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This journal promotes and publishes conceptual papers/models, qualitative research, pedagogical research, practice notes, and case studies in business and applied sciences. Submissions are made through www.baasana.org

International Review of

Business & Applied Sciences (IRBAS)

Scope and Coverage

The *International Review of Business & Applied Sciences (IRBAS) is* a double-blind peer reviewed journal of Business and Applied Sciences Academy of North America BAASANA) that publishes conceptual papers, Qualitative Research, Case Studies, Pedagogical Research and Interviews involving global or country specific Business, Social, Behavioral and Applied sciences. The primary focus of the journal is on innovative ideas leading to solutions to problems. Interdisciplinary and or discipline specific descriptive, conceptual ideas, constructs, propositions, models and theories including moral and ethical call for actions toward solutions of problems across digital divide.

IRBAS publishes review articles, original ideas, and theoretical, conceptual narratives with less discipline specific jargons. Statistical analysis when used, should be explained in plain language for interdisciplinary global readers. Commentaries on articles and reports published in the Journal are welcome and encouraged. Authors will have the opportunity to respond to the commentary on their work and those responses will be published. Special Issues devoted to important global topics, including disruptive innovations, and case studies on UN Sustainable Development Goals (SDG) will be routinely published.

The journal is an invaluable support to academics and researchers, environmental activists,
SDG participants, teachers using innovative pedagogical styles, and all those charged with setting policies and strategies for business and social, global, and non- profit organizations.

Readership

Professionals, academics, researchers, managers, policy makers, environmental activists, and the promoters and implementers of UN SDG.

Subject Coverage

- Management Issues
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- Entrepreneurship, and Innovation
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- Business Ethics
- Business Policies and Strategies
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- Issues of Non-Profit developmental organizations

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All authors must declare that they have read and agreed to the content of the submitted manuscript.
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Journal Index

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EDITORIAL

Papers included in this issue are six. They are conceptual in nature—clearly fitting into the scope of the journal. All of them relate to issues in applied sciences and business. The first paper is authored by a distinguished faculty scholar with a vast background in curriculum and academic leadership, Jeffrey A. Krug of Smeal College of Business, Penn State University, In this paper the author argues for creating a mindset of the entire student body and provides a holistic framework for the International business curricula. If implemented, he argues, students will appreciate global cultural differences and will prepare them to work effectively in multinational firms and cross-cultural settings upon graduation.

The second paper is authored by Edward Strafaci Pace University & Donald Crooks Wagner College. In this paper authors categorize profiles of the buyers of convertible securities (CS) and how they navigate for best returns for their investments. Four different hypotheses were tested to provide a parallel between CS and the Equity Securities. Except for higher volatility of CS due to the buyer optimism versus the buyer pessimism, CS they argued, generally resembles Broader Equity Market.

The third Paper was co-authored by Afolarin Joshua Aiyedun of St. John's University, NY, and Dexter Phillips,also of St. John's University, NY.. This study assesses the mental health literacy of young adult college students (n=206) in the U.S. to determine whether greater mental health literacy is needed to improve help-seeking behavior. Authors used descriptive statistics and t-tests of significance to compare outcomes of mental health literacy in the groups of sample population. The study concluded that the sample population had sufficient mental health literacy, and that intervention for help-seeking behavior may not be needed. On the contrary, more access to mental health services may better serve the cohort studied.

The fourth paper was authored by Serajul I. Bhuiyan of the Department of Journalism and Mass Communications at Savannah State University, GA,. The paper focuses on The Covid-19 Pandemic caused disruption in the educational institutions forcing them to implement online teaching worldwide due to its contagious impact on human health. This research focused on instructional strategies for student engagement in online teaching during the Spring and Fall of 2020. These instructional strategies were adopted in eight classes during two semesters at Savannah State University in Georgia. The case study developed various strategies to involve and engage students in the active learning process for online teaching without compromising learning quality.

The fifth paper was authored by Jet Mboga, of Bloomsburg University of Pennsylvania. It studies the association between financial performance and corporate giving (to charity).A sample of top Fortune 500 companies *ranked* by *total revenue* and another sample of 50 top ranked companies based on their respective *charity giving* in 2014 (selected from the list of Charity Foundation Center were used for the study. The total *revenue* of the companies (independent variables) was correlated and regressed with the *charity giving* (dependent variable) in both samples (the sample from the Fortune 500 and the other sample from the

Foundation Center. The study concluded that there is no significant association between dependent and independent variables.

The sixth paper was authored by Pedro Vasseur, Catherine Dwyer, William Tereshkovich, Charles Tappert,. Seidenberg School of Computer Science and Information Systems. Pace University, New York. This paper focuses on software systems based on Machine Learning (ML), and Artificial Intelligence (AI). In the case of ML techniques, these rules are derived from training data from which programmatic requirements are generated inductively. This paradigm change makes understanding the behavior of the software system with ML components difficult, resulting in software systems that are intrinsically challenging to test and verify. The risk was that humans, once they have started trusting AI in their daily tasks, could begin adapting their behavior to AI assistance and therefore may make incorrect decisions and actions.

This is the second volume of the IRBAS. Papers included in this issue are interdisciplinary and have dealt with issues of importance. The readers will find them informative and useful toward personal professional growth and beneficial to students and institutions. We will continue to publish qualitative papers, research models, conceptual papers, case studies, professional interviews, reports of disruptive innovation in education and other applied sciences. We welcome authors to spread the word and invite scholars and practitioners to read and then also volunteer to write for future issues of IRBAS.

Sincerely,

M. Ruhul Amin, Ph.D.
Editor-in-Chief

The Challenge of International Business Education:

A Holistic Approach

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Abstract

International business curricula and study abroad programs are a critical part of international business education. A weakness of this approach, however, is that they focus significant faculty and staff resources and time on a small number of students, leaving a majority of students untouched by internationalization efforts. Our goal as educators should be to educate the entire study body on international business and cross-national cultural differences, in order to increase student awareness and appreciation of cultural differences and prepare students to work

effectively in multinational firms and cross-cultural settings after they graduate. This goal requires significant changes in how we deliver international business education. It requires programs that touch the entire student body in ways that help all students develop a global mindset. Such efforts have the potential for strengthening a business school or university's internationalization efforts that extend far beyond what other academic institutions have attempted to date. This paper proposes a new, holistic approach to internationalizing the entire business school student body.

1 | INTRODUCTION

The internationalization efforts of most business schools to date have focused primarily on curricula and study abroad programs. Many business schools offer undergraduate programs with a major and/or minor in international business, with international business courses supplemented by study abroad programs and foreign language study. This approach to international business, although necessary and laudatory, falls short in two respects. First, students typically study a single language and study abroad in a single country, most likely a country where the foreign language studied by the student is spoken. This approach is effective for broadening students' country-specific skill sets.

But how much of the world does this approach really help students understand? Does this help students develop a global mindset? It is highly unlikely. There are roughly 7,139 languages spoken in some 200 countries worldwide (Ethnologue, 2021). A focus on a single country and language does give a student advantages over students with no international business experience; however, it is unlikely to be sufficient to provide many students with enough global knowledge to function effectively in other parts of the world. Second, and perhaps more important from an institutional and societal point-of-view, this approach fails to educate a large majority of students in international business. Many of our students graduate with little foreign language training. Most students never participate in a study abroad program. If our goal is to help all students develop competencies in international business, increase their understanding and appreciation of cross-cultural differences, and develop competencies to effectively work in multinational firms, what should we do?

This paper outlines a new approach to internationalization that is designed to touch the entire business school or university student body. The vision is to produce business graduates with a global mindset, interdisciplinary skills, global competencies, and an appreciation for making contributions to society as a whole (see Figure 1). The program envisions graduates who are worldly, sophisticated, open-minded, tolerant, compassionate, and creative ("global mindset"). It envisions graduates who are comfortable working in multicultural, diverse, and ambiguous groups and settings ("interdisciplinary skills"). It envisions graduates with a wide range of skills, knowledge, and competencies that enable them to succeed in a global environment ("global competencies").

Last, it envisions graduates prepared and motivated to make positive contributions to society. It takes a holistic approach that views international business education as an evolutionary process. Students develop into better human beings, appreciate cross-cultural differences, and develop a desire to make positive contributions to the world around them when they are exposed to a range of diverse, interdisciplinary, and cross-cultural settings over time.

2 | WHY INTERNATIONAL BUSINESS EDUCATION MATTERS

International business has become an increasingly important topic for students, researchers and practitioners during the last thirty years. Few business schools even offered courses in international business until the 1980s, when the field of international business was just emerging as an independent field of study (Daniels & Krug, 2007). The world was much different then. Foreign investment was dominated by a small number of multinational firms, primarily located in the United States and Europe. Japanese multinational firms followed with significant foreign direct investments in the late 1980s. Until this time, few people thought seriously about the need to train students in international business or gave much thought to the need to increase students' global understanding and appreciation of cultural differences.

When *Fortune* introduced its first "Global 500" in 1990, most companies on its list were U.S.-based firms. No Chinese firms appeared on the list. *Fortune's* most-recent "Global 500" list, however, shows that Chinese firms (124) now exceed the number of U.S. firms (121) for the first time (Murray and Meyer, 2020). Moreover, multinational firms headquartered in 32 different nations now appear on the list (*Fortune,* 2021). This demonstrates how rapidly the world has become "global," with multinational firms emerging in a wide range of countries from all regions of the world (Table 1).

Globalization, however, doesn't only affect those who work in large firms. It also affects small businesses, government entities, and nonprofit organizations. In order to expand revenues and improve efficiencies, both large and small firms now routinely rationalize their value chains by shifting productive assets worldwide to reach a greater number of consumers and to achieve greater scale and scope efficiencies. In a large number of industries such as computers, telecommunications, semiconductors, automobiles, and pharmaceuticals, among many others, global competitors are rapidly displacing domestic competitors that sell to fewer consumers and operate with higher cost structures.

What has caused this phenomenon? The emergence of the internet, rise of high-quality universities outside North America and Europe, higher worldwide incomes, lower trade and investment barriers, rapidly evolving technologies in communications and travel, and emergence of regional trade and economic blocs such as NAFTA (North America), the European Union (Europe), Mercosur (Latin America), ASEAN (East Asia), COMESA (Eastern and Southern Africa), SAARC (South Asia), and Pacific Alliance (Latin America) have all contributed to the rapid globalization and interdependence of economies worldwide. Today, few of us are untouched by the effects of globalization, and few of us will live out our lives untouched by the need to understand and work effectively with people from other nations. The need for cross-cultural awareness, cultural understanding, and skills managing global organizations has never been greater.

3 | THE MULTINATIONAL ENTERPRISE

What are the distinguishing factors of international business? Scholars have focused on four primary areas: (1) cross-national cultural differences, (2) the globalization of business, (3) rise of the multinational enterprise (MNE), and (4) theories of foreign direct investment.

Globalization has forced many firms to reevaluate their strategies, structures, and scope of operations. Although globalization trends have given firms greater opportunities for expansion, they have also subjected them to a growing number of competitors, suppliers, customers, and substitute products worldwide. In general, competition has become more intense for many firms—both large and small—because their competitive arena is no longer defined by national boundaries. It is now global in scope.

Early research on the multinational enterprise focused on the "liability of foreignness," which describes the disadvantages firms face when they expand abroad (Hymer, 1976). How do foreign firms overcome the advantage of local firms in terms of physical distance, language barriers, cultural differences, differences in legal systems, access to distribution channels, and differences in marketing and financial systems and practices? How does a British firm, for example, compete with Chinese firms in the Chinese market? All these factors, among others, contribute to the uniqueness of international business compared to the functional areas of business. In response, the multinational enterprise (MNE) emerged as a new organizational form designed to overcome the firm's inherent liability of foreignness. The MNE, unlike most domestic firms, is capable of managing and coordinating a wide network of assets and subsidiaries worldwide, leading multicultural top management teams and employees, and establishing product differentiation and branding that gives it competitive advantages over local firms.

Although we can point to a wide range of factors that have contributed to globalization in general, the rise in international trade and investment is unlikely to have occurred absent the rise of the multinational enterprise (MNE). MNEs have both responded to and stimulated globalization. For example, advancements in communications and transportation have improved the firm's ability to enter and manage subsidiaries located in foreign markets. The rise of trade and foreign investment has stimulated greater spending on R&D, as firms attempt to develop firm-specific advantages that help them overcome their liability of foreignness in overseas markets. The most successful multinationals overcome the liability of foreignness by leveraging superior technologies and operating efficiencies to offer higher-quality and lower-priced products and services compared to local firms. Such advantages are achieved through significant investments in research and development and marketing, as well as greater scale and scope efficiencies as firms shift assets around the world to reach a greater number of consumers. As firms expand internationally, their subsidiaries also trade with each other by shipping components and finished goods across their worldwide network. This has increased the level and composition of trade and investment flows worldwide. In sum, research in the field of international business is both directly and indirectly linked to the multinational enterprise and its global activities.

The MNE has been defined in numerous ways. Early scholars defined MNEs by the number of plants located outside the MNE's home country, with the parent company using a single management strategy to guide the actions of large clusters of units located worldwide (Behrman, 1969; Vernon, 1971). Other scholars simply defined the MNE as a firm that controls and manages the production and distribution of goods and services located in two or more countries (Caves, 1996). More recently, scholars have defined MNEs in terms of how they integrate their worldwide operations into a common strategy, organize around an internal structure that manages resource flows and value-chain activities among worldwide subsidiaries,

and allocates and coordinates resource flows to promote efficiencies among competing subsidiaries worldwide.

Two factors are generally regarded as necessary when determining whether a firm is indeed multinational. First, the firm must have significant foreign direct investment (FDI). Firms may enter foreign markets using a range of activities other than FDI. These include importing and exporting; licensing of intellectual property rights such as technology, trademarks, copyrights, and franchising; joint ventures; foreign alliances; and the holding of non-controlling interest in foreign assets (Johanson & Vahlne, 1977). Direct investment in subsidiaries located abroad, however, remains the defining strategy of the MNE (Dunning, 1980; Rugman, 1981). Second, the MNE must actively manage and control its foreign-based assets. The definition of "control" has changed over time. Many countries historically restricted the ownership of local firms by foreign firms to 49 percent. Such policies presumably minimized a foreign firm's influence over domestic economic policy, trade, production, employment, and the balance of payments. Little evidence, however, suggests that specific levels of ownership actually affect a foreign firm's influence in domestic economic and political affairs. Such influence has much more to do with the firm's unique resources and capabilities. Consequently, most countries have since abandoned restrictions on foreign ownership of local firms.

