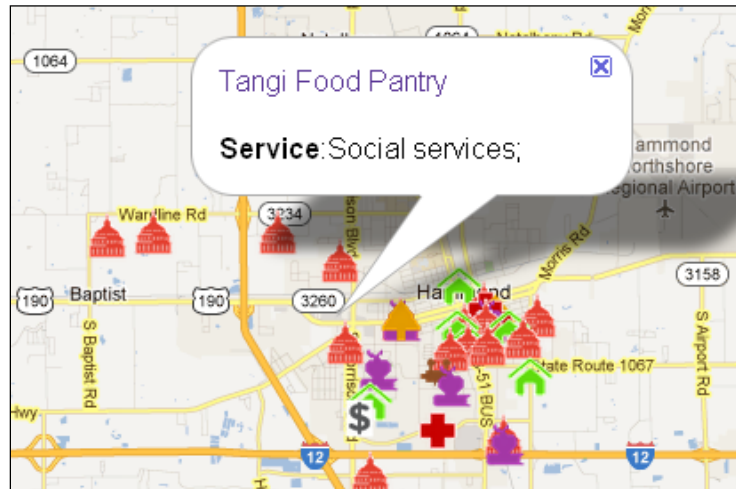
The pop-up panel contains the link embedded in the name of an organization. Clicking this link displays the detailed information about the organization as shown in Figure 5. Thus, from the map of community resources, researchers can have access to data presented in multi-layers including not only the location of the resources, the type of resources, but also the cluster and distribution of various resources available in a given area as well as their detailed information. In the current version of the CRM module, Google map extension was used to map an area. The data was linked to points on the map and the details were shown from a Mediawiki page.

The next feature is the List of Agencies as shown in Figure 2. Since these local organizations provide services to local communities, they are an important part of community resources. The List of Agencies feature is designed to solicit and display more detailed information about all agencies who post on either the asset-based or the need-based inventory. Information such as an organization's name, address, phone, contact person, mission, history, type, and other relevant specific details is solicited in this module. The feature is set up with a registration process. Hence, only authorized individuals are able to log in, access his/her own information, make changes, and update the content. Therefore, this feature is self-maintained by authorized individual who is the owner or creator of the content on his/her page. This is a unique feature and is made possible with the use of the open-source Mediawiki extension Edit own.

Figure 5: The detailed information about a local organization

Since deficiencies always exist in communities, almost all communities have a "need survey." While needs are often regarded as deficiencies, they can also be seen as opportunities when the resources and assets identified by communities are directed and channeled for better utilization to meet these needs. The feature Opportunities/Needs is designed to solicit needs posted by authorized agencies/organizations within a community as shown in Figure 6.

Such a need-based inventory can help translate needs into opportunities. When needs information is made available and is easily accessed and updated, it can be quite valuable in identifying appropriate resources and matching them with the needs.

The last feature as shown in Figure 3 is Student Organizations. This is another part of the resources and assets identified within a community. Identifying resources and assets is not necessarily regarded as identifying ways to find money. While money is an important resource, resources and assets mapping include more than just funding. Resources identification also covers human resources such as individuals' capabilities, abilities, gifts, skills, technical assistance, in-kind resources, voluntary services, academic expertise, along with services provided by for-profit organizations. In this feature, the focus is on student organizations within a university as a core association of community members. These organizations can serve as the engine of community action (Mathie and Cunningham, 2003). Figure 7 provides an example of the page listing Student Organizations sorted by various methods.

Figure 6: The information captured to convey the opportunities/needs

Figure 7: Different ways of listing student organizations sorted by College, Type, or Fraternity/Sorority

When clicking further on the link of a student organization, more detailed information about the organization is displayed as shown in Figure 8.

Figure 8: The detailed information about a student organization

Table 1 is the description of potential users of CDCS and their suggestive uses.   Among the major community members are community organizations, general public, governmental and administrative entity, students, and faculty.

Table 1 List of potential users and suggestive uses for CDCS	
USERS	SUGGESTIVE USES
Community organizations (profit and non-profit)	1. Post their organization's information on the web for publicity and public relations 2. Input their contact information and services and resources that they offer 3. Communicate their opportunities/needs
General public	1. Learn about available community development programs 2. Engage and participate in such programs 3. Volunteer to help 4. Provide feedback and do the rating on the information
Governmental and administrative entities	1. Manage and promote community development initiatives 2. Guide community development efforts by matching the right resources to the right opportunity/need 3. Assess and track community development programs
Students	1. Look at the information available and make a choice about getting involved 2. Know what opportunities/needs are available and identify relevant ones 3. Determine which opportunity/need fit their qualifications
Faculty	1. Match the community needs with their courses 2. Place students in relevant projects 3. Track the progress of the projects

CONCLUSION

This project is built upon the existing cyber-infrastructure as described in the Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyber-infrastructure. Its development is leveraged on the growing availability of open-source software where powerful tools for developers are now available and accessible. The goal is to design and development an open-source collaboration service that can provide a template on which others can adopt and adapt into more customizable applications for use in their own context. Below highlights several important and unique benefits that CDCS offers:

1. It is web-based so it could be accessed from any web browser without a need for proprietary client application. Hence, minimum training is required for the users. The web-based interface is also critical in making the data accessible and transparent to many stakeholders.
2. It is built with open-source software to avoid costly licensing fees and expensive purchase of proprietary software. The entire system ranging from the operating system to database engine, from programming language to database administration tools are selected and adopted from the pool of freely available open-source software.
3. It is based on a collaborative end-user approach to reduce the maintenance burden. Authorized users from community partners and local organizations are given accounts to CDCS. They can access CDCS to edit and update their own information via the web interface. This way, the content is directly updated by those who actually create, generate, and possess the information. As a result, the information will be more accurate when it is shared to targeted users.

The successful development of CDCS shows that it is feasible to create useful web service from open-source platform. As a result, such a web service can be made available widely and freely to the public. The successful development of CDCS can demonstrate that it is possible to do more with less through the use of open-source technology, especially at the time of economic difficulty. System such as CDCS can be adopted and customized as information portal to improve education, enhance workforce development, foster social community development, and facilitate economic development in a community by identifying available services and resources, disseminating areas of needs, and then matching the resources and the needs appropriately and efficiently.

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DEVELOPING A QR CODE/BARCODE PROCESSOR WITH A USER-DEFINED DATABASE FEATURE

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ABSTRACT

This paper describes the development of a mobile app that processes QR code/barcode. In the first section, the focus is on understanding the QR code and the tools available for mobile app development. It is followed with the detailed illustration/explanation of how the mobile app called BarCode Pro was developed and used. Finally, the paper discusses the main features of BarCode Pro with the highlights on its unique contribution and future direction for further development.

INTRODUCTION

In this paper, we reported our development of a mobile app called BarCode Pro. We had three goals in this project. Our first goal was to learn about the QR code. Our second goal was to explore available tools and adopt them for the development of BarCode Pro. Our final goal was to actually develop a functional mobile app that can encode and decode QR code/barcode. Our paper is divided into four sections. The first section provides background knowledge for understanding of the frameworks including the structure of QR code/barcode, and development environment of jQuery Mobile, and PhoneGap. These are three key parts in creating a QR code/Barcode processor. The second section describes specific components that we adopted in the development of Barcode Pro. It is then followed by the illustration of how BarCode Pro works. Finally, the paper concludes with the discussion of our contribution, the limitations in this project, and the future direction for further work.

BACKGROUND KNOWLEDGE

In this section, we presented the technical description for QR code, jQuery Mobile, and PhoneGap. What is QR code? How is it better than barcode? How does it work? These questions are the focus in the description of QR code. In this project, we were interested in developing an app that could run on different devices regardless of their different operating system. jQuery Mobile and PhoneGap are among the common frameworks that developers use

to create mobile apps. We attempted to explain these frameworks in general and relate them in the context of our development of BarCode Pro.

QR code

QR code stands for Quick Response code. It is a type of two-dimensional barcode invented by Denso-Wave (Denso ADC, 2011). The advantage of QR code over the traditional 1D barcode is its higher capacity in data codification. The reason is that unlike 1D barcode, the data in QR code can be extracted from both vertical and horizontal components of its image. Therefore, information such as numbers and characters can be efficiently encoded (*What is a QR Code*? 2013).

Figure 1 An image of a QR code

To read QR code and translate it into the original alphanumeric text or numbers, it is necessary to run a QR code reader (decoder) program. Vice versa, to create QR code from a given string of alphanumeric text or numbers, a QR code creator (encoder) is needed. In the subsequent section, we will provide more specific details on how the encoding and decoding processes of Barcode Pro work.

Below is the inner structure of a typical QR code as defined in the ISO/IEC 18004:2006(E) technical specification. According to the specification, QR code has two generations: Model 1 and Model 2. QR code Model 1 was the original specification of QR code; QR code Model 2 was an enhanced form of the symbology with additional features, primarily the addition of alignment patterns to assist navigation in larger symbols, and was the basis of the first edition of ISO/IEC 18004 (ISO/IEC 18004:2006(E), page vii). Model 2 is commonly used today with more than 40 different versions.

Figure 2 QR code inner structure(Source: ISO/IEC 18004:2006(E), page.8)
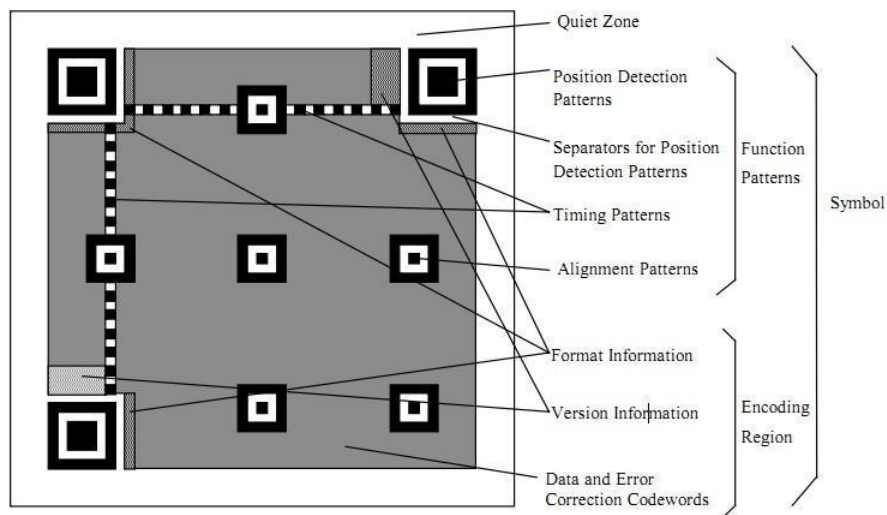
The process of encoding and decoding QR code/barcode involves several factors including mode, character count, error correction, cross-placement, etc. Mode stands for the type of content. Character count indicates the length of the string. Error correction is the built-in mechanism to ensure the integrity of the data, the recoverability of the data. Cross-placement is for masking the data and thus provides a layer of data protection. (c.f. the specification ISO/IEC 18004:2006(E) for more technical details).

QR Code/Barcode Software Development Kits (SDKs)

In order to create BarCode Pro, we needed software development kits that would provide necessary tools to process QR code/barcode. There are many development kits that can encode / decode QR codes according to the structure. Many are commercial, but there are also a few open-source SDKs. In our research for an open-source SDK, we found two particular SDKs that fit our needs: ZBar and ZXing.

ZBar is an open source software suite. It provides resources needed to support the encoding and decoding of many popular symbologies (types of barcodes) including EAN-13/UPC-A, UPC-E, EAN-8, Code 128, Code 39, Interleaved 2 of 5 and QR Code (*ZBar bar code reader*, 2014). ZBar has the capability to recognize 1D and 2D barcodes created from various sources including handheld barcode device, camera, video streams, image files, and raw intensity sensors. Since it has a library for Ubuntu (a Linux operating system), we were able to install ZBar on our Ubuntu server and make it a PHP extension. After that, we were able to use ZBar to decode QR code images linked to the data on our own database.

ZXing (short for Zebra Crossing) is an open source project from Google. ZXing project provides a library which supports decoding and generating of symbologies such as QR Code, PDF 417, EAN, UPC, Aztec, Data Matrix, Codabar (*ZXing.Net*, 2014). In our project, we used ZXing to support the scanning of 1-D or 2-D "graphical barcodes" with the camera on an Android device. The program read the scanned image and processed it into the alphanumeric string. The strings could be anything such as web addresses, key terms to a database, geographical coordinates, email addresses, phone numbers, etc. Since Google provides an open source decoder online at http://zxing.org/w/decode.jspx, user can send a post request there and get the decoded result back (*ZXing*, 2014). Thus, by pointing an Android device's camera to a QR code/barcode, ZXing provides the capability to link the device to the location of the information on the web or to make a phone call.

The main difference between ZXing and ZBar in our project is that ZXing uses the decode resources from remote Google server whereas ZBar decodes locally on our server.

jQuery Mobile

jQuery Mobile is a HTML5-based user interface system designed to make responsive web sites and apps that are accessible on all smartphones, tablets, and desktop devices (*A Touch-Optimized Web Framework,* 2014). Instead of writing native apps for each mobile device or OS, jQuery Mobile can be used as a web framework to create a multi-platform accessible app. The syntax of jQuery Mobile is simple just like regular HTML codes except that it includes additional capability of JavaScript, CSS and Ajax method to deliver its functionalities. It is built on top of jQuery Standard framework but is touch-optimized. More details about the basic introduction of jQuery Mobile can be obtained at http://demos.jquerymobile.com/1.4.2/intro/

Table 1 below shows common components for a typical app using jQuery Mobile. Various user interface elements can be defined by simply specifying "data-role" as well as other data-* attributes. These data-* are actually HTML5 attributes implemented by jQuery mobile (*HTML data-* Attributes*).

Table 1 Common user interface components in jQuery Mobile (Adapted and modified from http://www.ibm.com/developerworks/library/wa-jqmobile/)		
Component	**HTML5 data-* attribute**	**Remark**
Header	\<div data-role="header"\>	Creates a HTML5 division at the top of the page.
Footer	\<div data-role = "footer"\>	Creates a HTML5 division at the bottom of the page.

	Table 1 Common user interface components in jQuery Mobile (Adapted and modified from http://www.ibm.com/developerworks/library/wa-jqmobile/)	
Component	**HTML5 data-* attribute**	**Remark**
Content Body	<div data-role="content">	Creates a page in between header and footer where the actual contents are displayed.
Buttons	Button	Creates a user friendly button with an icon.
Grouped buttons	<div data-role="controlgroup"> Yes No Cancel </div>	User friendly list which might have embedded links.
Basic List Views	<ul data-role="listview"> One Two Three 	Shows "index.html" page when these buttons are clicked.
Dialogs	Open dialog Open dialog	Creates a HTML5 division at the top of the page.
Transitions	<a href="index.html" data-transition="pop" data-back="true">	Creates a HTML5 division at the bottom of the page.

Furthermore, users can have their own custom theme designed using Themeroller. It is a tool developed by the jQuery Mobile to allow users create customized themes. In our project, we created a theme (.css file) using Themeroller and refer to that file in our jQuery mobile pages. It functions like overwriting the default theme (*ThemeRoller for jQuery Mobile*).

PhoneGap

There are many developers who know web development technologies but do not have the knowledge of every platform's application development language. PhoneGap would let the developers use the knowledge of web development technologies in order to develop native looking mobile applications without the need to learn a completely new technology. PhoneGap is

a cross-platform mobile application development framework for creating mobile device apps. It provides access to the native functionalities such as camera, storage, geo-target location, and file storage by using common web development languages like HTML, CSS , and JavaScript.

Figure 3 Sample jQuery Mobile Page generated by the codes in the common components
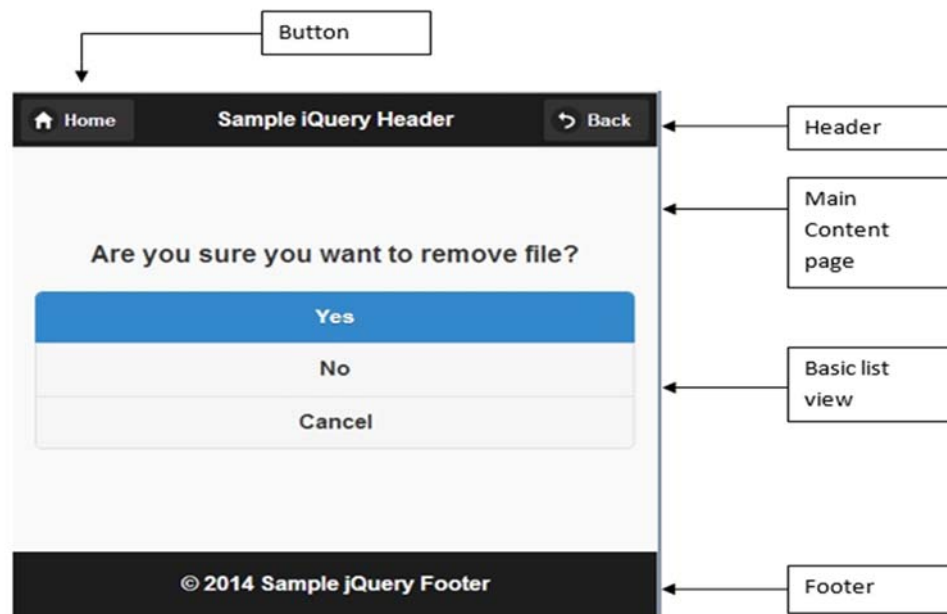
PhoneGap supports multiple platforms including iOS, Android, webOS, Windows, Blackberry, Symbian, and more. It takes in codes such as HTML5, CSS3, and JavaScript and packages them with its library codes. For every platform e.g. Android, iOS, Blackberry, etc., PhoneGap has some codes in the background to communicate with the platform APIs. Because of the existence of many different platforms, the PhoneGap package to be used in the development would be varied according to a specific platform. However, the end result is the app that would function the same regardless of the platforms.