3.1 | Theory of the MNE and foreign direct investment

A wide range of theories have emerged to explain the motivation and direction of trade and investment flows across national boundaries. Notable theories include internationalization theory, capital market theory, the market disequilibrium hypothesis, monopolistic advantage theory, government-imposed distortions, trade cycle theory, industrial organization, appropriability theory, internalization, diversification, the eclectic paradigm, and transaction costs. Theories have generally considered three issues. First, how can firms compete with foreign firms in overseas markets? This issue addresses how firms can overcome their "liability of foreignness" when operating overseas. Second, why do firms establish subsidiaries (foreign direct investment) rather than penetrating foreign markets using other modes of entry such as exporting, licensing, joint ventures, or alliances? This issue addresses why it is more advantageous for firms to penetrate foreign markets through direct investment rather than alternative modes of entry such as exporting. Third, why do MNEs invest in certain foreign markets and not others? Other factors that have influenced the development of FDI theory include issues such as why large firms that invest in oligopolistic markets tend to dominate foreign direct investment, why foreign investment is more prevalent in certain industries but not others, and why foreign investment in a foreign market tends to lead to "reverse investment," with foreign firms responding by investing directly in the MNE's own market. Such effects have been shown to occur at both the country and industry level.

In the field of economics, models have focused to some extent on portfolio investments to explain why capital as a factor of production tends to flow from domestic to foreign markets. International capital flows are often explained by inflation and interest rate differences between countries. Investors may take advantage of these differences by moving capital from high inflation to low inflation countries, or to countries with higher real interest rates, in order to increase return on investment. Such a perspective, however, doesn't explain why a multinational firm should invest directly in foreign markets using subsidiaries rather than other modes of entry

such as exporting or licensing. It also doesn't consider why firms invest in assets that are not easily shifted to other markets following inflation and interest rate changes. Last, why do firms expect to earn higher returns through direct investments rather than simply acquiring ownership in local firms when executives may view foreign investments as riskier compared to investments in their home market? If executives view foreign investments as riskier than home investments, how can firms offset these risks and earn higher returns than local firms?

FDI theory evolved by explaining conditions under which an MNE may earn higher returns in foreign markets through branding, superior technology, and management skills, which the firm can leverage throughout its worldwide network of subsidiaries. This line of thought led researchers to focus on differentiation as a primary motivation behind foreign direct investment. It also helped to explain why firms in the same industries tend to invest in each other's home markets. Differentiation enables firms in the same industries to operate profitably in each other's markets by establishing unique market positions and by selling products and services that appeal to different market segments.

Hymer (1976), Kindleberger (1969), and Caves (1971) provided important initial theoretical frameworks for understanding the origins of the multinational enterprise and linking them to differentiation strategies. They linked their theories to early work that discussed entry barriers, the structure of competition, and trade flows (e.g., Bain, 1956; Coase, 1937; Dunning, 1958). This literature helped shift the focus of international business scholars from trade theory, with its heavy focus on understanding the direction of trade flows, to theory of the multinational enterprise, with a focus on firm-specific advantages. A primary assumption of these later theories was that multinational firms operate in imperfect markets, which enable firms to overcome an industry's entry barriers by exploiting monopolistic advantages.

Theory, therefore, began to focus on the ability of firms to create low-cost advantages through greater economies of scale and differentiation based on superior technologies, brand, and knowledge. Whereas earlier economic theories examined how market disequilibria or government-induced distortions created deviations from equilibrium within markets, Hymer, Kindleberger, and Caves, among others, examined how market structure imperfections created by a firm's monopolistic characteristics created deviations from purely market-determined prices. Thus, multinational enterprises behave in ways that deviate from the assumptions of perfect competition by using firms-specific advantages to influence market prices.

This research created a foundation for understanding why multinational firms are willing and motivated to undertake greater risk by competing in foreign markets. These theories, however, did not examine why multinational enterprises should penetrate foreign markets using foreign direct investment instead of other modes of entry. Two important theories that followed established theoretical frameworks for understanding why firms engage in foreign direct investment—appropriability theory and internalization theory. Appropriability theory (Magee, 1977) established that multinational firms create valuable firm advantages at different stages of a product's life cycle, e.g. product discovery, product development, production, market creation, and appropriability. In the final stage, firms "appropriate" valuable product and service technologies by selling them to consumers internally. By using internal channels, namely foreign-based subsidiaries, rather than external channels, such as licensing and joint ventures, the firm's technology and innovations are less likely to be imitated or appropriated by other firms.

Consistent with appropriability theory, internalization theory (Buckley and Casson, 1976; McManus, 1972; Rugman, 1981) argued that foreign-based production is not valuable because of the transfer of capital; rather, it is valuable because it increases the firm's managerial control over assets, knowledge, and technology. Knowledge and firm-specific advantages are, therefore, a necessary but insufficient condition for the firm to engage in foreign direct investment. A second important condition is that the firm is more effectively able to create and retain monopolistic advantages—and to achieve greater returns on proprietary assets and technology—by investing abroad through foreign-based subsidiaries under their control. In short, foreign direct investment provides the greatest long-term returns from firm-specific advantages relative to returns from exporting or other modes of entry.

The eclectic paradigm (Dunning, 1980) added a third element to multinational enterprise theory by examining the importance of location-specific advantages. In doing so, it addressed not only why firms engage in foreign direct investment but also why multinational enterprises establish foreign-based production in specific locations. Thus, international production takes place when three conditions are met. First, firms overcome their liability of foreignness by exploiting firm-specific advantages that are superior to products and services offered by local firms in foreign markets. Second, firms maximize their economic returns—and minimize risk—by internalizing the transfer of assets, knowledge, and know-how through direct investments under their control. The advantages of internalizing transactions is greatest in markets where the costs of enforcing property rights and controlling information flows are high. Third, the returns to exploiting firm-specific advantages are greatest when firms invest in the most structurally attractive foreign markets. The value of foreign direct investment, therefore, is maximized when firms have differentiated products and services, internalize these advantages through foreign direct investment, and invest in attractive foreign locations.

3.2 | Structure and control of the multinational enterprise

Foreign direct investment has both advantages and disadvantages. On the one hand, firms reach a wider range of consumers—and increase revenues—by expanding abroad. Higher revenues lead to greater economies of scale and operating efficiencies as the firm spreads its fixed costs over a greater number of units sold. Foreign expansion also allows firms to benefit by extending the product life cycle by selling mature products in less saturated markets. Firm also benefit when they shift production and value-chain activities to lower-cost locations, which increases operating efficiencies and lowers costs. Finally, as firms increase in size and expand the number of countries in which they operate, they can access a diversity of consumer viewpoints, which enhances organizational learning.

Foreign direct investment, however, creates problems not faced when firms only operate in their home market. As multinational firms expand the number of countries in which they operate, increase the number of organizational units located worldwide, and hire employees in different countries, the management of complex, widely dispersed assets and employees becomes more difficult. Physical distance becomes a problem because it is more difficult to communicate with employees and control the quality of the firm's products and services. A good example is the fast-food industry. In domestic markets, fast-food companies may be predisposed to franchising, which shifts the daily operations of restaurants from the corporate parent to locally owned franchisees. Outside their home country, however, the corporate parent has less control

over product quality and operational efficiencies of foreign-based restaurants, which might vary widely from one franchise to another. Physical distance makes it more difficult to monitor and correct problems in franchised units. As a result, companies may prefer to operate company owned restaurants in foreign markets to improve monitoring and control.

In short, the distance between operating units acts as a barrier to the transfer of information and knowledge. Especially in the case of tacit knowledge, it is simply easier to communicate knowledge through face-to-face communications. Language and cultural differences also create communication problems and affect organizational policies on things like salary and incentives, which may be culturally acceptable in some cultures but not in others. As a result, multinational firms must rely on different cultural approaches as they integrate their operations worldwide.

3.3 | Our challenge

As educators, we are faced with the challenge of developing new programs and curricula that improve students' critical thinking skills, increase their understanding and appreciation for international business and cross-national cultural differences, train them how to manage complex multinational enterprises, and prepare them for the challenges of an increasingly complex, global, and diverse business world. This requires us to think about innovative ways of educating not only students who choose to study international business. It requires that we educate the entire student body in ways that allow them to succeed in careers—and work effectively with people—across national boundaries and in cross-national settings.

4 | HOW TO INTERNATIONALIZE THE STUDENT BODY: A HOLISTIC APPROACH

4.1 | Program objectives

Tables 2 and 3 outline a new, holistic program for educating the entire business school or university student body. Each objective (Table 3) contributes to multiple components of the program's vision (Table 2). The first objective ("internationalization") focuses on the development of each student's "global mindset" (vision #1 and #2). This includes greater awareness of global and multi-cultural issues (vision #2) and an understanding of domestic and international markets and institutions (vision #3). The second objective ("*interdisciplinary skills"*) focuses on developing student awareness, appreciation, and knowledge of multiple disciplines (vision #2). This includes critical thinking, analytical reasoning, and problem-solving skills (vision #1, #2, and #3); interpersonal, leadership, and communication skills (vision #2 and #4); and functional business knowledge (vision #3). The third objective ("*personal and professional growth"*) focuses on increasing students' understanding of ethical issues and responsibilities (vision #1, #2, and #4); improving students' skills, knowledge, and competencies in a specialized area of international business (e.g., through language study, study abroad, and international internships) (vision #3 and #4); and, preparing students for employment in the global marketplace (vision #4).

4.2 | STRATEGY

4.2.1 | Internationalization Seminar

The proposal is designed to strengthen the business school or university's existing activities in the area of international business or "internationalization." It moves beyond the traditional focus on degree and study abroad programs, and attempts to touch every student in the business school or university. The proposal's strategy comprises three components. First, all students would enroll in a one-credit internationalization seminar during each of their eight semesters at the university. Each year, four seminars would be run simultaneously, with each seminar focusing on one of four world regions and language groups. Each two-hour seminar would include lectures, discussion, and group foreign language practice sessions. In the student's first year at the university, he or she chooses one region and language. During each of the next three years, students choose a second, third, and fourth language from each of the other three regional groups. During their four years at the university, all students will have attended all four area seminars and studied four different languages with four different student groups. Each year focuses on a theme that contributes to the evolution of each student's global mindset:

Year 1: Awareness. Develop student awareness of the importance of culture, language, and global markets and institutions. In essence, begin the process of changing the way students view the world around them. Devote several seminars to increase student awareness of future study abroad and foreign language opportunities.

Year 2: Depth. Continue to develop student awareness of multiple disciplines, cultural differences, languages, and global markets and institutions. In essence, widen the student's global perspective. Devote several seminars to prepare students for future study abroad, foreign exchange, and foreign language study.

Year 3: Experience. Focus on the student's international experiences (component 2) by devoting several seminars to students' upcoming study abroad programs.

Year 4: Application. Increase student awareness of the applicability and marketability of the international knowledge they have accumulated during their four years at the university. Integrate seminars with a speaker series and other university-wide programs.

4.2.2 | Foreign Language Study

The second component of the program is the study of four different languages–one chosen from each of the four geographic or regional groups shown in Table 4. An assumption is that human beings cannot fully appreciate the nuances of other cultures until they have attempted to communicate in the native's own language. Exposure to four different languages during the student's four years at the university is not designed to develop fluency in the language. Rather, it is designed to develop awareness of foreign languages and cultural differences, and an appreciation of the importance of communicating with others in their own language. It is also

designed to generate a life-long interest in cross-cultural interactions and international activities (i.e., to develop a global mindset).

We envision all of our undergraduate students sitting in a restaurant, bar, or cafe on a Friday evening and the topic of conversation is the foreign language(s) each has studied since their first year at the university. We envision students walking across campus and speaking a variety of languages as they pass one another–Portuguese, Arabic, Swahili, German, and Turkish. It doesn't require more than a few words (e.g., "Merhaba"–Turkish for hello) to alter the way students interact with one another, change the way students view the world around them, and create new opportunities for making friendships.

One method of learning a language is the Pimsleur method, developed by Professor Paul Pimsleur (1927–1976), a professor of language education and director of the Listening Center at The Ohio State University (Pimsleur, 2021). Based on the "principle of anticipation" and memory training he called "graduated interval recall," Pimsleur's technique is now used to train students in 51 languages. Learning is achieved online, with students learning the language by listening to phrases in the target language and repeating. No reading or writing is required. As a result, the student can study the language on his or her own time without the aid of an instructor. The method is highly effective in developing language skills quickly. Students can listen to the assigned lesson during the week on their own, then review the lesson with their group when they meet for the weekly Internationalization Seminar.

Other popular foreign language tapes include Berlitz and Rosetta Stone. The latter has recently become a popular software package. Students learn the target language by combining listening with visual cues on the student's computer or smart phone. The Pimsleur Method, in contrast, is based entirely on listening to phrases and repeating them.

4.2.3 | Interdisciplinary Groups

It is envisioned that each foreign language group will consist of five males and five females. No more than two students would be represented by a single major within the business school. Groups would comprise students from each of the undergraduate majors in the business school (e.g., accounting, economics, finance, management, marketing), if the program focuses on business school students. Alternatively, the program can be operated university-wide as a tool for internationalizing the university's entire student body, in which case groups would comprise students from different colleges, further enhancing the student's experience. By design, each group should be interdisciplinary.

The interdisciplinary structure of the program has three important objectives: (1) increase student awareness and appreciation of multiple disciplines, (2) increase student awareness and appreciation of different points of view, and (3) expose students to a wide range of disciplines early in their academic careers. Today, students often spend little time interacting with students from outside their area of specialization (e.g., marketing or accounting). This makes it more difficult for students to develop an appreciation for other areas within their college. The interdisciplinary composition of groups addresses this problem.

4.2.4 | International Experience

The third component of the program requires all students to complete an "international experience." Most students will prepare for this experience during their first and second years. The experience will normally be undertaken in the student's third or fourth year at the university. Each student will be required to follow at least one of these paths: (1) foreign exchange program (i.e., semester exchange with a partner institution), (2) study abroad program (summer, faculty-led study abroad), (3) intensive foreign language study, or (4) community service activities. The latter is designed to accommodate students who are unable to participate in one of the other three activities (e.g., students with disabilities). In these special cases, students would be required to develop a two-year program of involvement in a community organization such as the Red Cross, Salvation Army, Lion's Club, or a local church or hospital. This involvement would be designed to support the organization, develop student appreciation for non-profit and/or community activities, and provide the student with practical experience that will benefit his or her future personal and professional life.

5 | IMPLEMENTATION

It is envisioned that two years of preparation will be needed to fully implement this new program. During this time, the "Seminar on Internationalization" would be planned and coordinated with faculty from all the university's undergraduate colleges (e.g., Colleges of Business, Humanities & Natural Sciences, Music & Fine Arts, and Social Sciences), if the program is run university-wide. Alternatively, it would be planned and coordinated by faculty from the business school's different undergraduate majors, if the goal is to internationalize business school students. In larger universities with more than four undergraduate colleges, it may be necessary to consolidate similar colleges into a smaller number of groups. Using a large state institution with ten undergraduate colleges as an example, colleges might be consolidated into groups such as: (1) Agricultural Sciences and Earth & Mineral Sciences, (2) Arts and Architecture, Communications, Health & Human Development, and Liberal Arts, (3) Business, Education, and International Affairs, and (4) Engineering and Information Sciences & Technology. The structure, format, and number of groups can vary based on the size of the university, number of undergraduate colleges, and number of students.

In the third year following the inception of the program, the "Seminar on Internationalization" would be offered for the first time to incoming students. This one-credit, pass/fail seminar might be offered each Friday afternoon to avoid conflicts with regularly scheduled classes that meet. Four two-hour seminars would run simultaneously, with each seminar focusing on topics related to one of the four regions and foreign language groups: (1) North and South America, (2) Western and Eastern Europe, (3) Asia and India, and (4) Middle East and Africa. During each two-hour seminar, faculty from various undergraduate colleges will lecture and lead discussions on a topic related to each region. The Latin America seminar, for example, might include topics such as Latin American business practices (offered by faculty in the College of Business), natural resources and agriculture (offered by faculty in the College of Agricultural Sciences), Latin American art and architecture (offered by faculty in the College of Arts and Architecture), political systems and regional trading groups (offered by faculty in the College of International Affairs), evolution of technology (offered by faculty in the College of Information Sciences and Technology), and so on.

The selection of topics is expected to vary from institution to institution based on programs offered and faculty interests. Topics may change from year to year. The goal is to expose business students to a wide range of topics from all the undergraduate colleges, in order to widen their view of the world. More importantly, the seminar is designed to widen student perspectives of the world around them. The goal of the program can be met using a variety of topics that fit the particular structure, size, and idiosyncrasies of each academic institution. Following the lecture and discussion of the topic of the day, students will break into groups based on their foreign language area. This time will be used for foreign language study. Foreign students may enhance the experience of domestic students by participating in the weekly foreign language sessions.

In their second year, students will choose a second region and foreign language group. Students will then attend a weekly seminar that focuses on topics related to this second region. In addition, they will spend the year studying a second foreign language. Incoming students will also choose a region and foreign language. Therefore, first- and second-year students will attend the weekly seminars and study their chosen foreign language together during the year. In the following year, the seminar and foreign language study will include third-, second-, and first-year students. In the next year (the sixth following initiation of the program), fourth-, third-, second, and first-year students will participate in the program. Therefore, the entire student body will be involved in the program by the sixth year following the program's initiation. Graduating students would be studying their fourth foreign language and attending their fourth seminar–one seminar from each of the four world areas and one foreign language from each of the four world areas and language groups.

6 | CONCLUSION

The proposed program is designed to strengthen the business school or university's existing programs in international business education and promote internationalization of the entire study body. It is unique in its approach in that it moves beyond the business school or university's existing international and study abroad programs, which touch only those involved in these activities. The goal of such a program would be to include all students. By exposing students to a wide range of topics and foreign languages in an interdisciplinary setting over a four-year period, the program hopes to develop students with a global mindset, global competencies, an appreciation of cultural and global differences, and a desire to contribute to society and the welfare of human beings worldwide.

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Evolution of "Global Mindset"

"Global Mindset"

Global Competencies

Global Appreciation

Global Awareness

Area Studies

Study Abroad Programs

Foreign Exchange Programs

Foreign Language Training

International Business Courses

Foreign Internships
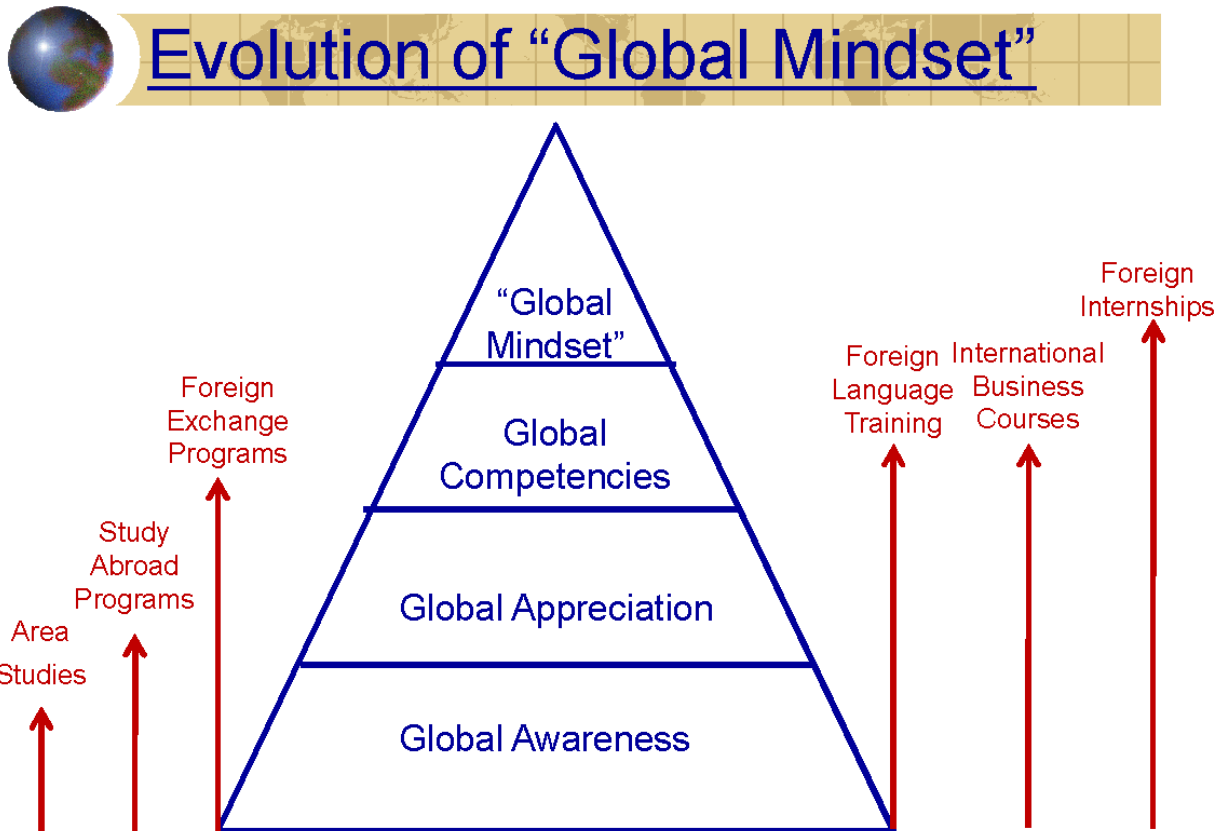
FIGURE 1   Evolution of "Global Mindset"

TABLE 1 *Fortune Global 500:* Top ten countries-of-origin

Rank	Country	2000 Companies	Corporate Tax Rate	2020 Companies	Corporate Tax Rate[1]
1	China[2]	10	33%	124	25%
2	United States	179	39%	121	26%
3	Japan	107	43%	53	30%
4	France	37	38%	31	32%
5	Germany	37	52%	27	30%
6	United Kingdom	38	30%	22	19%
7	South Korea	12	31%	14	28%
8	Switzerland	11	25%	14	21%
9	Canada	12	43%	13	27%
10	Netherlands	10	35%	13	25%
	Top 10	453	40%	431	25%
	Other	47	35%	69	27%
	TOTAL	500	39%	500	27%

[1] Top statutory corporate income tax rate, including both national and subnational corporate tax rates.

[2] Excludes companies headquartered in Hong Kong (n=7 in 2020).

Source: Bloomberg Tax (2020, November 17). Daily Tax Report. Retrieved from https://news.bloombergtax.com/daily-tax-report/the-changing-headquarters-landscape-for-fortune-global-500-companies/.

<u>**TABLE 2**</u>   Vision of program

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1) **Global Mindset**
   - Produce graduates who are worldly, sophisticated, open-minded, tolerant, compassionate, and creative.

2) **Interdisciplinary Skills**
   - Produce graduates who are comfortable working in multi-cultural, diverse, and ambiguous groups and settings.

3) **Global Competencies**
   - Produce graduates who are equipped with a wide range of skills, knowledge, and competencies that enable them to succeed in a global environment.

4) **Contribution to Society**
   - Produce graduates who are prepared and motivated to make positive contributions to society and the world around them.

TABLE 3 Program objectives

Internationalization

- Help students develop a global mindset (vision #1 & 2).
- Develop students' awareness of global and multi-cultural issues (vision #2).
- Expand students' awareness of domestic and international institutions and markets (vision #3)

Interdisciplinary skills

- Expand students' awareness, appreciation, and knowledge of multiple disciplines, both across the various functional areas of business and outside the business disciplines (vision #2).
- Enhance students' critical thinking, analytical reasoning, and problem-solving skills (vision #1, 2, and 3).
- Develop students' interpersonal, teamwork, leadership, and communication skills (vision #2 and 4).
- Increase students' functional business knowledge (vision #3).

Personal and professional growth

- Increase students' understanding of ethical issues and responsibilities (vision #1, 2, and 4).
- Enhance students' in-depth skills, knowledge, and competencies in a specialized area of international business that enriches the student's life and helps the student develop a more global mindset (vision #3 and #4).

Prepare students for employment in the global marketplace (vision #4).

TABLE 4 Regions and language groups

North & South America	Eastern & Western Europe	
	Western Europe	*Eastern Europe*
Ojibwe	Danish	Albanian
Haitian Creole	Dutch	Armenian (Eastern)
English (ESL)	Finnish	Armenian (Western)
Portuguese (Brazilian)	French	Croatian
Spanish (Latin America)	German	Czech
	German (Swiss)	Hungarian
	Greek	Lithuanian
	Icelandic	Polish
	Irish	Romanian
	Italian	Russian
	Norwegian	Turkish
	Portuguese (European)	Ukrainian
	Spanish (Spain-Castilian)	
	Swedish	

Asia & India	Middle East & Africa	
	Middle East	*Africa*
Chinese (Cantonese)	Arabic (Eastern)	Swahili
Chinese (Mandarin)	Arabic (Western)	Twi
Hindi	Arabic (Modern Standard)	
Indonesian	Dari (Persian)	
Japanese	Farsi (Persian)	
Korean	Hebrew	
Punjabi	Pashto	
Thai	Urdu	
Vietnamese		
Tagalog		

An Examination of the Relationship between

Convertible Returns and

Broad Market Indices.

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Abstract:

In this paper we categorize several key characteristics behind the purchase of convertible securities (CS) and how that drives their returns. A chronic complaint among CS investors is that these securities perform well when markets are buoyant, as convertible models would dictate, yet disappoint during market downturns. This research attempts to conclude that the returns of the United States (US) convertible securities market is driven by the same factors that propel equity securities. To demonstrate this, we will regress a basket of CS that are derived from the SPDR® Bloomberg Barclays Convertible Securities (CWB) exchange traded fund (ETF). This fund was chosen as it provides the most capitalized convertible linked ETF offered as of this research. We test the returns of the individual convertible securities against broad market index indicators such as the CBOE Volatility Index (VIX), U.S. 10-year Treasury Benchmark Yield (TNX), the SPDR® S&P 500® ETF (SPY) , the Barclays High Yield Bond ETF (HYL) and the broader Russell 2000 Index (RUS) . This research seeks to infer that the convertible market reacts to market movements in the same fashion as United States equities. In this way we may conclude that, as with equity securities, the valuation models for such securities are more certain during periods of optimistic sentiment than during negative and highly volatile cycles. Indeed, models for most asset classes may fail during market disturbances. However, idiosyncratic liquidity issues concerning CS make these securities much more difficult to monetize as opposed to common stocks.

Keywords: securities, convertible returns, market indices

1. Introduction and Literature Review

Convertible bonds were first issued by railroads during the mid-1900s. By 2015 convertible market had grown to over $340 billion dollars and stands at over $300 billion as of this research. Approximately 50% of convertible issuance is US based, while at least 20% of the issuance occurs in Europe and the remainder distributed between Japan and other markets. A convertible bond gives the holder the right to convert the bond into the issuer's shares. In exchange for this optionality the lender agrees to a lower interest rate than would be expected in a non-convertible security (Ammann, Kind, & Seiz, 2010; John P. Calamos, 2018).

Comparatively, this asset class is relatively small compared to other debt classes. According to the Bank for International Settlements the U.S. Corporate Debt market is $22.4 trillion, and the general U.S. Government Debt market totals $18.7 trillion as of the fourth quarter of 2018(B.I.S., 2019). We posit that this relative illiquidity may cause convertible valuation models to have a greater error rate then would be expected with more liquid securities.

This illiquidity bias may be a reason that CS do not perform as well in a severe downturn when buyers become scarce. Research cites illiquidity for a prime impetus behind mean reversal.   In fact, liquidity, as it relates to the convertible markets, may offer clue as to why these securities performed poorly compared to model expectations.

Admittedly, many factors affect asset prices. However, research in the field indicates that market size and liquidity have a profound effect on the robustness of theoretical models. Perhaps a liquidity quotient needs to be applied to the convertible asset class when estimating fair value. Models need to be adjusted for market fluidity.(E. F. Fama & French, 1993; F. Fama, 1996; Pástor & Stambaugh, 2003).