PhoneGap provides Adobe PhoneGap Build service (c.f. https://build.phonegap.com/) which would make the workflow even simpler. One could simply upload the HTML5, CSS, and JavaScript assets to the Adobe PhoneGap Build cloud service and it does the compiling process. It could create apps for multiple platforms using the same files. The result is the app that could be ready for uploading to the app store. Figure 4 below is the illustration of the function of PhoneGap Build.

Figure 4 The role and function of PhoneGap Build
(Source: https://build.phonegap.com)
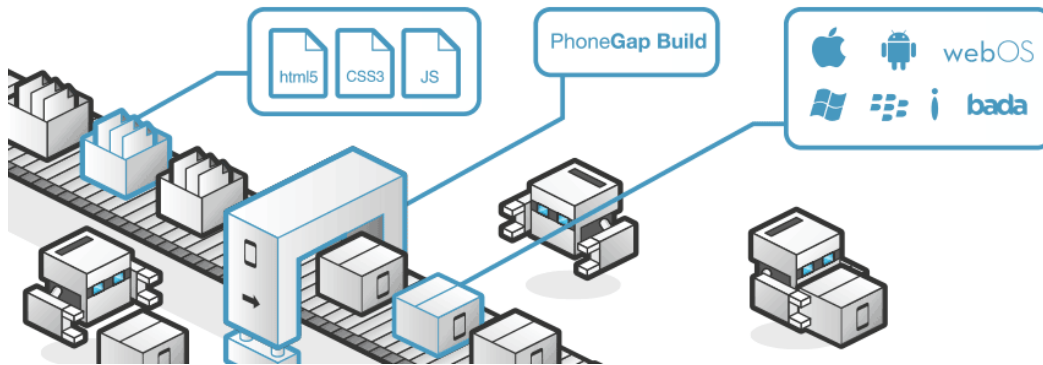
DEVELOPMENT OF BARCODE PRO

The main function of the mobile app BarCode Pro is to read and decode a QR code as well as other barcodes and then retrieve the information associated with these codes. Unlike other QR code and barcode readers, BarCode Pro is configurable to work with a specific database that a user wants. For instance, if a user wants BarCode Pro to access student records from his/her web database, then the user could specify BarCode Pro to point to the designated database, make connection, and retrieve appropriate records from it. Thus, the information processed by BarCode Pro can be defined by users and stored on the users' own web database. In addition, BarCode Pro also allows users to encode the information into a QR code using a mobile device.

Let us first begin with the description of the required components that we adopted for and used in the development of BarCode Pro. Table 2 below lists the components and provides a brief description for each of the component and its associated web resource.

Table 2 Tools for the development of BarCode Pro		
COMPONENT	**DESCRIPTION**	**RESOURCE**
_ Server running Ubuntu operating system version.10.4	Ubuntu is an open-source operating system. It is a Linux-based OS and can be obtained free from this URL.	http://www.ubuntu.com/server/
_ MySQL version 5.1.69	MySQL is the database engine to allow users to create database and thus store data/information to be retrieved by BarCode Pro.	http://www.mysql.com/
_ Apache version 2.2.14	This is an open-source web server software to allow users to connect to the server via any web browser.	http://httpd.apache.org/

Table 2 Tools for the development of BarCode Pro		
COMPONENT	DESCRIPTION	RESOURCE
_ PHP version 5.0	This is the programming language that we used to create interface between the database (e.g. MySQL) and the other programming languages such as HTML, JavaScript, etc.	http://www.php.net/
_ ZBar version 0.10	ZBar is an open source software suite for reading bar codes from various sources.	zbar.sourceforge.net/
_ ZXing	ZXing is an open source project fromGoogle, that allows a user to scan 1-D or 2-D "graphical barcodes" with the camera especially on their Android device.	https://github.com/zxing/zxing
_PHP QR Library	PHP QR Code is open source library for generating QR code, Implemented purely in PHP.	http:// phpqecode.sourceforge.net

Figure 5 below illustrates the tools and development frameworks that we used to develop BarCode Pro. The five environment frameworks are: PhoneGap, Decode SDK, Encode Lib, JQMobile, and Web database shown in the rectangular boxes in Figure 5 along with their associated tools. PhoneGap provides hardware control. JQMobile offers support for appearance design. Web database framework allows BarCode Pro to connect and access user-defined information. Decode SDK and Encode Lib provide the reading and writing of QR code/barcode. In the decoding process, BarCode Pro reads a QR code image and retrieves information from the web-database. In the encoding process, BarCode Pro can create a QR code image for the key term stored in the web-database as well as for any other alphanumeric string.

THE CONCEPTUAL ILLUSTRATION OF BARCODE PRO

When we developed BarCode Pro, our goal was to create an app that could do two things. One was to encode QR code/barcode and the other to decode QR code/barcode from a mobile device. Figure 6 shows the high-level flow chart of our app.

Client represented a mobile device and server represented the host which stored a customized database. The process was pretty straightforward. In the encoding process, a client sent in code, e.g. an alphanumeric string and the server would return a picture, e.g. QR/code or barcode image to represent the input code. In the decoding process, a client sent in a QR code/barcode picture and the server would return the original alphanumeric string.

Figure 5 An integrated view of the BarCode Pro's development frameworks and tools
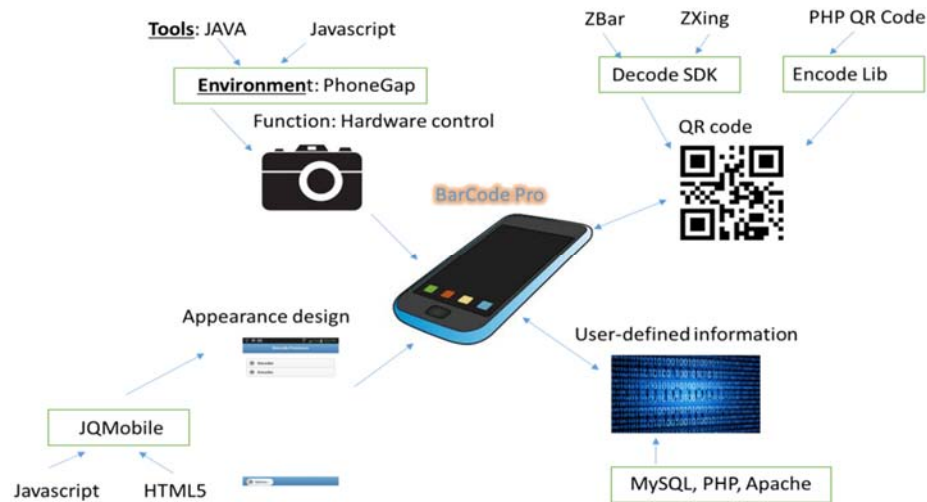
Figure 6 High-level flow chart of BarCode Pro
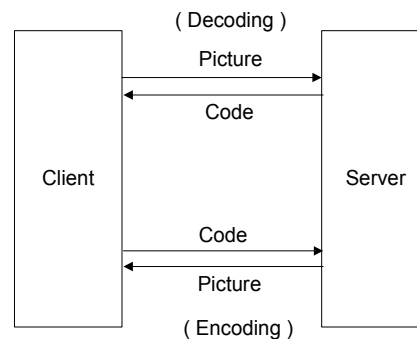
To further unfold the encoding and decoding process, we created the following flow chart in Figure 7 to show more specifically what technologies were being used. For the encoding process, the server (PHP QR) was used to read the input, e.g. an alphanumeric string, and generate a QR code image. More specifically, we integrated the codes from PHP QR Code from Table 2. to achieve this functionality. For the decoding process, there were two paths. One was to capture the image from the camera and the other from photo library. The image was then sent to the server and was processed by the either Zbar or ZXing decoding mechanism. At the end was the original alphanumeric string obtained from the decoding process.

Figure 7 Detailed flow chart of the decoding and encoding process
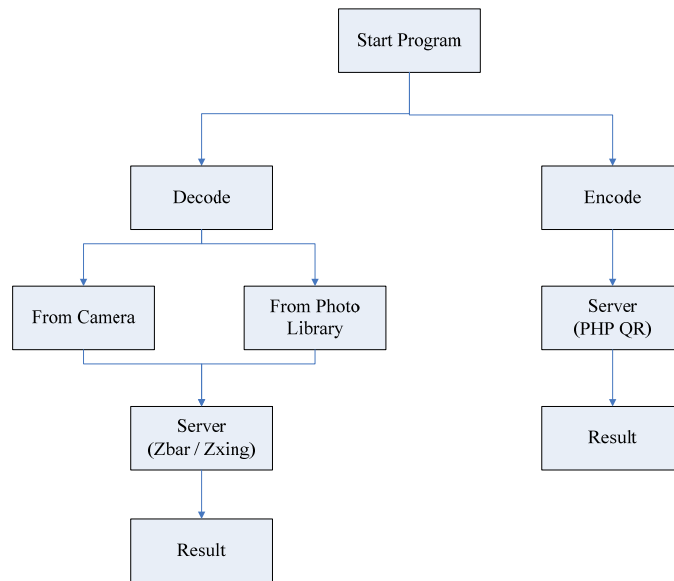
HOW BARCODE PRO WORKS

In this part, we presented the screen shots captured during an actual use of BarCode Pro to encode and decode QR code/barcode. We also provided detailed explanations for each of the screen shots. The actual version of BarCode Pro can be downloaded for use on any Android device. It is available for free at this URL: http://cob.cdcs.selu.edu/appstore/BarCodePro/

Figure 8 The main user interface of BarCode Pro
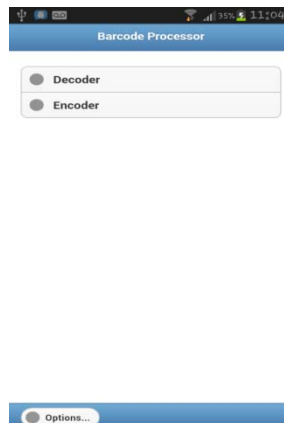
This Figure 8 displayed two main functions of BarCode Pro: Decoder and Encoder. The app could handle QR code as well as other common barcodes. For encoding process, a string was input and the app took that string and encoded into a barcode/QR code. In reverse, the decoding process took the image or a barcode/QR code and then the app returned a string as a result.

Figure 9 Encoding process user interface

Figure 9 depicted the encoding process. For instance, when the user typed in the string "www.selu.edu", the app would read the string to be encoded and send it to the server. In BarCode Pro, the server's address and information could be specified by the user. Then, the program on the server used the function from the code library to encode the given string. The server sent the encoded image back to the device and in real-time, the device displayed the encoded image. The image was also downloaded and stored on the device as shown in Figure 10.

Figure 10 Saving an encoded picture to a local device
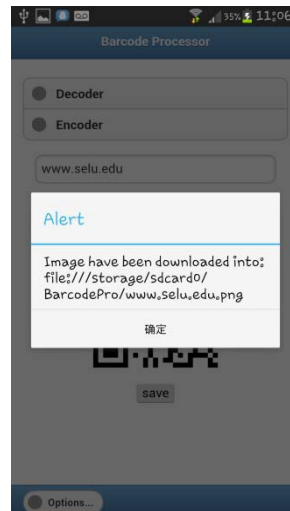
Figure 11 depicted the decoding process. Users had two choices. One was to capture a QR code/barcode with the on-device camera and the other to choose an existing image of a QR code/barcode on the device.

Figure 11 Decoding process user interface
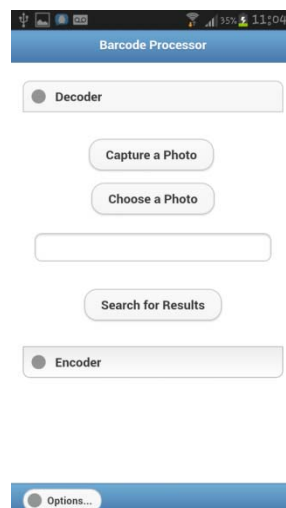
There were four sub-processes involved in the decoding process of a barcode/QR code.

1. The first sub-process took the encoded image and sent it to the server. Once, the server received the encoded image, then the second sub-process took place.

2. In the second sub-process, a program on the server ran and decoded the barcode/QR code. The result was the string that the barcode/QR code represented. To go deeper into the lower level, we unfolded the second sub-process further. Let us take a closer look at the inside of this sub-process, First of all, the program on the server had to read the barcode/QR code as an image. Next, the program removed the header of image. Then, it began to convert the image into binary file format. This binary file was the input of the barcode/QR code to ZBar extension. The ZBar extension was the engine that converts the binary file input into a string output.

3. In the third sub-process, the server then sent the result to the device. Again, imagine that we could see further inside this sub-process, we discovered that in this step the result string from the second sub-process was being checked against the information on the database.

4. The final sub-process simply displayed the result receiving from the server. If the information existed in the database, the program retrieved the information. Then, it sent the string back to the device which displayed the result on the device. Figure 12 illustrated an example of this sub-process. When we scanned a QR code that contained the original string "laptop", BarCode Pro returned the string "laptop". When we pressed the button "Search for result" and then pressed the button "Search our DB", BarCode Pro retrieved a record that displayed our information including multimedia elements from the database, e.g. Item, Price, Quantity, image, and video as shown in Figure 12.

Figure 12 Getting a result after QR code/barcode being decoded

Search "laptop " from the user-defined database

The original string "laptop" was decoded from the QR image.

The result was retrieved from the database.
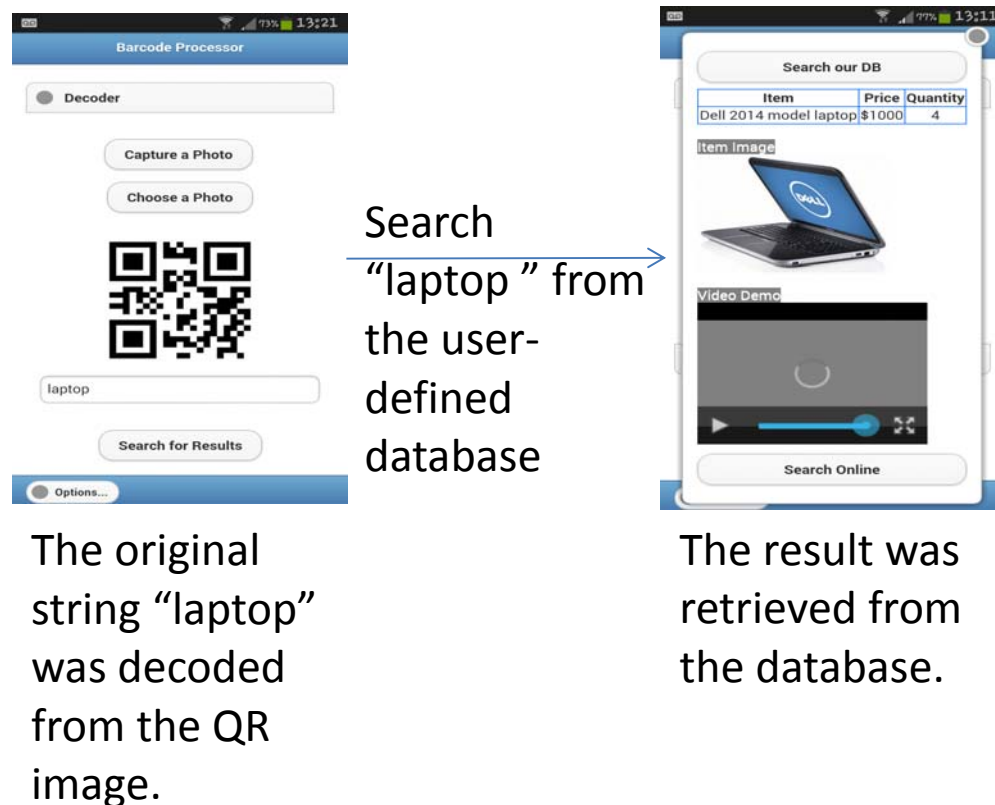
However, when we searched on our database and the term did not match with any record in our database, BarCode Pro would display a message stating that nothing was found in our database as shown in Figure 13.