The convertible security can be thought of as a hybrid security that is part debt and part equity option. In terms of its role as an option substitute, one can think of this security as a call option, in that it participates in the upside of the underlying equity on a delta adjusted basis. These securities also contain a put option. The put value is derived from the fact that each convertible security has an underlying investment value theoretically protecting the holder in the event of a collapse in the common stock.

As the CS price decreases, these securities eventually reach a point where investors will purchase the bond for yield and are indifferent to the option value. This is commonly referred to as fair value. (John C. Cox, Ross, & Rubinstein, 1979; Crépey & Rahal, 2011; Merton, Brennan, & Schwartz, 1977). Convertible models are used by professional investors to determine an issues' fair value. These models are basically Black-Scholes based in relation to the call option value of the convertible. The financial apparatus used to value debt are also used to determine the CS investment value or theoretical floor (André-le Pogamp & Moraux, 2004; Brennan & Schwartz, 1980; Schaefer, 1980). Traditional debt metrics such as duration need to be adjusted due to the hybrid nature of the convertible. Convertible adjusted duration modifies duration based on the relationship between the CS investment value and its conversion value (See Appendix A).

High growth companies such as those in the biotechnology and technology sector have been predominant issuers of convertible debt. According to a survey conducted by Charles Schwab, the average credit rating of these bonds is Ba1/Ba 2 using the Moody's scale. In fact, more than half of the components of the CWB are not rated at all. Technology issuers make up approximately 40% of the index. The complexion of the CS market has been traditionally dominated by more aggressive small cap growth companies seeking more economical borrowing rates. A decrease in price may also be accompanied by the underlying bond acting more distressed than those in the general population of debt issuers. These issuers maybe more of a credit risk than the average borrower. In this respect the buyer, while seeking growth, may not embrace the notion that these CS offer strict downside protection. The Schwab study also corroborates this presumption that CS are more aligned with equity factors. Using broad based CS indices, and not individual CS, the Schwab research concludes that there is a high correlation between broad U.S. Stock Market indicators and CS. They also find a positive correlation between CS and U.S. Treasury and High Yield security Indices (CharlesSchwabResearch, 2017).

The CS pool of investors has traditionally been a combination of long only buyers and convertible arbitrageurs. The arbitrageur, using a delta neutral strategy, attempts to exploit the perceived mis-valuation of the convertible. The arbitrageur purchases the convertible when

models indicate undervaluation and short sells the underlying equity in a delta neutral ratio. As the long position increases, and the convertible acts more equity like, the arbitrageur will hedge a bond at up to 100% of its underlying value. This creates positive cash flow on a static basis for the arbitrageur (See Appendix B). When the bond exhibits a hybrid nature the arbitrageur will delta neutral hedge in a ratio dictated by a modified Black Scholes model. Lastly, as the underlying stock trades down, the arbitrageur will sell the convertible bond and repurchase the short shares. The position will presumably earn a profit as the bond should hold its fair value, while the profit on the short sale outstrips the long bond loss (Choi, Getmansky, Henderson, & Tookes, 2010). As this potential for profitability exists, the arbitrageur may be less sensitive to fair value in a quest to harvest a profit. This may offer another potential explanation for our assumptions.

Another factor to consider regarding the "hedged buyer" is that they are theoretically indifferent to stock and bond price. However it should be noted, convertible arbitrage strategies have traditionally performed better in buoyant market scenarios (Loncarski, Ter Horst, & Veld, 2009). Research has shown that the announcement of a convertible issue coincides with lower prices in the underlying common as investors fear dilution. The arbitrageur can take advantage of an assumed eventual rebound in prices by purchasing the convertible security in a less than optimal delta hedge (Arshanapalli, Switzer, Fabozzi, & Gosselin, 2004). This phenomenon is not unlike the dynamic when equities are issued in secondary initial public offerings (Corwin, Harris, & Lipson, 2004; Dawson, 1987).

Since the crisis of 2008, long only investors have been more present in the convertible securities market. The long only CS purchaser, who may be more equity oriented, may also explain why the convertible market is influenced by the same dynamic that affects equities. As illustrated in the convertible price versus underlying equity price graph (See Figure 1), as the underlying equity vacillates pricewise the convertible can be thought of as shifting from a stock substitute to a bond substitute. This relationship makes the CS more difficult to value than a security with just a debt or equity bias. Given the hybrid nature of the convertible, distinct specialist skills are required to evaluate the equity and debt portions. The traditional long purchaser, and the arbitrageur, may not be expert in those skills. Furthermore, the downside protection rooted in the fixed income portion of the CS depends on the creditworthiness of the issuer. Therefore, credit selection is key when purchasing a CS.

The nature of the convertible can widely fluctuate depending on where the convertible falls between the fixed income and equity range. The holder of CS must be adept at assessing both asset classes to properly price these assets. This in fact may not be the case. Based on this postulation the CS holder, being more equity focused, may undervalue the debt portion. Since most convertible issuance occurs when the bond is more hybrid in nature, and thus dominated by equity-oriented investors, these initial buyers may not be sophisticated enough in fixed income valuation to properly price the CS. This may contribute to their poor performance during down markets(Charles Schwab Research, 2017; Kealhofer, 2003; StamfordAssociates, 2015).

Finally, the convertible security, having both option and bond components, will be affected by interest rate movements. The embedded call option will have more value if rates increase (John C. Cox et al., 1979), while an increase in interest rates will diminish the fixed

income value (Merton, 1974). CS are issued in Debt and Preferred [1]structures, our research will include both. The convertible purchaser must also account for the maturity of the security. Liquidity preference will affect valuation regarding the debt or preferred portion which may exhibit both long and, in the case of preferred, indefinite lifespans   (Choudhry, 2010; John C Cox, Ingersoll Jr, & Ross, 1979; Kaufman & Hopewell, 2017; Reilly & Sidhu, 1980) . Again, the traditional CS holder may not fully appreciate the economic factors that determine interest rates, or may hedge out that risk in an attempt to better capture the option value (Faulkender, 2005; Hilliard, 1984).

There is scant literature that directly relates to the subject matter. Most of the research centers around the theoretical valuation of the CS market (Baumol, Malkiel, & Quandt, 1966; Brennan & Schwartz, 1980; Schaefer, 1980; Zabolotnyuk, Jones, & Veld, 2010). More direct study concerns the performance of CS funds in an overall investment portfolio. Interestingly, while both academia and industry practitioners have extensively researched the performance and return characteristics of various equity and debt classes, little attention has been devoted to the inquiry and experimentation of the performance of investing in CS (Ammann et al., 2010).

The professional CS trading and investment banking industry has long had to contend with the criticism that CS do not perform as well during illiquidity events caused by sudden and severe market sell offs (John P Calamos, 1998; StamfordAssociates, 2015). This presents a drawback when investing in CS due to their relative lack of liquidity as compared to more active asset classes. All assets' classes may experience a dislocation between valuation predictions and actual prices realized during market disruptions. However, holders of CS may be forced to realize much larger relative losses than anticipated due to their lack of liquidity. In fact some research suggests adjusting alpha and beta coefficients for market conditions (Christopherson, Ferson, & Turner, 1999; Fabozzi & Francis, 1977). This examination hopes to help explain why that phenomenon takes place and begin the process of offering potential explanations and solutions to that challenge.

2. Hypothesis Development:

To understand the relationship between the CS market drivers it is recommended that CS returns should be tested against broad market indices. There are in fact several approaches using Bayesian theoretical models and lognormal distributions(Barillas & Shanken, 2018; Berk, Green, & Naik, 1999; Hudson, 2010). A more direct approach would be to use daily returns and adjust the regression models for the different inception dates to capture more relevant data. This is since CS may have more limited lives due to their callability and forced conversion. To examine the relationship between CS and market factors we theorize the following hypotheses:

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[1] Please note that convertible securities are also issued as preferred stocks. In this case the preferred acts

as additional equity on a company's balance sheet. Preferred stocks are typically issued by financial and energy

companies, as these companies aim to add more equity in their balance sheets. The mathematical and financial

constructs can be used in either case with adjustments.

Hypothesis 1: *Convertible securities, although hybrid instruments, are more equity like and are influenced by the same factors that influence equities. The returns on convertible securities will positively and significantly be related to general market indicators such as the S&P 500 and the Russell 2000 Indices.*

There is a linkage between Treasury Securities and equities. Research shows that equity and treasury markets move in a positive direction when markets are placid and are sold when there are periods of uncertainty. In these instances, investors sell corporate debt and raise cash. Longer maturity obligations carry more risk than short term debt and money market alternatives (Fons, 1994; Modigliani, 1944; Stivers & Sun, 2002; Tobin, 1958). CS have both equity and debt components. CS may be influenced in a positive direction by long term government obligations due to their debt like nature (Duffee, 1998; Hull, Predescu, & White, 2004). To identify how CS, react to changes in risk free rates these variables need to be tested.

Hypothesis 2: *U.S. Government Treasury Security returns and convertible bond returns exhibit direct relationships. Given the longer maturities, investors either purchase both in optimistic scenarios or sell both in market downturns to shift into cash alternatives.*

High Yield securities can sometimes be used as equity substitutes. This is due to their risk parameters of much higher-than-average credit spreads and default risk. These securities may be positively correlated with CS. Analyzing high yield debt requires both debt and equity skills (Altman, 1998). In this way this asset class can be thought of as a convertible substitute.

Hypothesis 3: *The returns of high yield securities and CS are directly related due to their congruent debt and equity like features and should be influenced by the same factors.*

Given the optionality of CS the volatility index should have a correlation as volatility directly influences option value(Black & Scholes, 1973). CS returns should increase in value during periods of high variance and the opposite should also hold true.

Hypothesis 4: *Volatility, as measured by the returns of the broad market volatility index, should be positively and significantly related to CS due to the call option value embedded in the CS.*

3. Methodology and Results:

3.1 – Overall Results

The data used for the dependent and independent variables had different inception dates. This helped to capture a larger sample as the average convertible has a shorter life span due to forced conversion. Forced conversion occurs when the issuing company exercises its right to trigger a call that leads to the convertible being redeemed for its underlying shares. Issuers exercise that right since it becomes more economical to do so.

This data was symmetrically arranged by date for each dependent variable (CS) and independent variables (IV) by date using a panel regression. A mixed effects model was used in this study since there were different intercepts for each data set, or each CS, in the study. The mixed effects model will let you fit an average intercept and slope as fixed effects and correct for this issue. This methodology permits the intercepts to randomly vary across all the convertible data sets. The fixed component of the intercept is the average (grand mean) of the intercepts. The random component represents the deviation of each bond from the grand mean of the intercepts.

Using matrix notation, a mixed model can be expressed as:

$$y = x\beta + Z\mu + \epsilon$$

Where:

- y is the known vector of mean observations

 - with mean observations $E(y) = x\beta$

- β represents an unknown vector of fixed effects

$Z\mu$ is an unknown vector of random effects, and ε is the vector of random errors with variances across the different estimated variance of the intercepts(Baltagi, 2008; Boozer, 1997) .

SPSS was the software application used to perform a linear mixed effects analysis of the relationship between CS and the IV. As fixed effects the IV were entered into the model. Examination of residuals did not reveal any obvious deviations from homoscedasticity or normality. P-values were obtained by likelihood ratio tests of the full model. (Baayen, Davidson, & Bates, 2008; Gelman & Hill, 2006; Winter, 2013)

Based on this, our model would therefore be stated as follows:

$$CS = VIX + TNX + SPY + HYL + RUS + idate + e$$

Where:

$idate$ - is the different inception date for each CS in the study, e is the error function.

The convertible security daily price data was sourced from the components of the SPDR® Bloomberg Barclays Convertible Securities ETF. The fund seeks to provide exposure to the market of U.S. convertible securities. The securities in this fund are required to have an issue amount of at least $350 million. There were 161 securities in the fund, average coupon for the fund was estimated at 2.8% with a maturity of approximately 8.5 years and an average price of 123% of Face value (FV) as of June, 2019 ("SPDR® Bloomberg Barclays Convertible Securities ETF- Home Page.," 2019).

The study used daily prices from 55 of the securities in the fund that provided 35,486 observations. These securities comprised over 61% of the fund. The weighted average coupon of the data is 2.58% with an average weighted maturity of 10.79 years and an average percentage of face value of 123.37%. Table 1 shown on the following page, provides summary statistics for the observations used in the study.

The CS in the study had varied FV, face value is a function of price over par value of the issue. The data needed to be adjusted for FV due to the different par amounts of bonds and preferred stocks. FV was determined using the following equation:

$$FV = price/par\ value$$

FV largely determines whether a CS is equity or debt like. An FV value of below 80% would indicate CS with more debt like behavior. Those above 130% would exhibit equity characteristics and CS between 80 and 130% would act as hybrid securities and be subject to corporate call risk (see Figure 2) (De Spiegeleer, Schoutens, & Van Hulle, 2014; Ho & Pfeffer, 1996). Our data had an average of 123% with an SD of 42.53% indicating a broad representation of FV. The observations dates ranged from January of 2013 to March of 2019. Figure 1 illustrates the monthly distributions of observations with a normal distribution overlay.