Figure 13 Searching for a possible result from our own database
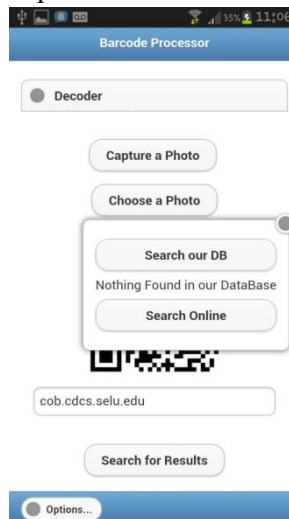
At this point, we had an option to end here or to search online. If we clicked the button "Search online", then we received whatever information that Google returned as shown in Figure 14.

Figure 14 Searching for a possible result from Google database
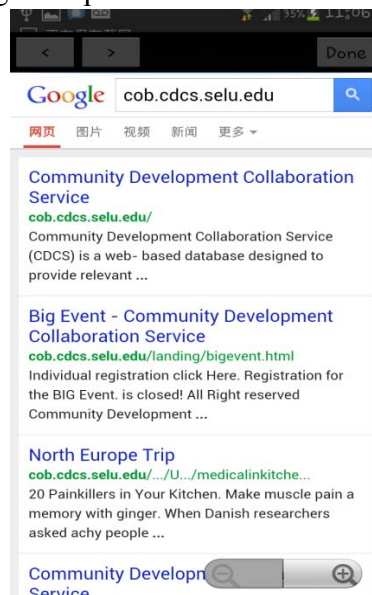
CONCLUSION

In summary, this project involved the design and development of an android app called BarCode Pro to read/write QR code and barcode. As described above, BarCode Pro could process 2-D codes such as QR code as well as other common 1-D barcodes such as EAN, UPC_A, etc.

In this paper we highlighted the development of BarCode Pro. We relied on all open-source software and freely available tools in to create our app. Although it did take some time to learn the development environment and to develop skills in using various tools, at the end we were successful in our effort to develop not a prototype but an actual fully functional mobile app for processing QR code/barcode. Among the key features of our mobile app Barcode Pro are the following:

It can retrieve useful content from a web-based database by scanning a QR code on a physical object.
It can encode and decode QR code.
It can decode many other one-dimensional barcodes (e.g. Aztec code, Code 39, Code 128, EAN, UPC_A, etc).

Unique contributions

While there are several QR code/barcode readers on the market, what we developed does offer a few unique contributions in comparison to those existing apps. The unique capabilities in Barcode Pro are three-folded. First of all, it provides direct link from QR code (physical world) to information on a web-based database (online world). Unlike the existing apps, BarCode Pro can be configured to work with the user's specific database. This means that it can be customized to function in any specific context because the user has the ability to configure his/her own database to be linked with BarCode Pro. Therefore, the app can be adopted and used in the context that associates with the needs of the users not the developers. Secondly, BarCode Pro incorporates two decoder engines (ZXing and ZBar). As a result, it can support many more different barcode formats. Finally, in term of its design for performance, the decoding process of BarCode Pro takes place on the server not on a specific local device. Therefore, it is not device dependent and our approach offers a possibility of developing BarCode Pro into a true cross-platform app that can run from many different mobile devices.

Currently, the Android version of BarCode Pro is available for download at this URL: http://cob.cdcs.selu.edu/appstore/BarCodePro/

Limitation in the current project and future direction

In this project, we were able to develop successfully the mobile app for Android device. We did manage to develop a prototype for the web version. It did work for demo purpose, but it does not have all the features of the Android version. In addition, we currently did not have the iPhone version of BarCode Pro.

In the next phase, we plan to design and develop the cross-platform version that would function on Android device, iPhone, as well as any tablets. We also plan to offer the web version with more complete features. Another enhancement is to extend the content to include not just alphanumeric data but multimedia elements from a web database. As we stabilize BarCode Pro, we would focus on ways to distribute this application for use in different contexts, e.g. learning and teaching environment. .

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HOW RELEVANT IS TRANFORMATIONAL LEADERSHIP TO TECHNOLOGY ADOPTION AND INFUSION IN SALES CHANNELS?

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ABSTRACT

The purpose of this paper is to theoretically examine and validate if Transformational Leadership (TL) style of management can impact and diffuse technological innovation in sales organizations. We start by exploring the meaning of corporate innovation, and the transformational leadership style. We look to see what TL is, and how they perform in a sales force automation environment. There are different types and stages of TL that will be investigated. We also explore why companies should hire a transformational leader and if TL is a positive influence on innovation, in particular in the adoption and diffusion of sales force automation (SFA). A hypothetical measurement model is proposed to examine the underlying constructs to better understand the role of TL in diffusing (SFA) based strategies. The model proposes to empirically validate the interface between TL, Technology Acceptance Model (TAM) and the organizational and personal attributes in corporate sale environments that can potentially impact upon acceptance of and diffusion of SFA.

INTRODUCTION

The global economy is becoming dynamic and very competitive. New technologies are giving corporate customers faster access to more information and product suppliers with Internet based sales and service platforms. The time it takes for a company to bring a new product to market, their product diversity and cost vs. quality ratios have never been more critical than they are now (Reuvers, Van Engn, Vinkenburg and Wilson-Evered, 2008). The increased competiveness of the global market and changing expectations of customers are forcing organizations to become more flexible, responsive and efficient (Reuvers, Van Engn, Vinkenburg and Wilson-Evered, 2008). Internal process and product innovation are becoming necessary for organizations to ensure they have a future in the global marketplace. Therefore, strong transformational leaders are needed to instigate such changes within the organizations, in particular, in the B2B and B2C sales channels. Further, "buyer-seller interface" has become more complex (Ploufffe, Sridharan and Barclay, 2010) dictating that "sales persons focus on solutions that would identify the needed technological resources for better customer relationship management (Jones, Dixon, Chonko and Cannon, 2005).Morgan and Inks (2001) further assert

that "SFA is no longer the future of sales but rather a competitive imperative" in sale environments.

In most researches globalization is one of the most mentioned reasons why organizations have to innovate in technology tools (Bouwen & Fry, 1991). The survival of organizations are threatened by external (economic and political environment) and internal pressure (new technologies, changing attitudes of members). Further, "Organizations around the world today face a common challenge: the need to improve their corporate sales performance in order to capitalize on rapid change, and to establish or regain competitive edge." (Basadur & Gelade, 2006, p. 19). Therefore, a TL based leadership style becomes a prerequisite condition to deal with all the internal and external pressures and move the sales organizations in a positive technology based direction in order to survive in the future.

TRANSFORMATIONAL LEADERSHIP AND IMPLEMENTING CHANGE

Leadership is the method of persuading people to work towards a common or required goal (de Jong, & Den Hartog, 2007). Paulsen, Maldonado, Callan, & Ayoko (2009) state that leaders have the ability to change how their followers views of themselves and they also have the influence over their sense of belonging to the team. TL's have a strong persuasion over the team's behaviours and in turn their innovation can be purposeful to start the flow of ideas or just a daily leadership style. Thus, the inclusion of TL type managers in sale and service technology based environments is a must.

With the sales and service firms moving away from standard day-to-day tasks and more towards a fast paced, always changing, knowledge and product information centered environment, businesses must learn how to harvest and use their employee's talent to innovate. By generating new ideas employees can improve performance, create new products, and improve upon services and processes. Leaders support the idea that individual and team innovation can help companies achieve success (de Jong, & Den Hartog, 2007). Leaders can further "transmit, and embed organizational culture through deliberate teaching, coaching, role modeling, reward allocation, recruitment, selection, promotion and other mechanisms" (Jaskyte, 2004). Leaders can emphasize the core corporate values, pursue goals and strategies so as to involve employees into accepting new technologies and use these technological tools to improve sales and service functions.

Therefore, infusion of sales force automation (SFA) strategies at the corporate level thus becomes a prerequisite condition of firm survival and can be significantly impacted by the TL style of management and leadership.

Gardner, & Avolio (1998) have reported evidence that there is a positive relationship between corporate performance and the leadership style. Evidence shows that one the main factors in achieving innovative success is the type of leadership style the organization has. TL helps build a "sense of community, trust, and teamwork to turn creative ideas into innovative

products and services" (Paulsen, Maldonado, Callan, & Ayoko, 2009). Research has also proven that non-verbal behaviours such as facial expressions greatly affect the feelings and willingness of people to follow. When failures occur it has been documented that followers are much more likely to forgive a TL then a non-charismatic leader (Awamleh, & Gardner, 1999).

Transformational leaders help employees view problems in a new light, which allows them to expand their potential and their ability to solve problems in creative and innovative ways that may not otherwise have been realized. de Jong, & Den Hartog (2007) documented empirical evidence that shows a positive link between idea generation and innovative role modelling done by leaders. Paulsen, Maldonado, Callan, & Ayoko (2009) found that leadership behaviours are very good predictors of technical quality as much as the requisite conditions for organizational change.

Transformational leaders encourage performance improvement, under rapid change which then can lead to innovative strategies. Basadur and Gelade (2006) relate these strategies to the top management. They explain that the top management of the organization should develop specific strategies to bear up the thinking skills in daily work life. Besides that the top managers must lead the way by learning and visualizing, using the process and create new managerial activities, for example including publicizing, rewarding, modeling, providing resources and coaching and teaching, as well as new organizational structures to engage all members of the organization in applying the process daily. These issues should be led by the top management to promote the change-making process (Basadur & Gelade, 2006).

Another issue which should be imbedded in the innovative strategies is the organizations capitalization with failure. Amy Edmondson, a professor at Harvard Business School says that the organizations management must create an environment of psychological safety. The people shall be convinced that they will not be humiliated or punished if they speak up with ideas, questions, concerns, or make mistakes. (Amabile & Khaire, 2008)

There are several more issues that influence organizational innovation, such as culture, climate, leadership, management practices, information acquisition, retrieval, sharing, organizational structures, systems and environment (Kaiser, 2000) (Bates & Khasawneh, 2005). In particular, user acceptance and rejection of new technologies, the personal "lenses" of the employees , a sales person's belief structure are traits that need to be examined and understood by the TL so as to adopt and diffuse SFA platforms in corporate sales platforms (Speier and Venkatesh, 2002).

INNOVATION AND ITS INTERFACE TO TECHNOLOGICAL CHANGE

The various definitions for innovation starting with Tidd and Bessant: "Innovation is a process of turning opportunity into new ideas and of putting these into widely used practice". (Tidd & Bessant, 2009, p. p. 16). Shipton, Fay, et.al. describe Innovation as "the intentional introduction and application within an organization of ideas, processes, products or procedures,

new to the unit of adoption, designed to significantly benefit the organization or wider society' (West & Farr, 1990) (Shipton, Fay, West, Patterson, & Birdi, 2005), to Bouwen and Fry: Innovation is defined here as "the development and implementation of new ideas by people who over time engage in transactions with others within an institutional order" (Van de Ven, 1986). The emphasis is on the interactive process among people about new ideas in an organizational context. We term this the organizational innovation process. (Bouwen & Fry, 1991)

Innovativeness has two key markers; 'new products' and 'new processes' (Bossink, 2004). Tidd, & Bessant (2009) have described innovation as a "successful exploitation of new ideas" and that "Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced" (p.16).

These definitions proof that there is no consensus about what is innovation. Talking about innovation, different pictures may emerge in the minds of men. Hage, relating to Blau (1973) describes that not only innovation in products, services, technologies, and administrative practices is relevant. There are other institutional sectors besides the economy, like significant breakthroughs in science, the development of superior military equipment, the creation of interdisciplinary programs in higher education, the reform of welfare etc.(Hage, 1999)

REVELVANCE OF TECHNOLOGY ADOPTION

Transformational leadership defined by Gumusluoglu & Ilsev (2009) are leaders who "transform followers' personal values and self-concepts, move them to higher levels of needs and aspirations and raise the performance expectations of their followers." This leadership style has four main components: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass, Jung, Avolio & Berson, 2003). Tichy & Devanna (1990) highlight the transforming effect these leaders can have on organizations as well as on individuals. By defining the need for change, creating new visions and mobilizing commitment to these visions, leaders can ultimately transform the organization (Ticky & Devanna, 1990). Gumusluoglu & Ilsev (2009) further state that transformational leadership is an important determinant of organizational innovation and should be implemented by managers to promote strong innovation practices in organizations.

Gumusluoglu and Ilsev (2009) further propose a model of"... impact of transformational leadership both on followers' creativity at the individual level and on innovation at the organizational level" (Gumusluoglu and Ilsev, 2009). At an individual level, they used a Hierarchical Linear Modeling (HLM) and found that there was a positive relationship between transformational leadership and individual creativity ($\gamma 01=0.25$, $p<0.05$), after controlling for education and job tenure. Gumusluoglu and Ilsev (2009) also found that transformational leadership has a significant association with intrinsic motivation ($p<0.05$). In addition, intrinsic motivation significantly relates to creativity($p<0.05$) when entered together with transformational

leadership into the equation predicting creativity, where transformational leadership has no significant effect (non-significant) (Gumusluoglu and Ilsev, 2009).

Gumusluoglu and Ilsev (2009) tested the direct effects of transformational leadership and creativity on organizational innovations. These hypotheses were tested by regression analysis. The first hypotheses predicted a positive relationship between transformational leadership and organizational innovations. Results of the analysis reveal that, after controlling for firm age, transformational leadership has s significant positive effect on organizational innovation ($p<0.05$). The other hypothesis that Gumusluoglu and Ilsev (2009) tested states that creativity positively relates to organizational innovation. But since creativity does not have a significant relationship with organizational innovation (non-significant), this hypothesis was not supported. The findings of this study suggest that transformational leadership has an important effect at both individual and organizational levels (Gumusluoglu and Ilsev, 2009).

The other study done by Gumusluoglu and Ilsev (2009) is aimed to investigate that "…impact of transformational leadership on organizational innovation, and to determine whether internal and external support for innovation as contextual conditions influence this effect" (Gumusluoglu and Ilsev, 2009). The results of the study used the same data from the last study done by Gumusluoglu and Ilsev (2009). A four-stage hierarchical regression analysis was used to test the hypothesized direct effect of transformational leadership and the moderating effects of internal and external support for innovation (Gumusluoglu and Ilsev, 2009).

The first hypothesis predicted a positive relationship between transformational leadership and organizational innovation. Results of the analysis revealed that transformational leadership had a significant positive effect on organizational innovation ($b=0.65$, $p<0.05$). Therefore this hypothesis was supported. The second hypothesis was related to the moderating effect of internal support for innovation on the relationship between transformational leadership and organizational innovation. The results showed that the interaction between perceptions of internal support for innovation and transformational leadership was not significant ($b=-0.18$,n.s.). Therefore this hypothesis was not supported. The final hypothesis predicted a moderating effect of external support on the relationship between transformational leadership and organizational innovation. According to the results, the interaction term was statistically significant ($b=0.61$, $p<0.05$). Therefore, transformational leadership and external support had a significant joint effect on organizational innovation (Gumusluoglu and Ilsev, 2009).

Reuvers et al. (2008) theorized that differences in the relationship between innovative work behaviour and transformational leadership stemmed from the gender of managers and their employees. The results of their study were as follows. The first hypothesis was tested using a Multilevel Random Coefficients Model (MCRM) with innovative work behaviour set as the dependent variable and transformational leadership as the predictor. The effect was significant ($t=8.37$, $p<0.001$) which confirmed the hypothesis that "employees exhibit a higher level of innovative work behaviour when subjected to higher levels of transformational leadership" (Reuvers, Van Engn, Vinkenburg and Wilson-Evered, 2008). The study was also able to confirm

its second hypothesis. Results from the regression model were significant (t=2.48, p<0.05) and suggested that "transformational leadership by male managers induces a slightly higher level of innovative work behaviour in employees in comparison to female managers" (Reuvers, Van Engn, Vinkenburg and Wilson-Evered, 2008). The last goal of the study was to find a relationship between transformational leadership, gender of the manager and gender of the subordinate. The study tried to verify if managers with subordinates of the same gender were able to achieve higher levels of innovative influence than those of opposite gender. No evidence was found to support this three-way relationship which disconfirmed the third hypothesis (Reuvers, Van Engn, Vinkenburg and Wilson-Evered, 2008).

Garcia-Morales, Hurtado-Torres and Matias-Reche (2008) looked at "…the influence of transformational leadership on organizational innovation and performance depending on the level of organizational learning in technological firms (Garcia-Morales, Hurtado-Torres and Matias-Reche, 2008)." Their results found that organizational performance is influenced more strongly by transformational leadership in technological organizations with high-organizational learning (p<0.001) than in technological organizations with low-organizational learning (γ=0.32, p<0.001). The results show an indirect effect of transformational leadership on organizational performance due to organizational innovation (Garcia-Morales, Hurtado-Torres and Matias-Reche, 2008). They also found a positive relationship between organizational innovation and organizational performance. This relationship is greater in technological organizational with high-organizational learning than in technological organizations with low-organizational learning. Garcia-Morales, Hurtado-Torres and Matias-Reche (2008) conclude that "…The leader inspires organization innovation and organization performance, helping the members of the organization to discover their mental models, restructure their visions of reality to see beyond surface conditions and develop their systemic understanding (Garcia-Morales, Hurtado-Torres and Matias-Reche, 2008)."

Garcia-Morales et al. (2008) tried to measure the effect of transformational leadership on organizational performance using knowledge and innovation as key variables in their research. The study sought to fill the research gap by "analyzing theoretically and empirically how the leader's perceptions of different intermediate strategic variables related to knowledge (knowledge slack, absorptive capacity, tacitness, organizational learning) and innovation influence the relation between transformational leadership and organizational performance" (Garcia-Morales, Llorens-Montes and Verdu-Jover, 2008). The research team used a structured equation model (SEM) to estimate a model to test their data against. After the data was analyzed all twelve hypotheses were confirmed. Findings from the (SEM) showed a positive association between transformational leadership and all four key factors of organizational knowledge (knowledge slack, absorptive capacity, tacitness and organizational learning). The study also revealed interconnectivity between all four knowledge factors and showed positive association for all them with firm performance. The final hypotheses of the study which connected

transformational leadership with innovation and firm performance were found to be statistically significant (Garcia-Morales, Llorens-Montes and Verdu-Jover, 2008).

Those in favour of transformational leadership in organizations argue that these types of leaders effectively increase commitment from employees and elevate higher level needs such as self-actualization and self-esteem (Bass, 1990). As a result, employees are highly motivated, which can be an important driver of both employee creativity and firm innovation (Gumusluoglu & Ilsev, 2009). Essentially, transformational leaders encourage their employees to identify new approaches to problem solving as well as looking at old problems in new ways. (Gumusluoglu & Ilsev, 2009) Under these positive environments, employees are more likely to be engaged in innovative ideas (Oke, Munshi, & Walumbwa, 2009).

Overall, researchers tend to agree on the role of transformational leadership of top management in enhancing quality management (Berson& Linton, 2005) as well as significantly impact inclusion of SFA based action strategies. However, there is little agreement regarding the role of transformational leadership at lower levels of the organization (Berson & Linton, 2005), especially in the implementation of technology. For example, Dean and Bowen (1994) suggest that quality management practices could be seen as substitutes to leadership. In other words, instituting effective quality management practices diminishes the need for transformational leadership at lower levels of a firm (Sousa and Voss, 2002). This study will therefore the five practices and ten commitments of leadership attributes (Kouzes and Posner, 2002) and will attempt to measure the relationship how these attributed confounded by the TAM model attributes can potentially measure online sales and service outcomes.

TRANSFORMATIONAL LEADERSHIP ON ORGANIZATIONAL INNOVATION

Transformational leadership is the style of leadership that is most often seen in businesses and organizations today. Such leadership style is usually characterized by the factors of "contingent reward and management-by-exception" (Bass, 1990).

Though Oke et al 2009 suggest that ``transactional leaders are likely to contribute to innovative processes and activities by clarifying what performance standards are required and how needs would be satisfied," transformational leaders contribute to the innovation process by encouraging people to perform in a desired way by motivating them through rewards and punishment. The transformational leader has clear performance expectations, goals, and paths that link achievement of the goals to rewards.

This study will be grounded in the transformational Leadership Theory, the TAM (Technology Acceptance Model) and assessment of online sales force behaviour will be based on the definition consistent with the Theory of Reasoned Action (TRA's). Research will consider and examine how the transformational leadership style can impact upon acceptance and use of technology by corporate sales staff. In particular, online behaviour of sales staff for using computerized systems such as customer contact information, call history, sales (funnel analysis),

and order management tracking (Schilewaert et al, 2005) will be tested. The implementation of transformational leadership style, in a corporate sales environment will be examined.

This study hypothesizes that the transformational leadership style has the greatest potential of recognizing and innovating new sales for technological tools for sales efficiency and better customer service and sales automation. In a longitudinal study, some of leadership factors were examined (Jones, Sundaram and Chin, 2002) and the adoption factors of the sales force automation (SFA) was empirically tested.   The proposed measurement model in this study (Figure #1) will consider sales force behavior based personal innovativeness, perceived usefulness of a new system, sales force attitude toward a new SFA, facilitating conditions, as well as the Fields and Posner Model (1987) measurement factors will be considered in a factorial design.

The research will attempt to link the TAM and TRA Theories to Transformational Theory and the Leadership Practises Model. It will to attempt to validate how a new technology implementation paradigm that can help us to better understand and implement online sales channels for corporate sales, and attempt to quantify whether such channels will safeguard a successful sales outcome, and how this technology infusion instigated by the initiatives by a transformational manager can be perceived and adopted by the sales force. This perception by the sales staff needs to be quantified and modelled, as this new channel of sales is increasing globally at exponential levels. As well, the sale force today needs to be well-grounded in the use of new technologies, and have had the experience of seeing the positive utility of these technology tools in promoting online consumer utility.

This research paper will investigate the current connection between a Transformational Leadership style, and the not so clear promotion of technological implementation of web based sale force environments and sales automation factors as inspired by transformational leadership style.

IS TRANSOFRMATIONAL LEADERSHIP FIT FOR INNOVATION?

Humphreys (2001), state that there is little question that advancing technologies will impact the traditional view of leadership and that emerging technologies will have greater implications on effective leadership behaviours and leadership paradigms. Therefore, it makes sense that organizations should implement transformational leaders, as they promote innovation practices and utilize the most appropriate leadership qualities for this day and age; where continual change is driven by escalating technological advancement (Humphreys, 2001). Furthermore, Bass (1990) indicates that transformational leadership can lead to substantial organizational rewards. Transformational leadership has also been positively correlated to leader effectiveness ratings, leader and follower satisfaction, follower efforts, and overall organizational performance (Humphreys, 2008).

Transformational leadership is the better leadership style that enhances innovation within an organization. Using charisma, transformational leaders instil admiration, respect, and loyalty and emphasize a sense of mission (Gumusluoglu & Ilsev, 2009). They also build a one-to-one relationship with his or her followers and understand their individual needs, skills and aspirations (Gumusluoglu & Ilsev, 2009). Thus, transformational leaders meet the emotional needs of each employee (Bass, 1990). By inspirational motivation, the leader articulates an exciting vision of the future, shows the followers the ways to achieve the goals, and expresses his or her belief that they can do it (Gumusluoglu & Ilsev, 2009). In addition to its effect on the tendency of organizations to innovate, transformational leadership also has a positive impact on the market success of the innovations (Gumusluoglu & Ilsev, 2009). By articulating a strong vision of innovation and displaying a sense of power and confidence, this leader will strive to ensure the market success of the innovation (Gumusluoglu & Ilsev, 2009).

Furthermore, in addition to the internal roles, transformational leadership has been suggested to be effective in playing external roles such as boundary spanning, entrepreneuring and championing, which might be important both for understanding the needs of the market and marketing the innovation successfully (Gumusluoglu & Ilsev, 2009).

However, Bass et. al (2003) & Humphreys (2001) discuss how a transactional leader can have a negative impact on organizational innovation if they are constant reprimanding or disapproving of actions taken by employees. Contingent reprimand has a negative impact on employee performance, meaning they are less likely to want to achieve the desired result by its leaders. (Bass et. Al, 2003, Humphreys, 2001.)

Transformational leadership measured if (i) management was able to communicate and motivate its final goals to the organization's employees, (ii) leaders were masters of motivating their employees, (iii) management was consistently searching for new opportunities, and (iv) management constantly behaved as a leading force for the organization (Garcia-Morales et al., 2008).

Adding to the TL style of management, individual perception of technology by sales staff plays a significant role in accepting "system compatbility", "system visibility" and "triability" (Moore and Benbasat, 1991). There is now empirical evidence that "person-technology fit" (Speier and Venkatesh, 2002), "experience with technology", and "organizational characteristics" (Petersen, 1997; Seiebel and Malone, 1996; Jarvenpaa and Ives, 1990) and "individual traits" (Singh, 1998; Speier and Venkatesh, 2002) can impact SFA implementation strategies and need to be recognized by the TL.

Accordingly, the following hypothetical model is proposed to be considered for better understanding of the interface of these various human-machine elements and the personal attributes . Only by understanding this complex phenomenon and testing it empirically, one can truly appreciate the operational difficulties and the challenges a TL faces in implementing of SFA strategies and its success.

FIGURES

Figure 1: Hypothetical Model of TL motivated SFA innovation and implementation
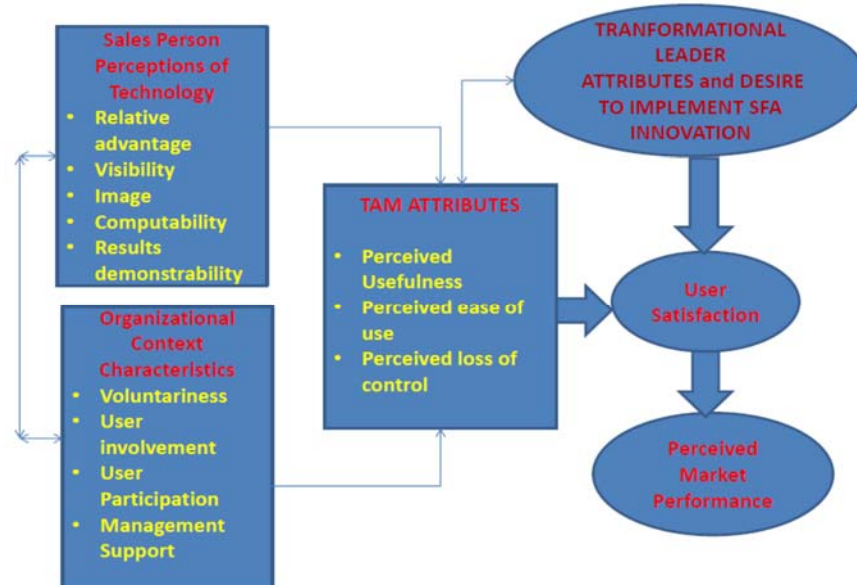
CONCLUSION:

Further, this study proposes to examine what organization factors moderate the relationship specific leadership styles to technology innovation processes in the computerized sales channels. This is where the TAM theory will help to link the implementation and utilization of new technologies in helping to sustain strategic positioning and sales leadership. The hypothetical model proposed will also be empirically tested.

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MEASUREMENT OF THE IMPACT OF SUPPORTING AND SUPPLEMENTAL LEARNING INTERVENTION STRATEGIES (SSI) IN INTRODUCTORY ACCOUNTING CLASSES AT THE UNIVERSITY OF FRASER VALLEY

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ABSTRACT

Our goal IS to measure the overall effectives of supporting and supplemental instruction (SSI) in a more critical teaching pedagogy focused on improving student performance explicit in an effort to foster measurable improvements in students' failure rates and student retention rates in the introductory accounting classes taught in the School of Business. Descriptive data obtained demonstrates that the (SSI) strategy does indeed improve student performance and retention rate. Further studies could explore whether such strategies could potentially improve upon students' critical thinking skills and enhance educational programming and student counseling services.

INTRODUCTION

The relevance of Business school education, especially as it pertains to expectations of Business graduates' critical business decision making skills in the workplace, is under scrutiny (Tushman, O'Reilly, Fenollosa, Kleinbaum, & McGrath, 2007). Labour markets are demanding that graduates of business schools acquire critical numeracy skills that can provide a "seamless transition" to the workplace, yet a common refrain in recent scholarship, especially when it comes to management education, is that the business community's needs are not being met (Hughes, Tapp, & Hughes, 2008; Tushman et al.; Currie & Knights, 2003; Ulijn, 2000). Introductory accounting courses constitute a key foundation of business school graduates' competencies and as such they are fundamental in building the tools for business decision making, and critical thinking skills (Etter, Burmeister & Elder, 2000)

Part of the problem, according to Dehler, Welsh, and Lewis (2001), stems from a deeply rooted historical trend towards teaching management decision making principles "as a set of 'content' areas to be learned'," and as such, denying the inherent complexity of managerial thought and practice (p.494). Hagen, Miller and Johnson (2003) similarly recognize this trend as the "restrictive thinking" of management education (p.242).

And yet, a study conducted by Malgwi (2006) "shows that one third of the students perceived the first course in accounting to be significantly important to their future career, irrespective of their major and gender" (p.67).

To truly enhance student learning and ensure more desirable learning outcomes, and improved skill sets relevant in the labour markets Dehler et al. (2001) contend a new approaches to business education are needed: "the complexity of managerial thinking and action needs to be reduced with sufficient clarity that students can comprehend its essence, while simultaneously *raising their o*wn level of complicatedness in order to grasp that extant complexity" (p. 494).

In particular, a bad learning student experience in an introductory accounting class can become a key factor (Cohen & Hanno, 1993) in deciding whether a career in accountancy should be pursued. Therefore, an SSI based teaching and learning pedagogy is a prerequisite condition for positively influencing positive student attitudes and perceptions for a successful career in accounting.

In light of this and related calls in the literature for change, we are prompted to question whether adopting a conventional teaching pedagogy that includes a strict in-class face to face instruction in accountancy is sufficient to develop a deeper, more nuanced understanding of the foundation skills required in accountancy.

Through the (SSI) intervention strategy of implementing a critical pedagogy in the Business 143: Accounting I , we hope to better understand if and how a heightened awareness of the course content might further foster student engagement and ultimately improve upon students' academic performance and help develop core business skills and competency badly needed in the labour markets . Such an interventionist strategy is ideal for better course and educational planning process whereby improving upon student retention rates, which has the potential of bringing about educational efficiency.

LITERATURE REVIEW

SSI supplemental instruction model was initiated at the University of Missouri Kansas City in 1970's focusing on students who were low achievers in their classes. In particular, this level of student marginality occurred in the introductory level courses which made it very difficult for such students to proceed unto upper level classes without acquiring fundamental skill set and the prerequisite knowledge (Blanc et al., 1983).

There has been considerable diffusion of SSI based programs in the United States (Fayowski & MacMillan, 2008) and data collected in such studies demonstrate considerable improvement with students enrolled in such programs (Martin & Arendale, 1992; Martin & Arendale, 1994)

Rath, Peterfreund, Xenos, Bayliss and Carnal (2007) "considered an institution-specific approach by measuring the impact of SSI on students enrolled in Introductory Biology at San Francisco State University (2007). Using data from 1,526 students collected between 1999 and

2005, they found SI participants, on average, earned higher grades, and were more likely to earn a "C" grade or higher in the course. The authors also found students from marginalized backgrounds benefited most from participating in SI, and were more likely to earn higher average grades in Introductory Biology and to graduate from university" (Queens Study, 2011).

Similarly, at the Canadian Universities, SSI based programs was implemented. At Carleton University, Miles, Polovina-Vukovic, Litteljohn and Marini (2010) used data from 4,942 students compared SI participants with non-SI participants in various faculties. Results showed SI participants achieved higher final grades than non-participants. Evidence from the University of Guelph and University of the Fraser Valley UFV show such similar positive results (Wilson, 2005).

SLG participants at UFV show higher GPA achievement than non-participants. These students were less likely than non-participants to drop a course or not complete SSI based programs (UFV, 2010).

The benefits of SSI on student performance and retention are significant.

There is also substantive evidence that demonstrates that SSI based instruction has long-term positive impact on the students' academic performance (Ogden, Thompson, Russell, & Simons, 2003).

The underlying issue for the proper implementation of an SSI based curricula and its success, is the inability of the post-secondary institution to implement SSI programs uniformly in their institutions, across all the introductory level course, which show high levels of student failure. That is an issue of diversity of their student intake. Canadian institutions face students who come from different cultures, a variety of teaching and learning environments. This level of complexity challenges the instructional faculty and forces them to seek alternate or supplementary styles of teaching. This is where SSI based curricula becomes a feasible option of instruction. This level of challenge goes beyond seeking new instructional techniques and brings opportunities in critical pedagogy.

Critical pedagogy, succinctly defined by Dehler (2009) as "a mechanism for problematizing values and learning" (p.33) that ultimately fosters a "critical consciousness" (Boyce, 1996; as cited by Hagen et al., 2003, p.243) and allows for "an opening of vision" (Chia, 1996; as cited in Hagen et al., p.243) has been regarded by some Business educators as a key to overcoming the pitfalls of simplified, instructor-centred curriculum. Such pedagogy can instead be implemented to enable educational training more relevant to the demands of the modern workplace and to assist educational development among faculty, too (Dehler et al., 2001).