TABLE 1- DESCRIPTIVE STATISTIC OF CONVERTIBLE BONDS USED IN STUDY

		Standard Deviation (SD)	Coeff. of Variation (CV)
Number of Issuers	55		
Number of Observations	35486		
Average Number of Observations	639	485.01	132%
Median	495		
Minimum	57		
Maximum	2083		
Weighted Avg Issue Size by Market Value	$45,453,806	$ 1,078,541	4,214%
Median	$31,040,301		
Minimum	$20,456,793		
Maximum	$328,488,889		
Weighted Average Coupon	2.58%	0.051%	5,041%
Median	1.50%		
Minimum	0.00%		
Maximum	7.50%		
Weighted Average Maturity (Years)	10.79	0.2983	3,617%
Median	4.76		
Minimum	0.00		
Maximum	34.86		
Face Value Descriptives			
Average Percentage of Face Value	1.2337	0.4253	290%
Maximum Percentage of Face Value	4.3743		
Minimum Percentage of Face Value	0.6285		
Median Percentage of Face Value	1.1191		

FIGURE 1- MONTHLY FREQUENCY OF OBSERVATIONS

Histogram

Mean = Apr/16/2017
Std. Dev. = 535.78 days
N = 35,489
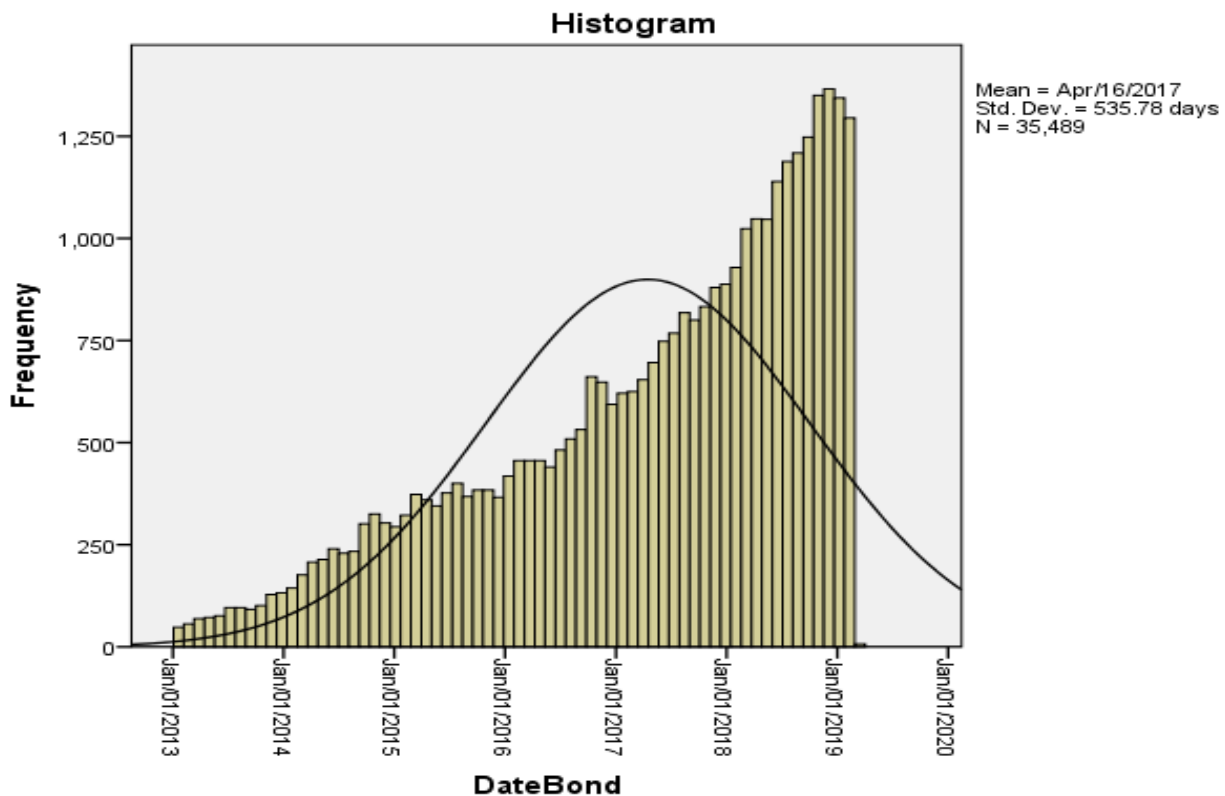
FIGURE 2 - GRAPHIC REPRESENTATION OF CONVERTIBLE PRICE
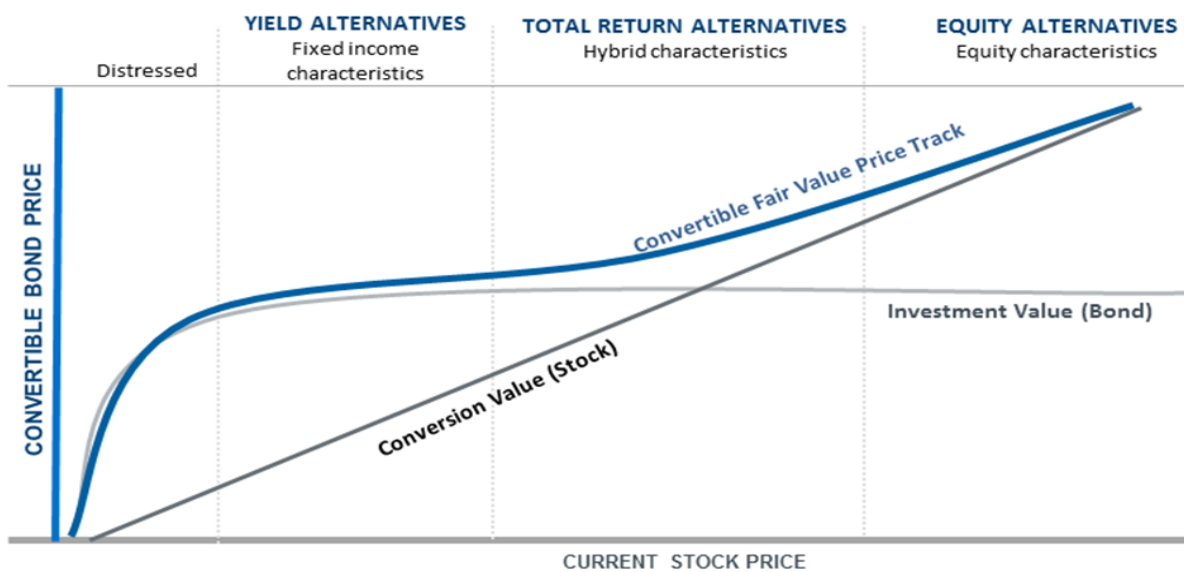
(John P Calamos, 1998)

Table 2 illustrates the results of the main model. Four of the IV tested were significant and positive (TNX, SPY, HYL and RUS). These correlation between the CS prices and the SPY and RUS may confirm our supposition that the CS purchasers are more equity driven. HYL is a fund of high yield securities. Due to the high-risk nature and increased basis spreads, these securities exhibit equity like characteristics and this test would also be a significant explanatory variable(Fridson, 1994; Ramaswami, 1991). The TNX coefficient is also positive indicating a link to our data and the risk-free yield.

TABLE 2- FIXED EFFECTS FOR ALL OBSERVATIONS IN STUDY

Parameter	Estimate	Std. Error	df	t	Sig.
Intercept	0.00019	0.00007	35486	2.795	0.5000%
VIX Return	0.00003	0.00078	35486	0.038	97.0000%
Treasury Return	0.16182	0.02334	35486	6.933	0.0000%
SPY Return	0.37554	0.01302	35486	28.853	0.0000%
High Yield Return	0.10890	0.02463	35486	4.422	0.0000%
Russell Return	0.20703	0.01026	35486	20.169	0.0000%
a Dependent Variable: CV Bond Return					

Finally, as we will see in our further test, the VIX did not reveal that volatility assumptions influence CS prices. Figure 3 is a graph illustrating the relationship between the SPY and the VIX. The graph reveals a significant variance in VIX returns. CS investors may not be able to accurately incorporate this factor into their models.

FIGURE 3 - GRAPHICAL REPRESENTATION OF RETURNS FOR THE S&P 500 AND THE VOLATILITY INDEX DURING OBSERVATION PERIOD.

Table 3 offers additional confirmation of our main model results. Note the high variance of values when considering the VIX.

TABLE 3- MEAN DAILY AND ANNUALIZED RETURNS FOR ALL OBSERVATIONS IN STUDY[2]

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[2] Mean daily prices are annualized using a daily compounding factor:

	Mean Return Daily	SD Daily	Mean Annualized	SD Ann
CV Bond Return	0.03878%	1.41%	15.201%	26.9%
Treasury Return	-0.00014%	0.31%	-0.050%	6.0%
VIX Return	0.34539%	8.89%	252.008%	169.8%
SPY Return	0.03616%	0.86%	14.108%	16.5%
Russell Return	0.03096%	1.05%	11.960%	20.1%
High Yield Return	-0.00588%	0.37%	-2.125%	7.1%

3.2 – Data Categorized by Rating

The data was categorized by bond rating to further examine the variables. Tables 4-1, through 4-3 examines the data from an issue and parity descriptive perspective using the Bloomberg Composite rating as it incorporates both the S&P and Moody's rating agencies. Issuers do not seek a rating due to the length of time involved in determining a rating and the costs associated. Industry studies do not show a wide disparity in defaults investment grade , non-investment grade and not rated (CalamosFinancialServices, 2017). We also tested our data categorizing between investment and non-investment grade. Tables 5-1 through 5-3 offers those descriptive.

TABLE 4-1 OBSERVATIONS SORTED BY RATING

Rating	N-Issuers	N	Pct.	AVG. N	SD	CV (%)
Not Rated	32	14359	40.46%	448	424.41	106%

MA=M Daily365, where MA= Mean Annualized.

The Standard Deviation was annualized using the following function:

$$SDann = SD*Sqrt(365)$$

Where SDann is the Standard Deviation annualized?

BB & B	12	10260	28.91%	855	331.08	258%
A	4	5725	16.13%	1431	197.68	724%
BBB	6	4446	12.53%	741	208.15	356%
CCC-	1	696	1.96%	697	N/A	N/A
Grand Total	55	35486	100.00%			

TABLE 4-2: ISSUE DESCRIPTIVE BY RATING

Rating	Wtd. Avg. Size of Issue ($)	SD ($)	CV (%)	Wtd. Avg. Cpn.	SD	CV (%)	Wtd. Avg. Mat. (Yrs.)	SD (Yrs.)	CV (%)
Not Rated	44,204,636	2,803,097	1577	1.77%	7.00%	2621	12.98	1.2708	1021
BB & B	43,415,094	1,371,883	3164	2.08%	0.11%	1914	7.82	0.8944	874
A	42,122,555	4,744,660	888	1.91%	0.40%	475	12.88	3.2557	396
BBB	64,253,705	9,138,488	703	6.38%	0.46%	1385	30	2.0552	146
CCC-	529,135	N/A	N/A	5.88%	N/A	N/A	2.34	N/A	N/A

TABLE 4-3 FACE VALUE ANALYSIS BY RATING

	Not Rated	A	BB & B	BBB	CCC
Mean	1.182	1.603	1.139	1.157	1.013
Standard Error	0.003	0.008	0.003	0.002	0.006
Median	1.063	1.417	1.088	1.177	1.021
Mode	1.040	2.288	0.915	1.025	1.066
Standard Deviation	0.366	0.627	0.328	0.131	0.146
Sample Variance	0.134	0.393	0.108	0.017	0.021
Kurtosis	11.246	3.132	20.409	-0.734	0.487
Skewness	2.810	1.750	3.683	-0.458	-0.834
Range	3.071	3.462	3.452	0.607	0.659
Minimum	0.679	0.912	0.654	0.807	0.628
Maximum	3.750	4.374	4.106	1.414	1.287
Confidence Level (95.0%)	0.006	0.016	0.007	0.004	0.011

TABLE 5-1 DESCRIPTIVE BY GRADE

Grade	Count of Grade	
Non-Investment Grade	25315	71.3%
Investment Grade	10171	28.7%
Grand Total	35486	100.0%

TABLE 5-2 - INVESTMENT GRADE

		Standard Deviation	Coefficient of Variation
Number of Issuers	9		
Number of Observations	10171		
Average Number of Observations	1130.11	495.02	228%
Weighted Average Issue Size by Market Value	$ 53,990,869	$ 3,925,755	1375%
Weighted Average Coupon	3.86%	1.11%	349%
Weighted Average Maturity (Years)	20.49010038	1.3778	1487%

TABLE 5-3 - NON-INVESTMENT GRADE

		Standard Deviation	Coefficient of Variation
Number of Issuers	46		
Number of Observations	25315		
Average Number of Observations	550.326087	428.28	128%
Weighted Average Issue Size by Market Value	$ 42,088,861	$ 1,363,538	3087%
Weighted Average Coupon	2.14%	0.05%	4309%
Weighted Average Maturity (Years)	7.157	0.2562	2794%

Table 6 are the results of this model.

TABLE 6- RESULTS OF PANEL REGRESSION BY RATING

Rating	VIX Coeff.	Sig.	SPY Coeff	Sig.	TNX Coeff.	Sig.	HYL Coeff.	Sig.	RUS Coeff.	Sig.
Not Rated	0.0009	0.501	0.4271	0	0.2911	0	0.0227	0.589	0.244	0
A	0.0018	0.248	0.5652	0	0.0148	0.722	-0.0283	0.523	0.1321	0
BBB	-0.0003	0.828	0.1721	0	0.4379	0	0.2652	0	0.0122	0.499
BB & B	-0.0015	0.363	0.3066	0	0.0655	0.154	0.2201	0	0.2794	0
CCC-	-0.0053	0.377	0.0529	0.655	-0.3089	0.044	0.5872	0.004	0.1899	0.031
Investment Grade	0.0008	0.431	0.3904	0	0.1671	0	0.0967	0	0.082	0
Non Inv. Grade 1	-0.0003	0.769	0.3761	0	0.1164	0	0.2469	0	0.1566	0

VIX denotes Cboe Volatility Index®, SPY (SPDR®) tracks the value of the S&P 500 Index, TNX denotes the CBOE 10 Year Treasury Note Yield Index

HYL denotes SPDR Barclays Capital High Yield Bond ETF and RUS tracks the value of the Russell 2000 Index.

1 -Non Investment grade includes those bonds which are not rated.

Interestingly the SPY results show a significant and positive relationship in all cases except for the CCC-. This may be explained by the relatively small sample set for the CCC- observation. The RUS shows the same relationship except for BBB and CCC-. The BBB data has a much longer maturity at 30 years and a above average coupon of 6.38%. CCC- data also has a higher than average coupon of 5.88%. In both cases the model indicates that these subsets are significantly and positively influenced by Treasury returns. These securities may be viewed as non-convertible debt substitutes. The BBB segment was dominated by high grade financial issuers. Consistent with our main results the VIX returns do not identify a significant relationship with CS returns. Both Investment and Non-investment Grade results mimic our main results. Given the large sample sizes this is not surprising.

3.2 – Data Categorized by Industry

Data categorized by Industry represents the following descriptive as shown in the below tables.

TABLE 7-1 - OBSERVATIONS SORTED BY INDUSTRY

Industry	N-Issuers	N	Pct.	Avg.- N	SD	CV
Technology	16	10383	29.26 %	648.94	551.89	117.58 %
Communications	13	8604	24.25 %	661.85	513.71	128.84 %
Consumer, Non-cyclical	8	5689	16.03 %	711.13	644.75	110.29 %
Financial	6	3751	10.57 %	625.17	261.77	238.82 %
Consumer, Cyclical	4	3375	9.51%	843.75	486.28	173.51 %
Utilities	4	1656	4.67%	414.00	264.71	156.40 %
Energy	3	1572	4.43%	524.00	229.24	228.58 %
Industrial	1	458	1.29%	458.00	N/A	N/A
Grand Total	**55**	**35486**	**100%**			

TABLE 7-2 - ISSUE DESCRIPTIVE BY INDUSTRY

Industry	Wtd. Avg. Size of Issue (Thousands $)	SD (Thousands $)	CV (%)	Wtd. Avg. Cpn.	SD	CV (%)	Wtd. Avg. Mat. (Yrs.)	SD (Yrs.)	CV (%)
Technology	45,103	3,115	1448	1.63 %	0.17%	959	9.66	1.21	8.00
Communications	32,427	2,196	1477	1.08 %	0.008%	1350	3.15	0.21	1528
Consumer, Non-cyclical	30,477	3,139	970	2.18 %	0.69%	316	10.32	2.34	442
Financial	125,568	22,643	554	6.82 %	0.50%	1364	30.19	2.82	1072

Consumer, Cyclical	32,427	4,779	678	0.68 %	0.21%	324	0.17	0.00	5548
Utilities	40,817	6,967	586	6.40 %	1.03%	621	30.86	4.93	626
Energy	29,064	5,495	529	4.83 %	1.34%	360	4.63	1.22	380
Industrial	20,679	N/A	N/A	5.38 %	N/A	N/A	30.86	N/A	N/A

TABLE 7-3 – FACE VALUE ANALYSIS BY INDUSTRY

	Utilities	Industrial	Energy	Cons.Ttl	Cons.Non Cyc.	Cons. Non-Cyc.	Tech	Finance
Mean	1.047	1.089	1.025	1.383	1.559	1.086	1.30	1.302
Standard Error	0.002	0.004	0.004	0.007	0.009	0.004	0.00	0.004
Median	1.025	1.092	1.000	1.151	1.306	1.022	1.17	1.258
Mode	1.025	1.086	0.952	0.935	1.095	0.942	0.91	1.238
SD	0.080	0.092	0.161	0.624	0.707	0.253	0.40	0.264
Sample Var.	0.006	0.008	0.026	0.390	0.500	0.064	0.16	0.069
Kurtosis	-0.536	-0.524	0.621	4.435	2.158	4.321	6.83	3.829
Skewness	0.329	-0.388	0.496	2.077	1.599	2.087	2.13	2.028
Range	0.441	0.432	0.879	3.695	3.695	1.458	3.45	1.555
Minimum	0.852	0.860	0.628	0.679	0.679	0.697	0.65	0.808
Maximum	1.293	1.293	1.507	4.374	4.374	2.155	4.10	2.362
Sum	2214	499	1612	12536	8868	3666	12163	4882
Count	2114	458	1572	9064	5688	3375	9359	3751
Confidence Level-95.0%	0.003	0.008	0.008	0.013	0.018	0.009	0.00	0.008

As would be expected, regarding CS Technology and Communication, those industries comprise over 50% of the observations. As previously observed Financial issues exhibit higher than average coupons and long maturities. These companies view CS issuance to improve their balance sheets and use preferred stock to achieve that purpose. The models also examined both Cyclical and Non-Cyclical Consumer Companies and these were then combined to explore further relationships that would test the hypotheses. We then turn to the regression results.

TABLE 8 – REGRESSION RESULTS

Industry	VIX Coeff.	Sig.	SPY Coeff	Sig.	TNX Coeff.	Sig.	HYL Coeff.	Sig.	RUS Coeff.	Sig.	
Communications	-0.00099	0.529	0.41079	0	0.09608	0.042	0.08617	0.083	0.32722	0	
Consumer, Non-cyclical	0.0013	0.215	0.3424	0	0.0359	0.238	-0.0032	0.918	0.1039	0	
Consumer, Cyclical	-0.0019	0.405	0.4101	0	0.0328	0.644	0.1259	0.077	0.3229	0	
Consumer, Total	0.001	0.699	0.2933	0	0.1032	0.185	0.1774	0.034	0.2582	0	
Energy	0.0002	0.917	0.1289	0	0.3279	0	0.1289	0	-0.0865	0.0001	
Financial	-0.0008	0.631	0.36715	0	0.0647	0.219	0.143	0.0009	0.3001	0	
Industrial	-0.0006	0.283	0.0126	0.862	-0.2718	0.013	0.8942	0	0.291	0	
Technology	-0.0065	0.646	0.3895	0	0.1616	0.454	0.3398	0.191	0.3795	0	
Utilities	0.0029	0.273	0.4452	0	1.2509	0	0.0015	0.986	0.074	0.048	
VIX denotes Cboe Volatility Index®, SPY (SPDR®) tracks the value of the S&P 500 Index, TNX denotes the CBOE 10 Year Treasury Note Yield Index											
HYL denotes SPDR Barclays Capital High Yield Bond ETF and RUS tracks the value of the Russell 2000 Index.											

The SPY and the RUS positive relationship to CS strongly support the contention that CS buyers are equity motivated. The TNX is significant in the Utilities, Energy, Industrial and Communications partitions.

As with the BBB segment these bonds are identified with comparatively higher rates of interest. We may conclude that CS with high coupons are more debt related, and the purchasers of such securities may see them as straight debt substitutes with an equity option. Once again, this analysis does not express a correlation of any kind with CS and VIX.

4. Conclusion and Recommendations for Further Research:

The returns of the S&P 500 and the more comprehensive Russell 2000 Index are positively and significantly associated with CS returns in virtually all our tests. There is a large variance in the FV of the CS tested as evidenced by the considerable standard deviation of FV. Therefore, given this wide distribution, we can infer that CS returns are correlated with the factors that influence equity purchases. This satisfies our first hypothesis. The limitations of this inference may arise because of the relatively limited economic period under consideration. Future research should encompass more broad CS data sets if available to further confirm this supposition. It should be noted that less stringent industry-based analysis also points to these same findings.

Treasury returns were positively linked to CS in the aggregate and when subdividing by rating. Yet the data displayed some degree of variance when subdividing the data by industry. All industries were significantly positive except for Consumer Cyclical, Finance and Technology. Overall, the data partially confirms our second hypothesis. Further experiment could be directed

at the relationship between industry and Treasuries, perhaps incorporating a non-convertible corporate debt data set to determine conclusiveness.

The results of the tests using a High Yield Index demonstrated that there is a clear connection between the returns of CS, screened by bond rating, and the determinants behind High Yield returns. This would confirm our third hypothesis as it relates to CS with lower credit ratings. Lower rated CS were positively and significantly linked to the High Yield Index. Further examination should incorporate a separate study of those bonds with lower face values. These CS are described as "busted" or distressed. A test that integrates a liquidity variable in that set of regressions may advance the understanding of CS return causes and suggest how theoretical valuation models should be adjusted. Convertibles with low face values would present the target data set that represents CS that may have the valuation issues that we have highlighted in this research. That analysis may reveal a more detailed explanation behind how CS react in severe market downturns. Given the objectives of this paper it would be logical to undertake that criterion.

There were no significant relationships regarding CS when testing volatility measurements. Thus, we would accept the null hypothesis in this test. This was surprising and may be partially explained by the high variance in returns of the VIX. Perhaps the CS investor cannot reasonably forecast future volatility and ceases to incorporate that variable substantially and correctly in model assumptions.

As a final note on the significance of this study, the strong connection between four of our independent variables and the wide range of convertible securities tested indicate that that the same influences affect both the convertible asset class and the equity sector. This may be due to the nature of the convertible investor who may be equity biased and unsophisticated or, in the case of the hedged buyer, relatively indifferent to realizing exact fair value. It may also be a function of illiquidity. In either case there may be a failure to value these securities properly as they become more bond like. In summary, our experiment infers a linkage between convertible trading impulses and ordinary equity impulses. The problem arises in that the convertible is a hybrid instrument that becomes bond like as markets trade down and illiquidity factors ensue. In that scenario, for the reasons, the convertible asset class may suffer in an inordinate way.

Given the scarce research in this area there may be fertile ground to further understand why convertible securities do not perform as promised in periods of uncertain probability. Industry research evidence concern on this subject. Undertaking more specific and inclusive research, including further subdivisions of CS tested and perhaps an industry survey, may lead to the construction of more precise convertible valuation models.

Appendix A

Convertible Bond Adjusted Duration:

To calculate the convertible adjusted duration (Dcv) or the convertible bonds' interest rate sensitivity we then use the following calculation:

$$Dcv = Dadj(1 - ((Cvl/IV)/2)$$

Where, C is the convertible securities' conversion value (Cvl) , and IV is the investment value(Brooks & Attinger, 1992; John P Calamos, 1998; Fabozzi, 2005).

Given that the convertible bond has an embedded equity option component the investor must adjust bond duration in consideration of the equity feature This equation must consider the conversion value of the security. As previously mentioned, formula is as follows:

$$Dcv = Dadj(1 - ((Cvl/IV)/2)$$

We note that the adjusted duration is multiplied by quotient that considers the convertible value divided by the investment that and then halved. This is a shortcut to adjust the convertible for the diminishing effect the equity option. The Calamos text explores this relationship in more detailed circumstances (John P Calamos, 1998; Ho & Pfeffer, 1996):

"The duration of the convertible security can be explained as a function of:

$$Dcv = \partial Sv(t)/\partial i = f\int \blacksquare [\partial Sv(t)/\partial i, \partial K/\partial Sv(t), \partial Wv(t)/\partial K, \partial Wv(t)/\partial K]$$

Where= i = long-term rates

The dollar change in the straight bond value with respect to interest rate changes can be expressed as:

$$\partial Sv(t)/\partial i = Sv(t)1 + 0.1((tii/1 + ym)^{\wedge}i)/Sv(t)) - Sv(t)$$

The dollar changes of the adjusted exercise price with respect to the dollar change in $Sv(t)$ can be expressed as:

$$\partial K/\partial S(t) = ((\partial Sv(t)/\partial di)/Cr(t))$$

The dollar changes in the Wv(t) with respect to the dollar change in the adjusted exercise price can be expressed as:

$$\partial Wv(t)/\partial i = Cr(t) - e^{\wedge}(- rT) N(H - \partial\sqrt{T})$$

The dollar change in the Wv(t) with respect to the percent change in interest rates can be expressed as:

$$\partial Wv(i)/\partial i = Cv(t)TKe^{\wedge}(- rT) N(h - \sigma\sqrt{T})$$

Where:

$Cv(t)$ = convertible value

$Sv(t)$= straight bond value

i = long-term interest rates

k = exercise price

$Wv(t)$ = warrant value

t = time

Ym = straight bond value discount rate

$Cr(t)$ = Conversion ratio

T = Period security is protected from a company call

e = exponential function

∂ = Partial derivative or derivative notation

σ = stock's variance

N = univariate cumulative normal distribution

h = upper limit of integration

These relationships indicate that the convertible security is sensitive to interest rate changes. The long bond rate clearly effects the investment value or the bond portion of the convertible. Higher rates indicate lower bond value and, conversely, lower rates boost the value of the bond piece. Short term interest rates also affect the convertible. In this case the movement of short-term rates will either increase or decrease the optionality of the convertible. Higher short-term rates increase the option value as an option represents, he substitution of an equity investment. In this case capital not invested in the actual equity while still controlling a similar amount of equity, through increased gearing in the convertible security, can be reinvested at higher rates. This makes the option more valuable to the convertible holder. Lower rates would do the opposite. Shifts in the yield curve have opposing effects on the convertible security. Assuming the shifts are flat in nature, the inverse relationship between the long rates effect on the bond portion and the short rate effect on the option portion may cancel each other out. The Black Scholes model calculates this "equity substitution affect " as short term interest rates are an important variable in option valuation(Baumol et al., 1966; Black & Scholes, 1973; Cohen, Black, & Scholes, 1972; John C. Cox et al., 1979; Karoui, Jeanblanc‑Picquè, & Shreve, 1998; Merton, 1976).

Appendix B

Convertible Arbitrage Example

The convertible arbitrageur attempts to exploit the difference between the mispricing of the convertible security and its' underlying equity. The arbitrageur seeks to calculate the securities delta. That is the movement of the convertible security per movement in the underlying stock. This can be accomplished through either a simple regression using past prices, or using convertible modeling using a Black Scholes estimation of the convertibles option.

The proper hedge ratio depends on where the convertible security trades within the pricing continuum. Deep in the money convertibles trade in an almost 100% movement with the underlying common and would require a full hedge. The arbitrageur will collect a cash flow (see below) and if the equity trades down dramatically may realize a profit by covering the underlying shares and selling the bond for a net profit. Bonds that are "busted" or where the stock has precipitously declined have very little sensitivity to the common stock may be held as fixed income alternatives.

Finally, the convertible that has a conversion price close to the underlying equity are most common and are most popular to the arbitrageur. If the common appreciates the arbitrageur can profit from the gain on the unhedged position. Alternatively, if the common declines the gain realized from the short stock position should be greater than the bond loss. The following example is used to illustrate this situation:

Conventional margin requirements allow the arbitrageur to leverage a hedged position. The arbitrageur is required to invest approximately 10% of the hedged position and 25% of the unhedged position when employing a hedged strategy.

This can be expressed as follows:

$$CVhdg = \Delta * cvr$$

$CVhdge$ = Convertible hedge = Delta of the Convertible Bond * Hedge Ratio.

$$Mr = .1 * (1 - \Delta * cvr) + .25 (\Delta * cvr)$$

Margin required (MR) = 10% of the hedged portion + 25 % of the unhedged portion.