This approach is rooted in a return to a more idealized understanding of business education as not just "specialized and skills but a wider and deeper understanding to be able to justify beliefs and behaviour" (Hagen et al., p.242-243). Achieving such a goal, however, according to Dehler, is largely contingent on extending beyond notions of "master[ing] a subject" (1996, p.222) to involve students in practices that sensitize them to the tacit social conditions shaping the work they do.

Therefore, (SSI) based teaching strategy must be an integral component of teaching and learning (Hurley, Jacobs & Gilbert, 2006; Arendale, 2000; Burmeister, Kenney & Nice, 1996). (SSI) based accounting education has been in use in the US schools of accountancy for years (Etter, Burmeister & Elder, 2000). The University of Missouri-Kansa City (UM-KC) developed the SI Model and implemented it very successfully in many of schools. Peer supported learning group (PSLG) strategies have been implemented in the Bachelor of Technology (BTech) courses in the Department of Electronic and Computer Engineering (ECE) in the UK universities (Mehdi, ?). Etter, Burmeister, and Elder (2000) used a meta-analytic model and examined the impact of SI on student success in Introductory Accounting classes. Their findings indicate student success in SSI based courses.

Similarly, a model of "collaborative learning in small peer-led group settings for the purpose of integrating instruction and reasoning skills with course content" (Fayowski and MacMillan, 2008) has been very effectively tested and used in first year calculus courses at a small Canadian university. In the Canadian experience, it was found that the instructor office hours and a single tutorial did not suffice for improvement of students' learning experience and that a more creative approach was needed. The SI model was chosen by the Canadian university for the purpose of "non-remedial image, learning and study skills in the context of the course and the programme's guiding principles"

A call for and (SSI) based teaching pedagogy that sensitizes students to social conditions, something that can be articulated as the link between "tacit knowing and explicit knowledge" (2002, p.35), Cunliffe endorses a more dialogic approach to challenge traditional instructor-student power relations in the Business classroom and encourage greater self-reflection and reflexivity among students and instructor(s) alike: one aimed at fostering "thinking and meaning-centred" learning in Business education (Resnick & Klopfer, 1989; as cited in Dehler, 1996, p. 222).

This approach, in its recognition of the transformative power of a student's own experience, resonates with Schon's call for a "practitioner-oriented model of education [that requires] practitioners to become more reflective of their own activities" (1987; as cited in Schryer, 1994, p.106) and Lave and Wenger's influential theorizing on legitimate peripheral participation (1991).

Though many like Cunliffe (2002) have contemplated the value of this more critical approach to Management education, few researchers have examined whether such pedagogy has been or should be most effectively implemented in the classroom (Currie & Knights, 2003).

Also, it is worth noting at this point that Cunliffe and others typically have interrogated pedagogic theories as they relate to MBA programmes in the US and UK. What happens, then, when one introduces a critical pedagogy in management courses more locally, at the undergraduate level – in a class of students preparing for both direct- entry into the workplace upon graduation as well as further academic study? Will intensifying students' critical engagement in numeracy skills and awareness in the course through select pedagogic strategies

better prepare these individuals for the "seamless transition" that employers and educators alike seek?

More recently, a pilot study completed at a Canadian University (2012), shows the following results on the SSI implementation strategy:

"Our findings suggest that the SLG program at Queen's University has been an effective supplement to traditional academic resources such as seminars and lectures, and has shown signs of positive, although mixed, success during its pilot years by reinforcing academic best practices and providing guided study time for students who are at academic risk. We also assert that further research remains to be done to understand more fully the role of this program in supporting student success" (Queens, Pilot Study, 2012)

METHOD OF MEASUREMENT AND IMPLICATIONS

Our study examined the level of success, as perceived by the attending students' pre and post SSI expectations of success and how these initiatives have translated to GPA levels at the end of the semester. At the beginning of the semester, an orientation was held for the students registered in the SSI Program. As well, instructors who would oversee and provide support to course mentors (mainly high GPA senior students studying accountancy). A pre-term student was also administered in order to assess the students' level of expectation from SSI participation. At midterm and the end of the semester, same students were asked to complete surveys to see if their expectations at the beginning of the semester yielded good GPA results as a consequence of SSI participation. All the three survey instruments are shown in the Appendix section of this paper.

Our goal with this approach was to investigate the overall effectiveness of the SSI strategies implemented in the first year accounting classes. In particular, the study probed whether high-risk students who participated in peer-led SSI instruction did significantly improve their mean semester GPA in 2011 academic year.

As a means of cultivating and ultimately measuring students' development in the face of this pedagogy, dialogic exchange and reflection was highlighted by way of explicit peer led instruction and practice in discourse analysis

Our goal was to gain insight into the class members' evolving critical engagement with and comprehension of the course material studied. As well, a quantitative dimension(s) to this project will consider some data mapping opportunities for better counseling and educational planning opportunities.

A factorial variance (PCA) model will be used to better understand the data that has already been collected. It is expected that with more advanced statistical analysis, we will have a

better understanding of the underlying constructs behind success visa a via the SSI intervention strategy.

KEY FINDINGS AND RESULTS

From the following Paired Samples Correlations, it shows that a weak and insignificant correlation exists between students' expected grades at the beginning and end of the receiving the Students-Learning-Group (SLG) program. It indicates that those who have reasons to expect high marks prior to taking the SLG are independent with their respective expectations after getting benefits from the SLG program. It implies that such large changes in their positive expectation of higher grades (i.e. 2.3889) may be attributed to the benefits after taking the SLG.

TABLE 1 DESCRIPTIVE STATISTICS

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness
BEGSLGBefore	342	1.0	2.0	1.947	.2236	-4.025
BEGLikelyAttend	342	1.0	5.0	2.251	.8904	.437
BEGExGrade	339	1.0	9.0	4.324	1.7082	.069
ENDHelpful	71	.0	5.0	4.408	1.2372	-2.694
ENDExGrade	72	.0	4.0	1.889	.8317	-.240
ENDWhyNotAttend	95	.0	6.0	2.000	1.6373	1.248
Valid N (listwise)	8					

TABLE 2 DESCRIPTIVE STATISTICS

	Skewness Std. Error	Kurtosis Statistic	Kurtosis Std. Error
BEGSLGBefore	.132	14.281	.263
BEGLikelyAttend	.132	.101	.263
BEGExGrade	.132	-.271	.264
ENDHelpful	.285	7.075	.563
ENDExGrade	.283	.140	.559
ENDWhyNotAttend	.247	.064	.490
Valid N (listwise)			

TABLE 3 PAIRED SAMPLES STATISTICS

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	BEGExGrade	4.278	72	1.5311	.1804
	ENDExGrade	1.889	72	.8317	.0980

TABLE 4 PAIRED SAMPLES CORRELATIONS

		N	Correlation	Sig.
Pair 1	BEGExGrade & ENDExGrade	72	.002	.984

TABLE 5 PAIRED SAMPLES TEST

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference (Lower)
Pair 1	BEGExGrade – ENDExGrade	2.3889	1.7406	.2051	1.9799

More importantly, the findings of 95% confidence interval with p-value less than 0.000 two-tailed levels exhibit a very statistically significant difference for such changes in expectation of grade. It suggests that because the SLG program did help students to acquire stronger comprehension of the fundamental accounting concepts, this process builds up more confidence for students who believe that they can achieve the respective learning objectives in various accounting topics. As a result, students have much better expectations on their grades. In addition, since this difference is not correlated with any reasons that students expected at the beginning of the semester, such variations could be due to the benefits of the SLG. Therefore, we can conclude that the SLG program is effectively helping students to learn better in their accounting knowledge so that it greatly improves students' expectations of achieving better final grades following their participation in the SLG program.

CONCLUSION

This study highlights the importance of such tutorial services as Student-Learning-Group (SLG) for elementary accounting students in university education. In their first year of the bachelor program, fundamental concepts of various accounting topics such as accrual accounting are the corner-stones for students who move up to higher and more challenging accounting courses. With some help and guidance from senior students in the SLG program, freshmen students who are willing to receive help will receive the benefits of learning better and getting higher grades. Such experience will help those students who are well equipped with the fundamental concepts, able to study better in the intermediate and advanced accounting courses, and ultimately go back to become the tutor and leader in the SLG program and help other junior accounting students. Consequently, this on-going, reciprocal cycle of helping each other will become a positive culture that promotes better tutors and learners in the university.

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APPENDIX

Survey administered as students enroll in the SSI Program

UNIVERSITY
OF THE FRASER VALLEY

Supported Learning Groups Survey

Name: _____
Term: _____
Course: _____

Supported Learning Groups will be offered for students enrolled in this course. This questionnaire will determine the most convenient times to schedule these sessions. Responses will be kept confidential, will not be released to the instructor, and will in no way be used to influence your grade for this course.

Please complete this survey even if you are not planning to attend the SLG sessions. Thank you.

1. How likely is it that you will attend SLG sessions for this course?

   Very likely   ○
   Likely   ○
   Neutral   ○
   Not likely   ○
   Very unlikely   ○

2. Have you attended SLG sessions before?

   Yes   ○

   No   ○

   If yes, how useful did you find the SLG sessions to be for helping you succeed in the course?

   Very useful   ○
   Useful   ○
   Not useful   ○

3. Select one or more of the following reasons you are taking this course:

   This course is required for my major.   ○
   This course satisfies an elective.   ○
   I am interested in this subject matter.   ○
   Other, please explain:

   _____

1

4. What grade do you *expect* to make in this course:

A+	A	A-	B+	B	B-	C+	C	C-	P	NC	W	AU
○	○	○	○	○	○	○	○	○	○	○	○	○

5. What grade do you *want* to make in this course:

A+	A	A-	B+	B	B-	C+	C	C-	P	NC	W	AU
○	○	○	○	○	○	○	○	○	○	○	○	○

6. Please fill out the schedule below to help us determine the most convenient times to schedule SLG sessions. Mark with an "X" the hours you know you would **NOT** be available for SLG (work, class, etc.).

Block	Time	Mon	Tues	Wed	Thur	Fri	Sat
A	08:30-09:50						
B	10:00-11:20						
C	11:30-12:50						
D	13:00-14:20						
E	14:30-15:50						
F	16:00-17:20						
G	17:30-18:50						
H	19:00-20:20						
I	20:30-21:50						

If you would like to be reminded of session time by e-mail, please provide your email address: _____

We welcome any additional thoughts or comments that you may have about the Supported Learning Groups project.

_____

_____

_____

_____

_____

Thank you for your time and participation!

2

Mid-term SLG Survey

Course: _____   **Instructor:** _____

Please answer the following three questions honestly. You don't need to put your name on this evaluation form, since it will not be used for data analysis. It's simply a way to learn how we can serve you better in SLG.   *Thank you.*

1.   Have you attended at least one SLG session for this course this semester?

      ○   Yes (proceed to question #3)

      ○   No

2.   If you have not, why? Please indicate the main reason for not attending and proceed to question #5.

      ○   Do not have the time

      ○   Do not need the help

      ○   Location of the sessions

      ○   Scheduling conflicts

      ○   Work better alone

      ○   Other reason

      If you indicated "other reason" please explain:

3.   If you *have* attended, have you found the sessions useful? Please explain your response.

4.   Is there anything you feel could be improved about the SLG sessions?

5.   We welcome any additional comments or any suggestions for future SLG sessions. Please use the back of the page if you require additional space for your response.

SUPPORTED LEARNING GROUPS: End-of-Term Survey

Course Name: _____   Term: _____

This information is for research purposes only, and will in no way influence your grades.

Please fill out only the side of this questionnaire that applies to you.

If you *attended* even one SLG session, please fill out this side:	If you did *not* attend any SLG sessions, please fill out this side:

If you *attended* even one SLG session, please fill out this side:

1. How helpful were the sessions to you?

   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

   not helpful...   to...   very helpful

2. What grade do you expect to make in this course?

   ☐ A ☐ B ☐ C ☐ P ☐ NC

3. How many sessions did you attend?

   ☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ more than 10

4. If you have any comments on the sessions and/or suggestions for improving future sessions we would appreciate having them. Use the back of the page if needed.

   _____
   _____
   _____
   _____
   _____
   _____

5. If you are interested in becoming an SL leader for this or other courses please provide us with the following information:

   Name: _____
   Student #: _____
   Email: _____
   Phone number: _____
   Course(s): _____
   Faculty Reference: _____

If you did *not* attend any SLG sessions, please fill out this side:

1. Please indicate the reason(s) you didn't attend any sessions.

   ☐ I wanted to but couldn't. The session schedule conflicted with work or other classes.

   ☐ I didn't feel it was necessary.

   ☐ I have been to similar kinds of study sessions for other courses and did not find them helpful.

   ☐ I have been to SLG sessions before and did not find them helpful.

   ☐ I intended to, but couldn't find the time.

   ☐ Other. Please explain. Use the back of the page if needed.

   _____
   _____
   _____
   _____

2. What grade do you expect to make in this course?

   ☐ A ☐ B ☐ C ☐ P ☐ NC

3. Did you fill out the time schedule questionnaire for SLG sessions at the beginning of the term?

   ☐ Yes ☐ No ☐ Can't remember

MIRED IN DEBT: GRADUATE SCHOOL DEBT

Liz Mulig, University of Dallas

ABSTRACT

Student school loan debts outstanding in the United States are a staggering sum. The amount is at an all time high. Even more alarming are the huge amounts that graduate students borrow. Graduate school loan totals are disproportionate when compared to the total borrowed by undergraduate students, an amount which is also staggering in its own right. This paper explores the reasons for the disproportion between undergraduate and graduate loan totals, how the huge loan burdens affect the economy and also how they affect where students choose to seek employment. Also addressed is the relationship of loan forgiveness programs and high graduate school borrowing amounts. Those who study loan issues and who set policies on the issues need to realize that there is a disproportionately large portion of the debt being incurred for graduate degrees versus undergraduate, which is where most of the focus has been in the past. They need to study why this might be (for instance issues such as the Public Service Loan Forgiveness Program) and whether they wish to continue policies which might be encouraging excessive borrowing.

INTRODUCTION

The level of undergraduate student loans is staggering. However, graduate student loans are disproportionately even higher than the undergraduate numbers. "Around 40 percent of recent federal loan disbursements are for graduate student debt, suggesting that a large chunk of the ubiquitous '$1 trillion in outstanding federal student debt,' number is, in fact, graduate debt," the New America Foundation reports (Delisle, 2014).

Traditionally, talk about student loans has been about undergraduate loans, with much of the content of those conversations about how undergraduate education has become almost too expensive to afford. A new report, though, shows that the largest increases in student borrowing is at the graduate level (Delisle, 2014).. This report draws attention to the amounts of money being borrowed for graduate school and questions whether loan forgiveness programs are driving the increases in the graduate student loan debt.

BACKGROUND

Graduate students rely much more heavily on loans than undergraduate students, according to the CollegeBoard. In 2009–10, 69 percent of graduate students' costs were financed

with federal loans, and the average student had about $15,888 in federally subsidized loans (Trends in Higher Education Series. Trends in Student Aid, 2012).   Now, however, graduate loans are not subsidized.

The largest of the government's school-financing plans, the Stafford loan program, has allowed most full-time graduate students to borrow up to $20,500 a year at 6.8 percent interest, $8,500 of which would be subsidized. ("Subsidized" means that the government pays the interest while the student is in school and for six months after graduation.) For additional money, students can turn to Plus loans, which are unsubsidized and have an interest rate of 7.9 percent. Repayment of Stafford loans may be deferred for six months after graduation, but the unsubsidized portion accrues interest while the student is in school and repayment of a Plus loan starts after just 60 days (The U.S. Department of Education offers, n.d.).

With the federal government no longer subsidizing graduate Stafford loans, the rules have changed and graduate students will immediately start accumulating interest on all these type debts. "A student who took out just the $8,500 a year in subsidized loans would have repaid $46,953 over the next 10 years…. Unsubsidized loans would add an extra $6,385 in interest payments." (Obama to Grad Students, 2012) Many students, though, incur substantially more loans than $8,500.

There are approximately 21 million students now enrolled in degree granting schools. About 60% of those students borrow each year to help cover the costs of their education (U.S. Department of Education, National Center for Education Statistics, 2012).

Among students who earned graduate degrees in 2007-08:

1. 26% had no education debt at all.
2. 14% had undergraduate debt but no graduate school debt.
3. 7% had borrowed $80,000 or more for graduate school.
4. 5% had borrowed between $60,000 and $79,999 (Student Loan Debt Statistics, 2012; Trends in Higher Education Series. Trends in Student Aid, 2012).