If the arbitrageur purchases a convertible security with a 5% yield advantage versus the underlying common, in a 75% hedge, the cash flows would be as follows (if we assume borrowing rates of 5% and short rebates of 2% as could be expected in normal markets, the difference of these two rates can be thought of as the fee charged by prime brokers for the use of financing (Agarwal, Fung, Loon, & Naik, 2011)):

Capital Required= $137.5 (25%*250)+(10%*750)

Capital Borrowed= $862.5 (1,000-137.5)

A. Long Coupon=   +$50   (5%*$1000 Principal Amount)

B. Short Rebate @2%=   +$15   (2%*$750)

C. Borrowing Cost=   -$43.125 (862.50*5%)

Net Cash Flow =   +21.875 (A+B-C)

Annual ROR=   15.9% (21.875/862.5)(E. Strafaci, 2019).

"The daily returns for a position i on day t are calculated as follows:

where Rit is the return on position i at time t, PC B

Rit = PC B it − PC B it−1 + Cit − Δit−1_ (PU it − PU it−1 + Dit) _ + rt−1Si,t−1 / PC B it−1 + Δit−1PU

it−1

Where it is the convertible bond closing price at time t, PU it is the underlying equity closing price at time t, Cit is the coupon payable at time t, Dit is the dividend payable at time t, _it−1 is the delta neutral hedge ratio for position i at time t − 1 and rt−1Si, t−1 is the interest on the short proceeds from the sale of the shares. Daily returns are then compounded to produce a position value index for each hedged convertible bond over the entire sample period (Hutchinson & Gallagher, 2010)."

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Exploration of Mental Health Literacy of young adult college students in the U.S.

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Abstract

Mental health declines are a significant problem for the U.S. population. They affect people of all groups, though some more than others. Researchers have suggested that greater mental health literacy could improve people's help-seeking behavior. As knowledge increases, so does a person's willingness to seek help, for a variety of reasons ranging from reduced stigma to a better understanding of how it can support them. Unfortunately, many people have poor mental health literacy and consequently seek help less. This can lead to long-term declines in mental health and severe negative outcomes, including suicide. In the present study, we gauge the mental health literacy of young adult college students in the U.S. to determine whether greater mental health literacy is needed to improve help-seeking behavior. We generated descriptive statistics detailing mental health literacy in the target population; the results suggested that they had sufficient mental health literacy, and improvements in this may not be needed to encourage help-seeking behavior. Alternative steps may be necessary, such as increasing the availability of mental health services. Such approaches may more effectively increase help seeking and improve mental health.

Mental Health Literacy Exploration

Mental health is important at all ages and in all demographic groups. An estimated 70% of mental disorders can be diagnosed before a person turns 25. On average, 34.7% of White people will experience depression, as will 24.6% of Blacks and 19.6% of Hispanics (American Psychological Association [APA], 2016); 11.2% of adults over 18 feel worry, nervousness, and anxiety (Center for Disease Control [CDC], 2020), and 4.7% experience regular feelings of depression. Further, approximately 18% of U.S. adults experience a diagnosable mental disorder in any given year, and an estimated 56.8 million people will receive diagnoses of mental, behavioral, or neurodevelopmental disorders from their physicians. And there are significant consequences when mental health disorders go undiagnosed; these ones lead to an estimated 4.8 million emergency department visits and contribute to 48,344 suicides every year. Yet people with mental health problems often do not find help. Some refuse to seek help due to cultural attitudes (APA, 2016). However, this is only one contributor to poor mental health literacy and whether people seek help for mental health problems (Brijnath et al., 2016).

Mental health literacy is an important contributor to the mental health treatment gap (Brijnath et al., 2016). Individuals with greater mental health literacy are more likely to seek help for mental health problems. Researchers have noted that mental health literacy is associated with use of mental health services (Bonabi et al., 2016). An examination of longitudinal data indicated that mental health literacy is a predictor of such use, and specifically increased people's likelihood of using psychotherapy and psychiatric medications in the following six months. Thus, the data indicates that mental health literacy increases not just help seeking in general, but

specific types of help seeking.

The connection between mental health literacy and help seeking is not limited to the United States. Researchers have found that it holds in the U.K. as well (Gorczynski et al., 2017). An examination of young people in that country indicated that women had better mental health literacy and thus might be more likely to seek help when necessary. Conversely, men were at greater risk of not obtaining mental health support when necessary.

Several attempts have been made to improve mental health literacy in various contexts. A systematic review of interventions among adults indicated that not all interventions have equivalent outcomes (Brijnath et al., 2016). It showed that web-based interventions targeting mental health literacy were more successful if they included active components that engaged the participant. This could be done by structuring and targeting an intervention toward a specific population. It was simultaneously observed that people with both mild and moderate depression saw improvements, suggesting the tailored programs were effective.

Improving mental health literacy among younger people requires several components (Kutcher et al., 2016), including teaching them how to obtain good mental health, helping them understand mental disorders, reducing stigmas toward mental disorders, and enabling them people to find help more effectively. Thus, improving mental health literacy revolves partly around improving people's attitudes toward and general knowledge of mental health.

The literature suggests a significant prevalence of mental health problems in the American population. Yet despite this, many people do not receive treatment. This can have negative consequences, including suicide. Although people might not seek treatment for many reasons, one contributor is poor mental health literacy. Mental health literacy has been linked to increased help seeking, so it is a matter of public concern that the general public be well informed about mental health. While many college campuses offer mental health counseling services, and utilization rates are increasing, their proportional usage is low especially among males, who often deal with poor mental well-being by adopting unhealthy coping strategies (DeBate, Gatto & Rafal, 2017).

Methods

This cross-sectional study was conducted on the Queen's Campus of St. John's University with 206 male and female college students. Research integrity and compliance approval for this study was provided through the St. John's University Institutional Review Board (IRB ID: 0519-349 Initial). The inclusion criteria for this study included: a) college students of St. John's University that provided informed consent for participation; & b) students age 18 and older.

College students were recruited on campus at open booths on campus, where they were informed about the study, provided consent for participation, and given the opportunity to complete the validated and reliable Mental Literacy Scale, created by Dr. Matthew O'Conner. The research team reached out to Dr. O'Conner to request for permission to use the Mental Health Literacy Scale, and he graciously granted his approval for the use the scale. Data was collected between August and November of 2019. Descriptive statistics for the study analyzed

SPSS statistical software (version 25).

Results

   Mental health literacy has been defined as awareness of and beliefs about mental illnesses that help one identify, manage, or prevent them. Literacy in mental health requires the ability to identify disorders; knowledge of how to look for information on mental health; knowledge of risk factors, causes, self-treatment, and available clinical support; and behaviors that encourage recognition and help seeking. This study used the mental health literacy scale (MHLS), with the permission of Dr. Matthew O'Conner, the author of the MHLS. The MHLS is a 35-item univariate scale that uses 4- and 5-point Likert responses ranging from 1 = very unlikely to 4 = very likely; 1 = very unhelpful to 4 = very helpful; 1 = strongly disagree to 5 = strongly agree; and 1 = definitely unwilling to 5 = definitely willing. Twelve items are negatively worded and were reverse coded. The sum of the responses, ranging from 35–160, provides an overall measure of mental health literacy.

   The MHLS was administered to N = 206 participants to measure its overall reliability and to assess the participants' mental health knowledge. The reliability of the scale was measured by conducting Cronbach's alpha, a measure of internal consistency. A general accepted rule is that an α of 0.6–0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level (Serbetar & Sedlar, 2016). Cronbach's alpha for the MHLS was 0.897.

   The sum of the responses to the Likert items ranged from 81 to 150 (M = 122.16, SD = 15.74). Skewness and kurtosis statistics were calculated to assess the normality of the responses. The results suggested that the deviation of the data from normality was not severe, as the values of the skewness (–.392) and kurtosis (–.485) indexes were between –3 and +3 (Kline, 2011). Figure 1 depicts a histogram of scores, which suggests an approximately symmetrical and mound-shaped distribution.

Figure 1

Distribution of Overall Mental Health Literacy Scores (M = 122.16, SD = 15.74).

Histogram
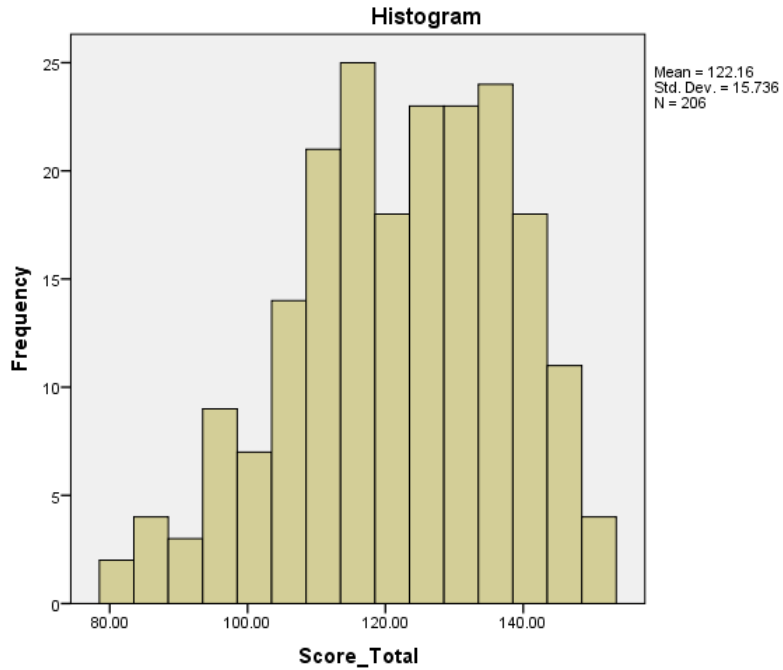
There were no outliers as assessed by the standardized scores, which fell between –3 and +3, indicating no extreme outliers. The individual responses are depicted in Table 1. Items 1 through 14 ranged from 1 to 4, and items 15 through 35 ranged from 1 to 5. The individual responses were approximately normally distributed, with skewness and kurtosis values from –3 to +3.

Table 1

Responses to Question Items

	Min	Max	*M*	*SD*	Skewness	Kurtosis
Q1	1.00	4.00	3.04	.70	−.663	.995
Q2	1.00	4.00	3.15	.68	−.378	−.077
Q3	1.00	4.00	2.96	.80	−.268	−.623
Q4	1.00	4.00	3.19	.80	−.652	−.352
Q5	1.00	4.00	2.80	.76	−.451	.098
Q6	1.00	4.00	2.93	.76	−.486	.125
Q7	1.00	4.00	3.40	.77	−1.081	.403
Q8	1.00	4.00	3.37	.77	−1.066	.548
Q9	1.00	4.00	2.70	.75	−.003	−.421
Q10_Rev	1.00	4.00	2.63	.68	−.391	.079
Q11	1.00	4.00	3.23	.78	−.732	−.098
Q12_Rev	1.00	4.00	2.68	.81	−.487	−.127
Q13	1.00	4.00	3.04	.65	−.567	1.134
Q14	1.00	4.00	3.33	.84	−1.089	.405
Q15_Rev	1.00	5.00	2.93	.95	−.449	−.507
Q16	1.00	5.00	3.74	1.08	−1.037	.754
Q17	1.00	5.00	3.87	1.05	−1.058	.760
Q18	1.00	5.00	3.71	1.08	−.724	.022
Q19	1.00	5.00	4.00	1.01	−1.225	1.479
Q20_Rev	1.00	5.00	3.94	1.20	−.886	−.258
Q21_Rev	1.00	5.00	4.24	1.06	−1.425	1.364
Q22_Rev	1.00	5.00	4.38	.95	−1.652	2.277
Q23_Rev	1.00	5.00	3.67	.99	−.284	−.440
Q24_Rev	1.00	5.00	4.39	.95	−1.607	2.129
Q25_Rev	1.00	5.00	3.64	1.10	−.475	−.467
Q26_Rev	1.00	5.00	4.35	.97	−1.771	3.001
Q27_Rev	1.00	5.00	4.06	1.03	−.854	−.127
Q28_Rev	1.00	5.00	4.11	1.04	−1.141	.750
Q29	1.00	5.00	3.32	1.11	−.304	−.466
Q30	1.00	5.00	3.80	1.08	−.747	−.093
Q31	1.00	5.00	3.86	1.09	−.817	.052
Q32	1.00	5.00	3.63	1.11	−.546	−.363
Q33	1.00	5.00	3.53	1.12	−.281	−.668
Q34	1.00	5.00	3.13	1.19	−.082	−.739
Q35	1.00	5.00	3.46	1.12	−.321	−.500

To determine whether each individual response was significantly different from a neutral response, a one-sample t-test was conducted. These are used to determine whether a sample mean response differs significantly from a hypothesized mean. For items 1 through 14, whose values ranged from 1 to 4, the sample means were tested against the neutral response of 2.5. Table 2 depicts the results. All 14 items had a significant positive mean difference, indicating that the mean response was significantly greater than 2.5. This suggests that the respondents gravitated toward the "Likely" side of the Likert scale.

Table 2

One-Sample T-Test Items 1 through 14

	Test Value = 2.5			Mean Difference	95% Confidence Interval of the Difference	
	t	*df*	*p*		Lower	Upper
Q1	11.090	205	.000	.54	.44	.63
Q10_Rev	2.750	205	.007	.13	.04	.23
Q11	13.316	205	.000	.73	.62	.84
Q12_Rev	3.202	205	.002	.18	.07	.29
Q13	11.825	205	.000	.54	.45	.63
Q14	14.237	205	.000	.83	.72	.95
Q2	13.661	204	.000	.65	.55	.74
Q3	8.162	204	.000	.46	.35	.57
Q4	12.405	205	.000	.69	.58	.80
Q5	5.674	205	.000	.30	.20	.41
Q6	8.137	205	.000	.43	.33	.54
Q7	16.752	205	.000	.90	.79	1.00
Q8	16.169	205	.000	.87	.76	.97
Q9	3.808	205	.000	.20	.10	.30

For items 15 through 35, whose values ranged from 1 to 5, the sample means were tested against the neutral response of 3.0. All the items but number 34 had a significant mean response

greater than 3, indicating that respondents leaned toward the "Agree" side of the Likert scale. Item 34 asked, "How willing would you be to vote for a politician if you knew they had suffered a mental illness?" The responses to this did not differ significantly from a neutral response.