Graduate school loan totals are disproportionate when compared to the total borrowed by undergraduate students. So why are there such large sums for graduate loans in comparison to undergraduate loans? There are numerous factors. For one, graduate school tuition is generally higher than undergraduate tuition. Also, many students' undergraduate tuition and fees are paid by their parents or scholarships and grants. In addition, an item that will contribute to the graduate loan totals being even higher in the future is that the government is no longer subsidizing graduate Stafford Loans.

A new report, The Graduate Student Debt Review, focuses on graduate student loans. The report shows that the largest changes (increases) in student borrowing is at the graduate level (Delisle, 2014). It draws attention to the amounts of money that are being borrowed for graduate school.

The Graduate Student Debt Review (Delisle, 2014) shows that most of the huge loan increase amount from 2004-2012 was from graduate programs. Traditionally, the public has thought of high loan amounts accruing for students in medical school and law school, but debt amounts are also very high now for other graduate programs as well. These programs include MA (Master of Arts), MS (Master of Science), MBA (Master of Business Administration) and others. These represent absolute, real increases in the cost of graduate school.

There have indeed actually been increases in the cost of graduate school. "Since the recession, tuition has risen 11%, to nearly $22,000, on average for private nonprofit graduate programs, about in line with tuition hikes for undergraduate students, according to the National Center for Education Statistics. At public colleges, tuition for grad students rose 25%, to $9,247, outpacing tuition hikes at the undergraduate level" (Andriotis, 2012).

However, the question also arises as to what extent the Public Service Loan Forgiveness (PSLF) Program is driving the increases in graduate school loan debt. This program was put into law in 2007 via the College Cost Reduction and Access Act (United States Cong., 2007). This program seeks to affect where students seek employment by making the lower salaries in public service less a factor in employment decisions by forgiving student loan balances if the students choose to work in public service and qualifying conditions are met. There are many rules and nuances in the rules for the program, but basically if a person works full time in public service employment, makes 120 qualifying payments on their direct loans and stays employed through the time they get loan forgiveness, then the remainder of the loan will be "forgiven." The Program applies to Direct loans, and it should be noted that many other type loans (although not private loans) may be consolidated into a Direct loan. In addition to the loan itself being forgiven if the rules are met, the loan forgiveness amount is not taxable.

Not only are the huge loan amounts a burden on students, "student debt can also negatively impact an individual's ability to take on other consumer debt – and therefore place a drag on the national economy" (Student Loan Debt Statistics, 2012). In 2011, this affect was felt as first-time home buyers, with a median age of 31, fell to the smallest percentage of total home purchasers since 2006" (Profile of Home Buyers and Sellers, 2011).

DISCUSSION

Loan Forgiveness

The idea behind the Public Service Loan Forgiveness program is to draw bright minds into public service who might otherwise be drawn to places paying higher salaries. The thinking is that if they are willing to work in public service for at least the (approximately) 10 yrs needed to meet the requirements, then the fact that their remaining loan balances will be forgiven will make the pay disparity not so great.

The question, and a concern, however, is that if a student can borrow money for graduate school versus paying cash, then have much of that debt forgiven (with 10 years of public service work and regular loan payments), then the Public Service Loan Forgiveness act might actually drive up graduate borrowing. This is a concern for numerous reasons. One of the primary concerns is the event that an individual takes the loans but then does not qualify for forgiveness as planned and doesn't repay the loan. This obviously could be a large cost to the government (ie the taxpayers).

If, however, the student does follow their plan of working in public service and meets all the rules for forgiveness, this Program would be very beneficial to them. It could, as hoped, actually draw some students into public service. It would, though, represent a cost to the government (taxpayers) for the amount of the loan and interest forgiven.

Necessity of Degree

Many jobs require "a degree" in order to obtain or stay in the position. Is it cost effective, though, and is there any reason for the government to offer a loan forgiveness program, if the degrees are not even required for the positions held? For instance, if a position only requires an undergraduate degree, should loan forgiveness be granted on graduate loans for someone who holds that position? A major goal of the PSLF Program is to have fairness in financing education, but again, how fair is it to pay for graduate (or even undergraduate) loans for public servants in positions where the degrees are not even required? Jason Delisle, director of the New America Foundation's Federal Education Budget Project, addressed a closely related issue when he said "An undergraduate degree, we've all sort of decided, is a must for earning a middle-class income. A master of arts? Probably not. These are all people who have an undergraduate degree. They have all made it, in that sense. They are a success. The question then is, 'What is the purpose of the public support of the master's degree?'" (Patel, 2014).

Nicholas Hillman, an assistant professor at the University of Wisconsin at Madison who studies higher-education finance, views it differently. He said … "critique of the PSLF program misses the point: A goal of the program is to encourage Americans to enter public-service jobs. Only looking at the financial costs without looking at the societal benefits is a really myopic way to view education," he said, "and this policy in particular" (Patel, 2014).

Loan Education

There is obviously still a need to educate borrowers on what it means to finance their education with loans. They should also be counseled on taking care that they borrow only what they need, and that they need to look forward as they are borrowing the funds, to the actual repayment amounts and length of time to repay. Many students may plan to go into public service and thus not have to pay the entire loan amount back themselves, but then after

graduation may enter another field. Others may start off in public service but change before 10 years of employment. Still others may fail on one of the other criteria for loan forgiveness. So they need to be educated on particulars of payback amounts and timeframes and the total cost. As one writer says "Ironically, although the debt taken on is for education, there's not enough education about the debt itself taking place" (Rowan, 2014). Perhaps if more education were conducted with the students about the debt they are incurring, the students wouldn't graduate mired in debt.

Those who study loan issues, and who set policies on the issues, need to realize that a disproportionately large portion of the debt being incurred is for graduate schools versus undergraduate, where most of the focus has been in the past. They need to study why this might be (for instance issues such as the PSLF Program) and whether they wish to continue policies which might be encouraging excessive borrowing (Delisle, 2014).

CONCLUSION

Student school loan debts outstanding in the United States are a staggering sum. The amount of such debt is at an all time high. Even more alarming are the huge amounts that graduate students borrow. Graduate school loan totals are disproportionate when compared to the total borrowed by undergraduate students, an amount which is also staggering in its own right. Numerous situations contribute to the high graduate school loan totals. Higher tuition for graduate school than undergraduate is one reason, and another is possibly the Public Service Loan Forgiveness program instituted by the College Cost Reduction Act of 2007. Regardless, these high loan amounts mire the students in debt, affect the economy and affect where students take positions upon graduation. Congress, and all those who set policies, need to consider that they should focus more on graduate school debt levels, why those levels are so high and whether they should continue with any policy that might actually encourage more borrowing by the students.

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OUT OF SIGHT OUT OF MIND: EFFECT OF OSTRICH LEADERSHIP ON AFFECTIVE COMMITMENT AND THE MODERATING ROLE OF TRUST IN SUPERVISOR

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ABSTRACT

Leadership and organizational commitment have been identified by researchers as the core features of high-performance organizations in today's competitive work environment. Employees are considered to be the most valuable assets of organizations. The affective commitment level of employees should be increased in order to valuably utilize this important asset, and leadership style is one of the determinants which can influence the commitment level of the workforce.

Leadership can affect many work related behaviors like, employee's attitude, motivation and performance all of which can affect the levels of organizational commitment. Two main styles of leadership i.e. transformational and transactional, as well as organizational commitment, are important factors and have received a significant worth in studies being carried on in different work settings. However the purpose of this study is to examine the impact of ostrich leadership style on employee affective commitment in Turkey's Top 500 Industrial Enterprises. While examining this impact, the moderating role of trust in supervisor will also be investigated.

INTRODUCTION

Affective leadership is a need of today's challenging world. When leaders interact with followers they apply combination of traits, skills and behaviors that is called leadership style. Leadership styles are commonly based on combination of their beliefs, ideas, norms, and values (Iqbal et.al, 2012). Leadership theories emphasize that in order to achieve desired results of the organization; leaders should create relationships with followers for stimulation of their commitment (Saher et.al, 2013). An ideal leader would be able to build teams and should be able to provide them with cohesion, direction, energy and support for the endorsement of change and organizational learning (Tushman & Nadler, 1986). There are different roles that leaders as well as managers undertake while they are managing their organizations. One of the roles a manager can bear is being a strategist. However some people prefer to act as an ostrich manager rather than a strategist. The term ostrich leader is based on the belief that an ostrich will bury its head in

the sand in order to protect itself, when a threat is confronted (Pryor et al, 2010). Some human beings also have the tendency to avoid situations that are perceived as threatening or risky.

One of the ways to ignore the threats or risks is to adopt a strategy that promotes the *"Out of Sight, Out of Mind Approach"* (Smith and Grosso, 2008). According to this approach ostrich leaders respond to threat by ignoring the threat and pretending that it does not exist. Ostrich leaders selectively accept information and/or situations. They tend to support the status quo by seeking self- preservation that might be a result of conflict, change or bad news etc. Ostrich leaders mostly let non-productive circumstances continue because of the difficulty and discomfort in correcting the situation (Pryor et. al, 2010). The focus of this study is on ostrich leadership. It is also important to emphasize that in organizations change and endings go hand in hand because change causes transition and transition starts with an ending. If things change within an organization some of the managers and employees are going to have to let go of something that results in the problem that people don't like endings (Bridges, 2009). In a rapidly changing environment, building organizational commitment involve engaging employees' emotional energy and attention (Ulrich, 1998, 15). Organizational commitment may represent a related but more evaluative linkage between the manager and the organization that includes job satisfaction and trust in supervisors among its specific components. Such commitment can generally be characterized by a strong belief in and acceptance of the organization's goals and values; a willingness to exert considerable effort on behalf of the organization; and a definite desire to maintain organizational membership (Mowday et.al 1974; Awamleh N.1996). Due to its importance organizational commitment has been variably and extensively defined, measured, and researched.

Organizational commitment has been viewed as an important antecedent to employee retention (Law, 2005). Organizational commitment has been operationalized into three components: affective, continuance, and normative. Affective commitment is defined as an emotional attachment to an organization characterized by the acceptance of the organization's values and by a willingness to remain with the organization (Meyer and Allen, 1991). In this study we mainly focus on the affective commitment rather than the others, because leadership behavior has an important impact on the employees' emotional attachment to their organization. Therefore the aim of this study is to investigate the affective commitment of employees who are managed by ostrich leaders and the moderating role of trust in supervisor in this relationship.

THEORETICAL BACKGROUND

Ostrich Leaders and Affective Committment

In order to better understand how ostrich leaders behave, first it is necessary to define what a strategist is. Strategist leaders are defined as people located in different parts of the organization using the strategic management process to help the organization reach its vision and

mission (Hitt, et.al, 2008). It will be a more productive approach to focus on how a leader thinks, because strategists think differently. Strategists are integrative thinkers who willingly confront messy problems and complex situations. These integrative thinkers are simply putting to work the human capability to simultaneously hold opposing views in constructive tension and contemplate them in such a way that they are able to "think their way" toward superior ideas (Martin, 2007). According to the differentiation between management and leadership, management is about coping with complexity and leadership is about coping with change or perhaps initiating change as they invent the future. Due to this approach strategic managers can be addressed as strategic leaders (Kotter, 1990). Ostrich leaders usually hide from the present and fail to consider the future, however strategists seem to be passionate about understanding the present and using it as the foundation for inventing the future. Ostrich leadership can be explained by selective attention in which individuals receive preliminary but incomplete information and the decide whether to acquire and attend to definitive information. The intuition is that individuals regulate the impact of good or bad news on their utility by how intently they attend to the news. Therefore ostrich effect means avoiding apparently risky situation by pretending they do not exist (Karlsson et.al, 2009). Ostrich leaders have the tendency to deny information that does not fit within their paradigms or assumptions. Ostrich leaders tend to have difficulty in acknowledging the existence of threats; their actions tend to be supportive of the status quo. Ostrich leaders are not focused on improving operations and relationships. They allow non-productive circumstances to continue because of the difficulty and discomfort in correcting the situation. As a result they consistently work with the wrong information or assumptions and make no effort to correct them or seek better data. Most of the time they are not aware of the common situations that their employees, suppliers and customers face regularly. Ostrich leaders try to avoid conflict, change and bad news; therefore they seek self - preservation. This is the reason why they avoid information or situations that are real and true, but uncomfortable. Ostrich leaders can choose to become strategists. Knowledge has no use, if it is not applied; and awareness is detrimental, unless it is accurate. It is still possible to change behavior such as ignoring information or pretending that it does not exist. However, before ostrich leaders change their behavior, they must change their fundamental assumptions because assumptions are the drivers of behavior. The fundamental assumption of ostrich leaders is that self-preservation is more important than company preservation; short term results are valid predictors of long term results; protecting people from the truth helps them more than revealing to them the truth; and problems will go away or resolve themselves if ignored. In contrast, the fundamental assumptions of strategists are that self-preservation is accomplished through company preservation; short term results are not a valid indicator of long term results; people need to know the truth so that they can act accordingly; and problems will only get worse if ignored (Pryor et.al, 2010). All these characteristics of ostrich leaders create a work atmosphere with poor morale and little enthusiasm in the organization.

Employees' emotional bond to their organization has been considered as an important determinant of dedication and loyalty. Affectively committed employees have a sense of belonging and identification that increases their involvement in organizations activities and their desire to remain with the organization (Rhoades et.al. 2001) Affective commitment is concerned with the extent to which the individual identifies with the organization. Affective attachment to the organization is influenced by the extent to which the individuals' needs and expectations about the organization are matched by their actual experiences (McDonald, Makin, 2000). Studies have found association between affective commitment and absenteeism, performance and turnover. Work experiences such as organizational rewards, procedural justice and supervisor support have demonstrated strong association with affective commitment (Mathieu, Zajac, 1990; Allen, Meyer, 1997; Mowday et al, 1982). There are also some other studies that investigate the job tenure and commitment relations. Organizational commitment and tenure relations can develop only after the employee has spent some years in the organization and, hence, develops investments, evaluates them, and decides, based on the exchange relation, whether or not to commit himself or herself to the organization (Cohen 1993). Much of the theoretical and empirical research devoted to affective organizational commitment has been based on the assumption that this form of commitment develops with tenure, displaying a rapid decrease after entry, followed later by a steady increase. (Beck, Wilson, 2000). Gender is also among the numerous factors that has impact on affective commitment. According to research results women have higher affective commitment than do men (Mathieu, Zajac, 1990; Mohamed et.al, 2006).

The degree to which employees show their emotional intimacy with organization is largely influenced by leadership style. Ostrich leaders ignore or selectively accept information and/or situations because of fear of change and uncertainty, the discomfort of learning and personal growth, the discomfort of unpleasant information, protection of one's ego or position in a company, and the comfort of the current familiar situation, that will lead to less enthusiasm and poor morale at the work atmosphere. Consequently these characteristics of ostrich leaders can have a negative impact on the commitment of the employees in an organization.

Trust In Supervisor

Trust is viewed as an important concept by academic researchers and by business practitioners. There are numerous studies indicating the critical importance of building trusting relationships in management (Hosmer, 1995). Leading means fostering changes in followers through the building of trust and credibility. In turn, trust enables and builds enduring commitment in the pursuit of the future goal (Kanunga et al. 1994). Trust is most often associated with situations involving personal conflict, outcome uncertainty and problem solving. It represents the level of confidence that one individual has in another to act in fair, ethical and predictable manner. Followers in a trusting relationship reciprocate in the form of enhanced job

attitudes, performance and organizational citizenship behaviors (Nyhan & Marlowe et.al., 1997). Organizational trust helps facilitate empowerment, collaboration and commitment. For higher levels of trust to exist three factors are essential: results, integrity and concern for others. Results include fulfilling obligations and commitments and being competent. Integrity refers to honesty in one's word and consistency in ones actions and concern for others promotes interpersonal trust. Developing higher levels of organizational trust offers new opportunities for less hierarchy, improved teamwork, better use of technological developments, and tolerance in the workplace. High trust environments stimulate high performance. It is important to emphasize that trust is a prerequisite to leadership effectiveness. Implementation of management by trust in an organization will lead to more effective performance. Increased performance will lead to an increase in the effectiveness of the leader (Shaw 1997).

Given the relationship of trust to organizational performance, leader effectiveness, and job satisfaction, and the relationship of these correlates to organizational commitment, it would stand to reason that trust would have a significant influence on organizational commitment. Followers who perceived their leaders to be more supportive and effective have higher levels of trust and higher levels of performance (Podsakoff et.al.,1996). Additionally, it has been found out that in a social exchange process trust in leaders is positively connected with organization citizenship behavior (Konovsky, Pugh,1994).

HYPOTHESES

In accordance with these findings, researchers would like to propose the following hypothesis.

> H1   *Ostrich leadership has a negative effect on affective commitment.*
> H2   *Trust in supervisor has a positive effect on affective commitment.*
> H₃   *Trust in supervisor moderates the relationship between ostrich leadership and affective commitment..*

RESEARCH METHOD

Proposed Model

The hypothesized model is shown in Figure 1.

Sampling Design

This study was carried out in Turkey's Top 500 Industrial Enterprises' ISO500 announced by Istanbul Chamber of Industry (ISO).

Total 1000 questionnaires were distributed 120 companies which accepted to answer the questionnaire (5 – 15 to each of them). Only 315 (52.5 %) questionnaires were returned. After deleting the semi-filled ones 292 (48.7 %) questionnaires were analyzed using SPSS statistical program.

The sample consists of 179 female (61.3 %) and 113 male (38.7 %) employees with a mean age of 31.72 (Standard Deviation: 5.57) and with an average tenure of 7.19 years (Standard Deviation: 5.37) in the current position or sector. The sample included both managers and non-managers.

Figure 1. Research Model

MEASURES

Ostrich Leadership

Ostrich leadership is measured by using the questionnaire Ostrich Manager Quick Test developed by Pryor et.al (2010). This questionnaire is developed for managers who wish to assess themselves and determine the extent to which they are ostrich managers or strategists. Participants are asked to rate each of the 11 items using a 5-point Likert scale so that they can select a numerical score ranging from 1 to 5 for each statement, where 1, 2, 3, 4, and 5 denote "Always", "Usually", "Sometimes", "Rarely", and "Never", respectively.

Affective Commitment

Affective commitment is measured by the organizational commitment questionnaire developed by Allen and Meyer (1991). Organizational commitment questionnaire consists of 18 items for 3 commitment types such as, normative, affective and continuance commitment. For

measuring the affective commitment of employees 6 items were used and rated by a 5-point Likert scale.

Trust In Supervisor

Trust in supervisor is measured by the short version of questionnaire Perceived Organizational Support that was developed by Eisenberger et.al (1986). The short version of this questionnaire includes 8 items for measuring the trust in supervisor. Participants are asked to rate each of the 8 items using a 5-point Likert scale.

Control Variables

Job tenure which is measured by the number of years an employee has worked for his/her company, is controlled due to its positive effects on affective commitment in many studies. The findings of our study have also shown that job tenure may impact affective commitment (Morrison et. al, 2010).

Mowday, Steers and Porter (1979) found that there was a coherent relationship between organizational commitment and gender. They added that females have higher level of commitment than males, because they tried to do a lot for their job status. The findings or our study has also proved that gender can impact affective commitment and women are more affectively committed than men.

Findings

As can be seen from the Cronbachs' Alpha values reported in Table.1, variables of our study are found to be reliable. Bivariate correlations between the variables involved in this research are reported in Table.1, ostrich leadership has a significant negative correlation with affective commitment ($r = -0.225$, $p < 0.001$), while trust in supervisor has a significant positive correlation ($r = 0.354$, $p < 0.001$).

Table 1
Means, Standard Deviations, Alpha Coefficients, and Correlations among Study Variables

Variables	*M*	*SD*	1	2	3
Ostrich Leadership	2.88	.83	(.89)		
Trust in Supervisor	4.13	.96	.062	(.96)	
Affective Commitment	2.96	1.12	-.225***	.354***	(.92)

Note: Values on the diagonal represent alpha coefficients.
* p <0.05, ** p <0.01, *** p <0.001 (two-tailed tests); N=292

In order to test the first two hypothesizes the hierarchical regression analysis is conducted. The control variable job tenure was added in Model 1. As shown in Table.2 two variables regressed affective commitment linearly. Ostrich leadership has low, negative significant effect on affective commitment and trust in supervisor has moderate positive effect supporting the Hypothesis 1 and 2.

The interaction term was created by multiplying the two main effects and added in Model 2 to test the moderating effect (Hypothesis 3) (Aiken and West, 1991). The results of Model 2 show a significant change in R-squared ($\Delta R = 0.009$, $\Delta F = 7.24$, $p < 0.05$). The moderating effect of trust in supervisor on the relationship between ostrich leadership and affective commitment ($\beta=-0.321$, $p<0.05$) is significant. Hypothesis 3 is supported.

<table>
<tr><td colspan="3" align="center">Table 2
Hierarchical Regression Results</td></tr>
<tr><td>Variables</td><td colspan="2" align="center">Affective Commitment</td></tr>
<tr><td></td><td align="center">Model 1</td><td align="center">Model 2</td></tr>
<tr><td></td><td align="center">β</td><td align="center">β</td></tr>
<tr><td>Control variable</td><td></td><td></td></tr>
<tr><td>Gender</td><td>-.159**</td><td>-0.158***</td></tr>
<tr><td>Job tenure</td><td>.149**</td><td>0.143***</td></tr>
<tr><td>Main effect variables</td><td></td><td></td></tr>
<tr><td>Ostrich Leadership (OL)</td><td>-0.225***</td><td>0.120</td></tr>
<tr><td>Trust in Supervisor (TiS)</td><td>0.406***</td><td>0.600***</td></tr>
<tr><td>Interaction variables</td><td></td><td></td></tr>
<tr><td>OL*TiS</td><td></td><td>-0.321***</td></tr>
<tr><td>R^2</td><td>0.229</td><td>0.238</td></tr>
<tr><td>ΔR^2</td><td>0.229***</td><td>0.009*</td></tr>
</table>

Notes: *p<0.05, ** p <0.01, *** p <0.001

The moderating effect of trust in supervisor on the relationship between ostrich leadership and affective commitment is depicted in Figure.2. As can be seen from the figure the ostrich leadership decreases employees affective commitment levels whether their trust in supervisor high or low. However employees with higher trust in their supervisor show higher affective commitment levels.

Figure 2. Moderating Effect of Trust in Supervisor on Ostrich Leadership – Affective Commitment Relation
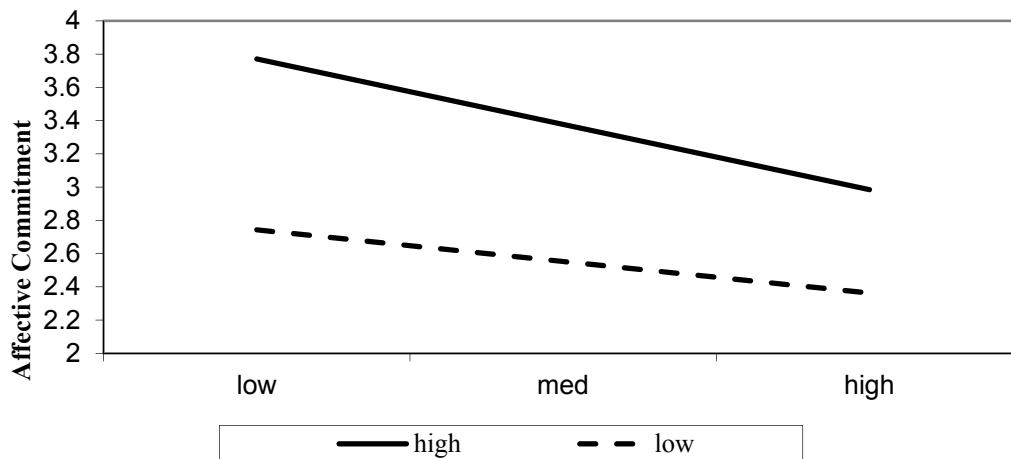
CONCLUSION

This work contributes to researches in leadership styles, organizational commitment and trust in supervisors. In this research we particularly aimed to better understand the features and the roles of ostrich leaders in promoting affective commitment within organization, and how the characteristics of ostrich leaders impact employees' affective commitment. Our study showed us that ostrich leadership plays a negative role on affective commitment of employees. The results of this study provide support to existing literature that leadership styles impact the affective commitment level of employees negatively. In today's business environment ostrich leadership is a less successful approach as it promotes the protection of the status quo, because changes are perceived as threats and sources of discomfort by ostrich leaders. Moreover, becoming an ostrich leader can not offer the potential for more long term safety, security, satisfaction and commitment in an organization. After understanding the features of ostrich leadership, leaders should evaluate the extent to which they are ostrich leaders and decide the extent to which they wish to be strategists. In this way trust in supervisors, which plays a moderating role on the relationship between ostrich leadership and affective commitment can also be promoted. Therefore, this study can provide some important implications for strategic and leadership management. Additionally it has been once more proved in this study that gender as a non-work related issue has an impact on affective commitment. It has been found out that women are more affectively committed than men in organizations. Besides, job tenure has been proved to have

positive effects on affective commitment. The limitation of this study is that the findings of this research are only generalizable to similar populations throughout Turkey i.e. the employees of industrial enterprises operating in Turkey. In order to generalize these findings to different population similar research would need to be replicated in different organizational and industrial settings.

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TEXAS GROUNDWATER RIGHTS BASED ON A REVIEW OF RESEACH STUDIES AND ARTICLES ON GROUNDWATER IN TEXAS

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ABSTRACT

"The UN suggests that each person needs 5-13 gallons of water a day to ensure their basic needs for drinking, cooking and cleaning" (Source: World Water Assessment Programme (WWAP)). According to water.org, 783 million people in the world still lack access to water. People in the United States never doubt the absence of water flow from their kitchen faucet when turned on. Recent studies on climate change behavior predict that cities such as New York, Los Angeles, Washington, D.C., and San Diego are to be the first to face water scarcity issues in the near future (Bloomsberg). When water sources become scarce, food shortages are soon to follow. Agricultural states known to be our "breadbasket" (specifically Nebraska, Illinois, and Minnesota) also made the list of areas soon to face water scarcity. As the demand for water continues to rise, the supply depletes at an increasingly alarming rate.

An article written mid August of this year stated that thirty Texas communities are in danger of running out of water before the end of the year. Barnhart, a West Texas community near San Angelo, has already run dry. Ranchers are being forced to drop herds of cattle, farmers are losing crops, and residents are living on strict water rations. San Antonio, the third-fastest-growing large city in the U.S., and Austin, the eighth-fastest-growing metropolitan area, are also in critical danger of running dry as the Edward-Trinity aquifer systems drops in volume daily. The Edwards Aquifer is the primary source of water for San Antonio and supplies the Comal and San Marcos springs that provide habitat for eight threatened or endangered species (Grubb 1997). As of June 19, 2013, the Edwards Aquifer was 1.5 feet away from a Stage 1 drought alert. With the Edwards reservoir level dropping a foot a day, the Edwards Aquifer Authority (EAA) issued a public plea for voluntary conservation.

Over the years various court cases and legislation have changed the way Texas landowners have been able to exercise their rights to groundwater. This article discusses the definition of the rule of capture, how it has changed since established through various court cases, the purpose of groundwater conservation districts, and how groundwater conservation districts limit the rule of capture. According to the Texas Water Code, sec. 35.002(5), groundwater is defined as, "water percolating below the surface of the earth." Underwater streams and underflow of surface streams are considered surface water, while aquifers and

underwater lakes are classified as groundwater. As of 1999, eighty percent of water drawn from aquifers was used for agricultural purposes, and thirty-six percent was used for municipal purposes. The Texas Water Development Board estimates that groundwater comprises one-half of the state's available water supply.

RULE OF CAPTURE

The rule of capture has long been established. The idea was adopted from English common law stating that the first person to "capture" the resource gets to keep the resource. Groundwater was thought to be free like a wild animal, and it was not until that animal had been harvested by someone that it actually belonged to any one person. Landowners were allowed to harvest as much groundwater as they pleased, even if it caused neighboring landowner wells to diminish flows or even go dry. In New York, the Court of Appeals stated in the *Pixley v. Clark* decision:

> "An owner of soil may divert percolating water, consume or cut it off, with impunity. It is the same as land, and cannot be distinguished in law from land. So the owner of land is the absolute owner of the soil and of percolating water, which is part of, and not different from, the soil. No action lies against the owner for interfering with or destroying percolating or circulating water under the earth's surface." *Clark*, 35 N. Y. 520 (1866).

When the rule of capture was officially established in 1904 by the Texas Supreme Court, groundwater was specified as a privately owned resource while surface water was stated to be owned by the state. This decision was last reaffirmed in 1999. The idea of the rule of capture is contrary to the "reasonable use" or "American rule" which concludes that landowners are limited to "the amount necessary for the reasonable use of his land, and that the rights of adjoining landowners are correlative and limited to reasonable use." *Friendswood Development Co. v. Smith-Southwest Industries*, 576 S.W.2d 21,25 (1978). The majority of the United States is now under the "American rule", but Texas has remained firm, through much criticism, in legally upholding the rule of capture.

In the 1904 *Houston & T.C. Railway v. East* case which established the rule of capture, East sued the Railroad for digging a well into the same aquifer as his, and drying up his well. After reviewing a similar case in England and the rules regarding surface water the court stated:

> "That the person who owns the surface may dig therein and apply all that is there found to his own purposes, at his free will and pleasure; and that if, in the exercise of such right, he intercepts or drains off the water collected from the underground spring in his neighbor's well, this inconvenience to his neighbor falls within the description of

damnum absque injuria*, which cannot become the ground of an action" (2). (* Latin for loss without injury). *East*, 81 S.W. 279 at 1235.

As a result, the Railroad's conduct was not actionable.

The rule of capture was adopted in Texas for two reasons summarized in the 1861 *Frazier v. Brown,* Ohio Supreme Court case:

> "1) Because the existence, origin, movement, and course of such waters, and the causes which govern and direct their movements, are so secret, occult, and concealed that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty, and would, therefore, be practically impossible. *East*, 81 S.W. 279 at 281.
> 2) Because any such recognition of correlative rights would interfere, to the material detriment of the commonwealth, with drainage and agriculture, mining, and construction of highways and railroads, with sanitary regulations, building, and the general progress of improvement in works of embellishment and utility." *East*, 81 S.W. 279 at 281.

The court concluded once again that a landowner could harvest as much groundwater as he/she desired as long as it was put to beneficial use, without waste.

The rule was first modified in 1917 after a severe drought. Article 16, section 59, parts (a) – (c) Conservation Amendment was added to the Texas Constitution stating that conservation and development, including the "control, storing, preservation and distribution of all natural resources were public rights and duties;" therefore the Legislature had the right to pass any laws dealing with such topics. This amendment also allowed the creation of conservation and reclamation districts in order to help accomplish the amendment's purposes. These districts would have political and corporate powers of the government, along with authority to enforce regulations. This includes the regulation of groundwater, while retaining the rule of capture.

Since *East*, two court cases have considered the rule of capture in relation to groundwater and have led to modifications of the rule. In *City of Corpus Christi v. City of Pleasanton*, 276 S.W. 2d 798 (Tex. 1955), the court added that a landowner could not "maliciously remove groundwater to injure a neighbor." In this case the City of Pleasanton sued the Lower Nueces River Supply Company and the City of Corpus Christi for waste of artesian water. Waste means:

> (A) withdrawal of underground water from the aquifer at a rate and in an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or stock raising purposes;
> (B) the flowing of producing of wells from aquifer if the water produced is not used for a beneficial purpose;

(C) escape of underground water from the aquifer to any other reservoir that does not contain underground water;

(D) pollution or harmful alteration of underground water in the aquifer by salt water or other deleterious matter admitted from another stratum or from the surface of the ground;

(E) willfully or negligently causing, suffering, or permitting underground water from the aquifer to escape into any river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by commission under Chapter 26, Water Code;

(F) underground water pumped from the aquifer for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge; or

(G) for water produced from and artesian well, "waste" has the meaning assigned by Section 11.205, Water Code." EAAA § 1.03(21).

The Lower Nueces River Supply Company was transporting 10 million gallons of water per day 118 miles down the Nueces River to Corpus Christi's reservoirs. Evidence showed that sixty-three to seventy-four percent of the water pumped into the river was lost in evaporation, transpiration, and seepage before it reached its destination. After referring to a 1925 statute defining waste in relation to artesian wells (stating artesian water must be put to lawful use), the Court found that the transportation of the water was not unlawful, nor was Corpus Christi's use of the water, therefore ruling in favor of Corpus Christi. Although the Legislature had the option of making transportation with excess loss illegal, they decided against it. In a dissent, Justice Will Wilson made a statement as to the relevance of the rule of capture with changing times. He acknowledged that what was "secret [and] occult" to the Court in 1904 was no longer the case. *Id* at 805-806 (Wilson, J., dissenting).

Due to explosive growth of unregulated groundwater withdrawals, in 1975 the Harris-Galveston Coastal Subsidence District was created to regulate and address problems caused by subsidence in the area. The need for regulation conflicted with the unlimited right to capture and use groundwater. In *Beckendorff v. Harris-Galveston Coastal Subsidence Dist.*, a number of rice farmers sought to have the district found unconstitutional. Both the trial court and Court of Appeals found the district constitutional. This case was the first legislative address toward the regulation of groundwater pumping. This case and the *Friendswood Development Co. v. Smith Southwest Industries, Inc.*, 576 S.W.2d 21 (1978) heavily influence the modification of the rule of capture. In *Smith-Southwest Industries*, landowners filed a suit claiming excessive groundwater pumping had led to subsidence in their area. Evidence showed that the land had subsided 2.12 feet from 1964 to 1973. The Court recognized a new cause of action, one apart from common-law:

"Therefore, if a landowner's manner of withdrawing ground water from his land is negligent, willfully wasteful, or for the purpose of malicious injury, and such conduct is a proximate cause of subsidence of the land of others, he will be liable for the consequences of his conduct. The addition of negligence as a ground of recovery shall apply only to future subsidence proximately caused by future withdrawals of ground water from wells which are either produced or drilled in a negligent manner after the date this opinion becomes final." *Id*. at 30.

This ruling was not used retrospectively, and the Court found at that time landowners were not responsible for causing subsidence in neighboring properties. The case was necessitated by East, without overruling it. In his dissention, Justice Pope stated that the Court's decision was based on "the mistaken belief that the case is governed by ownership of ground water." *Id*. at 31 (Pop, J., dissenting). He believed the landowners should be held responsible for causing subsidence, but to avoid political tension and overruling *East*, the Court chose not to alter rule of capture as it had been practiced, but did make subsidence and actionable compliant prospectively, thus altering the rule of capture.

A study published by the Texas House of Representatives (TWDB 2002) projected that the population in Texas will reach 40 million (double that of the population in 2000) people and groundwater sources will be at least 19% depleted (8.8 million acre-feet in 2000 to 7.2 million acre-feet) by 2050. Because of the expected rise in population, and the fact that half of the water supply in Texas is underground, legislatures felt it necessary to further regulate water usage. In 1997, Senate Bill (SB) 1, by Brown, was put into effect. The rule does not claim to replace or modify the rule of capture, but proves to be another way to manage policy issues related to groundwater while maintaining the rule of capture. The enactment of SB 1established groundwater conservation districts as the state's preferred method of managing groundwater resources. The established districts regulate pumping from wells through district-level rules and procedures. This bill has received praise and criticism. Supporters of SB1 claim that the rule of capture is upheld and property rights protected while allowing groundwater to be effectively managed at the local level. Opponents of water policy based on the rule of capture claim the rule to be outdated and obsolete. The rule was primarily established (as referred to earlier) because there was no way to monitor movements, or know about this "secret occult." There was also fear of interfering with the expanding railroads and other economic developments which had a great need for water. However, with modern technology and high demands on limited water supplies, the rule of capture, as argued, should be done away with.

The SB 2 was established in 2001 (also by Brown) as a partial response to the ruling in the 1999 *Sipriano v. Great Springs Water of America, et. al*., 1 S.W.3d 75. In *Sipriano*, the Supreme Court was asked to repeal the rule of capture. In a case similar to the *Houston v. East*, Henderson County landowners were suing Ozarka Spring Water Co. for their, "alleged nuisance, negligence, gross negligence, and malice", causing the depletion of their water wells. The

company was pumping 90,000 gallons of water per day for bottling purposes. The Texas Supreme Court ruled in favor of Great Springs Water of America, referring to the rule of capture. Sipriano then argued the rule of capture should be done away with. The Supreme Court acknowledged that Texas voters had made groundwater regulation a duty of the Legislature. However, since Senate Bill 1 had come out recently allowing residents to participate in democratic solution to their groundwater issues by district, the Court found it improper to intercede by changing common-law framework which Legislature attempted to craft. *Id*. at 80. Justice Nathan Hecht did remark, "Not much groundwater management is going on." *Id*. at 81 (Hecht, J., concurring). He also remarked, "It is revolting to have no better reason for rule of law than that so it was laid down in the time of Henry IV. It is still more revolting if the grounds upon which it was laid down have vanished long since, and the rule simply persists from blind imitation of the past." *Id*. at 82. Justice Hecht concluded by deferring the issue to the Legislature for now:

> "Nevertheless, I am persuaded for the time being that the extensive statutory changes in 1997, together with the increasing demands on the State's water supply, may result before long in a fair, effective and comprehensive regulation of water use that will make the rule of capture obsolete. I agree with the Court that it would be inappropriate to disrupt the processes created and encouraged by the 1997 legislation before they have had a chance to work. I concur in the view that, for now – but I think only for now – *East* should not be overruled." *Id*. at 83.

The ruling of the Court effectively recognized the legitimate authority held by the already established groundwater conservation districts while claiming to leave the rule of capture intact. Justices pointed to amendments to the Texas Water Code contained in SB1 and to the fact that Texas voters had made groundwater regulation a "duty of the legislature". By law, groundwater conservation districts can manage withdrawals and regulate water transferred outside the district. Senate Bill 2 (created by sixteen regional water planning authorities) created a statewide water plan for conservation and specified rules dealing with groundwater such as marketing regulations. The current conservation plan allows for an increase from 16.9 million acre-feet to 20 million acre-feet (15% increase) of overall water consumption by 2050.

Since the enactment of SB 1 and SB 2, there has been controversy as to who has the ownership right of groundwater. If conservation districts are allowed to regulate water usage, yet landowners are told they can pump out as much as they can put to beneficial use without waste or malice, who really owns the right to groundwater? Since established in 1904 with *East*, the courts have described the rule of capture as a real property right incident to ownership, but have never clearly determined when or if the right is vested. Russell Johnson summed up three situations where landowners were told they had the rights to their groundwater: In *East*, "An owner of soil may divert percolating water, consume or cut it off, with impunity. It is the same as

land, and cannot be distinguished in law from land. So the owner of land is the absolute owner of the soil and of percolating water, which is part of, and not different from, the soil." *Houston & TC. Ry. Co. v. East*, 81 S.W. 279,281 (Tex 1904). In *Pecos County Water Control & Improvement District No. 1 v. Williams*, 271 S.W.2d 503, 505 (Tex. Civ. App. –El Paso 11954, writ ref'd n.r.e.), the court stated, "It seems clear to us that percolating or diffused and percolating waters belong to the landowner, and may be used by him at his will…These cases seem to hold that the landowner owns the percolating water under his land and that he can make a non-wasteful use thereof, and such is based on a concept of property ownership." And finally in the *Friendswood Development Co. v. Smith-Southwest Industries, Inc.*, 576 S.W.2d 21, 29 (Tex. 1978), the court noted the rule of capture to be "an established rule of property law in this State, under which many citizens own land and water rights."

Despite the clear readings, the courts have avoided the interpretation of this absolute ownership rule until recently. In *Sipriano*, the Court was able to avoid the topic by stating it would be improper to insert itself into the regulatory mix, and that it would leave it for the time being up to the legislature and conservation districts. In *Barshop v. Medina County Underground Water Conservation District*, 925 S.W.2d 618 (Tex. 1996), the issue was argued to be directly relevant. In *Barshop*, landowners filed suit against the Edwards Aquifer Authority Act, claiming that regulation of groundwater was against Texas constitutional rights under the freedom of the rule of capture. The plaintiff argued that the legislation took away vested property rights. "The state countered that the rule of capture, while an ownership right, was not vested until the water was actually reduced to possession and no taking occurs by virtue of regulation of use." *Barshop*, 925 S.W.2d at 625. The court ruled that the case was "not unconstitutional on its face," and that no matter how the rule was applied, it would result in some "unconstitutional taking."

In 2008 Clayton Sam Colt Hamilton filed suit against the City of Del Rio. After Hamilton sold just the land to the City of Del Rio, but reserved the water rights, Del Rio drilled a well and started producing groundwater. The City claimed under the rule of capture, the water was anyone's until captured, therefore they had the right to drill as they so desired. However, the Court ruled in favor of Hamilton stating that "percolating water is part of and not different from the soil, that the land owner is the absolute owner of it, and that it is subject to barter like any other species of property." *City of Del Rio v. Clayton Sam Colt Hamilton Trust*, 269 S.W.3d 617 (Tex. App. – San Antonio 2008, pet. filed). Furthermore the court distinguished the rule of capture as a tort rule denying a landowner any judicial remedy, developed as a doctrine of nonliability for damage, not a rule of property. 269 S.W.3d at 617-18. "Under absolute ownership theory, the Trust was entitled to sever the groundwater from the surface estate by reservation when it conveyed the surface estate to the City of Del Rio." 269 S.W.3d at 617. This was one of the first cases ruling that groundwater was a part of real property ownership.

The second and most recent case where real property ownership was seen is in *Edwards Aquifer Authority v. Day*, 274 S.W.3d (Tex. App. – San Antonio 2008, pet. filed). Until the conclusion of the case, the ownership of groundwater "*in place*" had not been established. As far

back as the decision in the *Houston & T.C. Railway v. East* case, the court did not consider the issue of ownership of groundwater *in place*; instead the Railroad was given ownership of the water pumped from its well *at the surface*. Day and McDaniel claimed that the Edwards Aquifer Authority's decision to deny them permit application constituted as a taking under the Texas Constitution art. I, § 17. Although the EAA argued Day "did not have a constitutionally protected vested interest in the groundwater" *Day*, 274 S.W.3d at 756, the court held a landowner's "vested right in the groundwater beneath their property is entitled to constitutional protection." *Day*, 274 S.W.3d at 756. Since this was considered a constitutional taking, landowners who are restricted in the use of their water must be compensated for any water taken or diverted from them. The *Day* case ruling effectively gives landowners ownership of percolating groundwater in much the same way they own minerals "in place" under their land.

GROUNDWATER CONSERVATION DISTRICTS

Texas currently has ninety-one functional groundwater conservation districts, with four awaiting confirmation. "Groundwater conservation districts are to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater and groundwater reservoirs or their subdivisions and are to control subsidence." Tex. Water code § 36.0015. In 1917 voters added a Conservation Amendment to the Texas Constitution stating recognizing, preserving, and conserving natural resources were public rights. It was not until 1949 however that Texas legislature authorized districts to do so. High Plains Underground Water Conservation District No. 1 was established in 1951 as the first groundwater conservation district. The enactment of SB 1 in 1997 established groundwater districts as the state's preferred method for managing groundwater resources. SB 2 established in 2001, sets up an actual water conservation plan for the state, allowing for only a 3.1 million acre-feet increase in overall water consumption by 2050.

The Texas Water Code, chapter 36, subchapter B: allows for the creation of a groundwater conservation district, subchapter C: the means of governance, and subchapter D: their powers and duties. There are three ways a groundwater conservation district can be created, through actions of legislature, by petitions of landowners, and by the Texas Commission on Environmental Quality (TCEQ). In addition, landowners in an area can petition to be annexed into an existing groundwater conservation district. Tex. Water Code §§ 36.321 – .331. The majority of groundwater conservation districts are created as a result of legislature and are known as special-law districts. These districts all have powers of the chapter 36 Water code, as well as any additional outlines of power given by the legislature. Since there are special-law districts, many districts have different powers. "In recent years, many legislatively created districts have excluded the exercise of eminent domain and assessment of ad valorem taxes from the districts' powers." In order for a petition to be made a groundwater district, it must be approved and filed with TCEQ. Any new district must submit a ten year groundwater

management plan to the Texas Water Development Board (TWDB). This plan must include management and conservation goals and district procedures. TCEQ then evaluates whether the district can be adequately funded to sustain its duties. Typically TCEQ independently creates groundwater districts only when the deadline of two years has passed for a planned, but failed, groundwater district. Tex. Water Code § 36.0151.

Groundwater districts typically are governed by a board of directors. Five to eleven executives are elected by district voters for staggering four year terms. Districts are financed by user fees, the sale of bonds, and local property taxes. Although most conservation districts generally follow the framework of the chapter 36 Texas Water Code, many have different regulations; this proves beneficial, but also poses a problem. Since each Water district can be unique within the following of this chapter, it helps districts effectively meet the particular needs of their residents. Different water districts have varying climates, water volume, geologic limitations, and city ordinances. While some regions need to have differing regulations, many Texas residences are upset with the unequal standards. It does not seem fair that some agricultural and commercial wells are required to be monitored and charged for the amount of water withdrawn, while others go unsupervised. Or that the rule of capture can be limited through permitting maximum production amounts and well-spacing requirements for some and not for others. Exemptions include wells supplying water for rigs permitted by the Railroad Commission of Texas drilling/exploring for oil and gas or necessary for mining activities. "Wells used solely for domestic use of for providing water for livestock are [also] exempt from all permit requirements if they are incapable of producing more than 25,000 gallons per day, are not located in a subdivision requiring platting, and the property is at least 10 acres."

CONCLUSION

Groundwater is defined as "water percolating below the surface of the earth." Tex. Water Code § 36.002 (5). The rule of capture came from English common law, and was officially adopted in Texas in 1904 during the *Houston & T.C. Railway v. East* Texas Supreme Court case. Although the rule of capture has long since been established, and been recognized repeatedly in various court case rulings, the rule appears to have changed with the creation of groundwater districts. The rule originally stated that a landowner had the right to dig for his purposes on his land and take as he so desired. If he happened to inconvenience his neighbor, the landowner could not be held liable to the injury. The rule was adopted for two reasons summarized in the 1861 *Frazier v. Brown*, Ohio Supreme Court case. The first reason was because it was impossible at the time to monitor and regulate the flowing of groundwater. Secondly, the Texas Supreme Court feared discouraging the growth of railroads and other industrial improvements in need of large amounts of water. If water was regulated, expansion would be proved more difficult.

The rule of capture's first modification took place in 1917 when voters adopted the Conservation Amendment to the Texas Constitution. This amendment made it Legislature's duty to conserve, develop, control, store, preserve, and distribute all natural resources, while "retaining" the rule of capture. The amendment also allowed for the creation of conservation and reclamation districts to help accomplish said duties. The next modification of the rule of capture took place in 1955. In *City of Corpus Christi v. City of Pleasanton*, the court added that a landowner could not "maliciously remove groundwater to injure a neighbor." In Justice Wilson's dissent of the case, he cautioned that the relevance of the rule of capture may change with changing times, what was "secret [and] occult" before, was no longer the case. In *Friendswood Development Co. v. Smith Southwest Industries Inc.* (1978), the rule of capture was altered again. In the event that a landowner caused subsidence to neighboring properties, he was not held liable, but the Legislature ruled that any such similar instance after the case, such a landowner would be held responsible. In *Friendswood*, the party causing subsidence was not found liable, this was believed to be the ruling to avoid tension at the time and not act as an overruling to the outcome found in *East*. After a projection by the Texas House of Representatives in the 1990s, both Senate Bill (SB) 1(1997) and 2 (2001) were put into effect. SB 1 established groundwater conservation districts as the state's preferred method of managing groundwater resources, while "maintaining" the rule of capture. The SB 2 created a statewide water plan for conservation and specified rules dealing with groundwater such as marketing and transportation regulations.

In S.C. case rulings of *East*, *Pecos County*, and *Friendswood* the rule of capture was clearly referred to as, "an establish rule of property law this State, under which many citizens own land and water rights." Although these statements were clearly defined, the court avoided the topic of absolute ownership. In *Sipriano*, the court stated it would be improper to insert itself in the legislature of conservation districts, even though it had the opportunity to apply the "reasonable use rule," in an instance where the rule of capture was obsolete. In *Barshop*, where the rule of absolute ownership was the issue argued, the court argued that constitutional rights had not been taken, only restricted. It was not until 2008 in the *City of Del Rio v. Clayton Sam Colt Hamilton Trust* that the court ruled under the absolute ownership theory. Furthermore, in *Edwards Aquifer Authority v. Day*, the S.C. clearly established the landowner as the having ownership of groundwater "*in place*" below their property, a right entitled to constitutional protection. If said right was regulated for use of someone else, the landowner could collect compensation.

Because of the differences in the ninety-one groundwater conservation districts, it appears that a Texas landowner's rights to use their groundwater vary from place to place across the state, and there is no equal protection of rights under the law. It remains to be seen what courts will do now that the S.C. has ruled that landowners do indeed own the groundwater *in place* under their property. I expect there to be a flurry of court cases testing how much groundwater conservation districts can limit a landowner's use of their water. Until equal protection rights are established, some will continue to withdraw groundwater at alarming rates,

increasing the water shortages in some water aquifers. These water scarcities may lead to food shortages, decreases in economic growth, and the extinction of endangered species. While this topic is currently more prevalent in Texas, other states and cities are soon to experience similar threats.

ADDITIONAL RESOURCES NOT CITED IN-TEXT

Austin, Tex. : House Research Organization, Texas House of Representatives, [2006] Groundwater Management Issues in Texas

Harry Grant Potter, III, History and Evolution of the Rule of Capture http://texscience.org/water/rule_capture/Potter_history_and_evolution_rule_of_capture.pdf

Russell S. Johnson, [Texas] Groundwater Law and Regulation http://texscience.org/water/rule_capture/Johnson_groundwater_law_and_regulation.pdf