Table 3

One-Sample Test Items 15 through 35

	Test Value = 3			Mean Difference	95% Confidence Interval of the Difference	
	t	*df*	*p*		Lower	Upper
Q15_Rev	−1.027	205	.306	−.07	−.20	.06
Q16	9.907	205	.000	.74	.59	.89
Q17	11.978	205	.000	.87	.73	1.02
Q18	9.391	205	.000	.71	.56	.86
Q19	14.146	205	.000	1.00	.86	1.13
Q20_Rev	11.224	205	.000	.94	.78	1.11
Q21_Rev	16.725	205	.000	1.24	1.09	1.38
Q22_Rev	20.807	205	.000	1.38	1.25	1.51
Q23_Rev	9.619	205	.000	.67	.53	.80
Q24_Rev	20.980	205	.000	1.39	1.26	1.52
Q25_Rev	8.371	205	.000	.64	.49	.79
Q26_Rev	19.868	205	.000	1.35	1.22	1.48
Q27_Rev	14.790	205	.000	1.06	.92	1.20
Q28_Rev	15.317	205	.000	1.11	.97	1.25
Q29	4.081	205	.000	.32	.16	.47

Q30	10.617	205	.000	.80	.65	.94
Q31	11.329	205	.000	.86	.71	1.01
Q32	8.071	205	.000	.63	.47	.78
Q33	6.752	205	.000	.53	.37	.68
Q34	1.578	205	.116	.13	−.03	.29
Q35	5.848	205	.000	.46	.30	.61

Discussion

The MHLS was administered to $N = 206$ participants at a university to assess their mental health knowledge. Cronbach's alpha for the MHLS was 0.897, which is considered very good reliability. One-sample t-tests were conducted to determine whether the responses were significantly different from a neutral response. There were no severe violations of normality as assessed by skewness and kurtosis indexes. The t-tests revealed that on average, people agreed with the statements provided to them. For one item, on whether the person would vote for a politician who had had mental illness problems, the overall mean response was neutral.

The current study suggests that in general, the college population has an adequate understanding of mental health. There was wide agreement with the statements and a general knowledge of the importance of addressing mental health problems. Although this knowledge did not increase participants' willingness to vote for a politician with a mental health problem, suggesting some remaining stigma toward such problems, there remained a generally healthy body of knowledge about the normality of mental health problems, the availability of mental health services, and the importance of seeking treatment. These findings suggested that there were adequate services and resources on the campus to educate individuals about the importance of mental health and seeking help when necessary. Making knowledge-based resources more widely available on campus would seem to be an ineffective use of limited resources, given that mental health literacy seemed sufficient in the target population.

The findings were limited by the small sample; however, these findings still have implications for public policy and mental health care. In general, there was an understanding that mental health problems needed to be addressed, and that there was little need for the common stigmas surrounding them. As such, it may be more important to address access and availability. As attitudes were generally positive toward addressing mental health problems, it may be possible to improve mental health treatment by prioritizing access and availability. Despite this, ongoing efforts should be made to improve mental health literacy in the population.

Conclusion

Mental health treatment remains an ongoing issue in the United States given its potentially severe consequences, including suicide. One way to improve help-seeking behavior is to ensure mental health literacy. The current study suggests that mental health literacy is high, even though the sample was limited in size. Given these findings, the priority for policymakers

may be widening access to mental health services. But it will remain important to continue ensuring that mental health literacy in the population is high.

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A Case Study on the Effectiveness of
Online Teaching During 2020 COVID-19 Pandemic:
Reflections on the Issues of Student Engagement

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Abstract

Due to the contagious and deadly impact of The Covid-19 Pandemic, educational institutions across the globe especially, the institutions in Higher Education had to quickly implement online teaching pedagogy. This paper is a case study of successful implementation of instructional strategies of student engagement in the online teaching platform during the Spring and Fall of 2020. These instructional strategies were adopted in eight classes in two semesters at Savannah State University in Georgia. The case study developed various methods to involve and engage students in the active learning process for online teaching without compromising the learning quality. The author claims that these strategies, if adopted, will help in designing a successful online that ensures maximum student engagement. Activities included the following steps: introducing and training students in the easy to use online tools of learning and then make them comfortable into the virtual classroom environment; guiding students with an obvious set of expectations before they commence their studies entirely online; develop personal rapport with the students through the use of social media; conducting regular virtual WebEx meetings; conducting online class discussions through the use of varieties of tools imbedded in D2L (Desire To Learn Platform); providing details on-time feedback on the individual classwork; collecting feedback on different teaching methods from the students at the end of the semester. Based on the student feed-back, the author concludes that the teaching method as outlined played an effective role in enhancing student learning during the Covid-19 Pandemic. Therefore, these instructional strategies may serve as very useful teaching tool in engaging students in the online classes.

Introduction:

The sudden eruption of the COVID-19 worldwide completely disarrayed the whole gamut of traditional human and social lives, especially the academic environment. As a result, the bewildered organizational leadership had to take possession of the organizational dynamic homeostasis's radar. The World Health Organization (WHO 2020) officially declared Covid-19 a pandemic as coronavirus caused a severe acute respiratory syndrome affecting students and

teachers worldwide and caused educational institutions to close everywhere due to this pandemic. It is estimated that approximately 862 million people around the globe were affected by the pandemic. According to Viner et al. (2020), Covid-19 impacted roughly half of the world student population, and 29 countries closed their educational institutions a week before the official announcements (UNESCO, 2020a, b).

In the field of higher education, where this author spent most of the adult life, saw a complete homeostatic metamorphosis defying all odds of large-scale online teaching and learning. Leveraging the nascent technology of reaching primarily to the adult non-traditional student cohort, the academic institutions are now compelled to use the same to allow mass access only to help them graduate on time. The gritty tasks of harnessing online pedagogy under the institutional (accrediting bodies') quality matrix while operating under a mode of "learn as you go" was indeed the toughest challenge of the highest magnitude the higher education ever faced. As is known, the crisis of the last two semesters (since COVID-19 has begun during late Spring 2020) taught us more than years of experience in student learning and engagement in the distance education platforms. Admittedly non-traditional institutions such as the University of Phoenix, National University-- catering mostly to non-traditional adult students may claim strategic expertise in the process, but by and large, the traditional 18-22 age cohort we deal with were afraid, apprehensive of the unfamiliar, unexpected shift of learning methods and the norms of the student engagement.

It was assumed in the past that minimizing social contacts can reduce influenza outbreaks (Jackson, Vynnycky, & Mangtani, 2016). Almost all higher education institutions, exclusively universities in the USA, moved toward online teaching mode, getting students educated online by sitting in front of a computer at home. UNESCO reports that 61 countries were enforcing closures of higher educational institutions that include regions of continental Africa, Asia (including Middle East), Europe, and America (UNESCO, 2020a, b). In this paper this author shares the experience and outcomes of a case of year-long application of available distance education tools in engaging students in learning at traditional public institutions of higher education in the USA.

The author taught fully online courses during the Spring and Fall semesters in 2020, where he continually experimented with the best practices for online student engagement.

What follows, therefore, is the reflection of the author's own experience of experimenting and teaching fully online courses at Savannah State University (SSU). The author reviewed available platforms and strategic suggestions for creating a dynamic learning environment. He integrated the institution specific student values and voices, synchronous and asynchronous modes into an active and engaged learning process. He used this "unique" learning process in all his four courses during the fall semester of 2020.

The author did use commonly identified critical course/teaching objectives, action plans, and student learning outcomes in the course outlines. He used an institution specific D2L LMS (Learning Management System) as the online course management platform. As a D2L certified instructor, the author integrated and leveraged the available instructional technologies such as

WebEx and Zoom to maximize faculty-student interactions, teaching with the usual annotated teaching notes (PPT), video clips, and other student learning activities. To boost the student-to-student interactions, he manipulated engagements in collective course activities such as virtual groups and teams with mechanisms for direct individual feedback. The author reported that the student satisfaction index and course objectives did not significantly differ from the previously taught face-to-face pedagogical format. He considered his effort a success, and that is why he ventured to write about it. The goal setting followed by the action steps he pursued in conformity with the contingency plan of Savannah State University during the Pandemic class sessions. Furthermore, it suggests strategies, which will be beneficial in online learning. The study reveals ten instructional strategies for successful online teaching in similar pandemics.

Theoretical Framework and Review of Literature:

The Covid-19 Pandemic compelled educational institutions in general and higher education, in particular, to offer courses online worldwide. Even though higher education transformed face to face practices entirely online, the transition left many faculty members still struggling to engage students in active learning online. They were required to select different strategies of student engagement from asynchronous and synchronous methods. Before the pandemic hit the education system, faculty members used different strategies and tools in engaging students in blended and flipped classrooms built in other LMS (learning management systems) while fully online courses and tools built in LMS are left with faculty members to engage students in an active learning process. According to Kahn and et. al, (2017), a positive relationship between online learning tools, student engagement, and education outcomes was revealed.

It is documented in different studies that in the aftermath of natural calamities such as floods, cyclones, earthquakes, hurricanes, and so on, teaching and learning become a challenging task and disrupt educational processes for the academic institutions worldwide. According to World Vision International (2020) a one hundred million students worldwide suffer every year by natural disasters. They face disruption to their schooling causing situations of crisis and conflicts as the biggest hurdles in the normal delivery of education in the institutions. It is also revealed by Di Pietro (2017) that many of the students and faculty impacted by the natural crisis suffer from stress, fear, anxiety, depression and insomnia that lead to diverted concentration and focus from the study and often disrupts their lifestyle.

Chang-Richards et. al, (2013) find that academic institutions become more resilient and find new ways to continue teaching-learning activities. A case in point is that Italy experienced three violent and powerful earthquakes in 2016 which caused massive devastation in a number of areas and more than one million people were affected with severe loss of life and property. In that situation, one of the world's older universities, the University of Camerino, suffered a considerable loss and brought the university into a structural crisis. Many students suffered from homelessness and were deprived of learning. In that situation, the leaders of the university devised plans to keep the educational processes to continue by using WebEx provided by Cisco.

WebEx provided technical assistance to the university and instructors to design instructional programs and to share notes and presentations with students. Ultimately the university became proficient with e-learning protocols and techniques. Since then, they integrated themselves well into an e-learning world. The experiment assured students and instructors about the efficacy of online teaching platforms. While recognizing the value of face-to-face instruction methods, e-learning can be used together with the traditional method to enhance the efficiency, effectiveness, and thereby attain the competitive edge of quality education (Barboni, 2019).

Todorova & Bjorn-Andersen (2011) find that information technology and online learning allowed the University of Canterbury (New Zealand) to restart its academic operations of teaching and learning following an earthquake of 6.3 magnitude in Christchurch which caused the university to collapse in February 2011. In the U.S., the Southern University in New Orleans converted itself into an e-learning campus after the violent hurricane caused Havoc (Omar et al., 2008) there. As mentioned earlier, the Covid-19 Pandemic made schools, colleges, and universities face lockdowns to curb the further spread of the CoronaVirus. Almost all academic institutions worldwide adopted online learning to avoid complete shutdown of academic processes.

Moore and Greenland (2017) found that online course offerings made education flexible and inclusive, particularly for adult learners, while it opened opportunities for a marginalized group of students. This is also true for different higher education institutions where students work per time and full-time to afford their educational expenses. An Australian study (Stone, 2019) found that students who come from low socio-economic backgrounds, or the first-generation learners, and students of color and, of disabilities are the most beneficiaries of online course offerings.

It is also evident from a study by Loveland (2017) online courses appealed to newer generations, including the Millennials and Gen Z, as they have been born during the IT revolution and embraced it quite early in life. The study also finds that online courses appeal to the new generation of students because: they are comfortable using digital technology; the practical learning enrichment; personal engagement in learning activities. In a study on the active learning process, Zayapragassarazan and Kumar (2012) found that online teaching and learning enhance interactive, collaborative, cooperating, peer teaching, and collaborative learning. A similar study found that online learning makes students actively involve themselves in better understanding and other higher-order functions instead of mere knowledge retention. Ritchhart and Morrison (2011). According to Dumford & Miller (2018) and Thurmond & Wambach (2004), usage of technology in online teaching helps faculty members enhance their ability to communicate mass to mass, allow them to organize students better, and is easier to oversee students which is especially important in the collaborative learning process. And online classes are beneficial in encouraging asynchronous interactions between teachers and students, which promotes engagement, comprehension and reflections—i. e. activities that are positively linked with active learning principles (Kahn et al. in 2017; and Robinson & Hullinger in 2008).

Research Methodology:

A Case Study based SWOT matrix was used in this study as it was easily understood, flexible, and focused on change in outcomes. It was used as a primary decision-making tool to examine SWOT quadrants to concentrate on the usage of online teaching's strengths, weaknesses, opportunities, and threats (Kotler & Armstrong, 2016; Santos E & Zanca, N., 2018) relative traditional F2F teaching method (Helms & Nixon, 2010, 216) in the academic institutions. According to Helms & Nixon (2010), a SWOT matrix was used by individuals, businesses, government, and NGOs as an assessment tool for strategic planning. The author incorporated SWOT analysis for face-to-face vs. online line teaching during COVID-19 Pandemic to review and analyze the internal and external environmental conditions in which the higher educational institution operate and classify them as strengths, weaknesses, opportunities and threats. The author takes the stakeholders' perspective of an educational venture. Per assumption, the opportunities and threats occur in the external environment and are difficult to predict or control from the stakeholders' perspective. The SWOT analysis format provided as an easy-to-read chart (see figure 1) illustrating the internal and external factors affecting the academic institutions.

The SWOT analysis identified many deficiencies identified by Pickton and Wright (1998) as the inadequate definition of factors, lack of prioritization of factors, and compiler bias. Their study also pointed out that inadequately defined factors can be situated in more than one SWOT quadrant, that a typical analysis does not rank the importance of various factors, and that managers are subject to various types of bias, including their personal opinions.

Objectives of the Study

1. To explore different strategies of engaging students in online teaching during Covid-19 Pandemic.
2. To conduct a Strengths, Weaknesses, Opportunities, & Threat (SWOT) analysis of online learning during the Covid-19 pandemic and natural disasters.
3. To give some suggestions and recommendations for the success of online mode of learning during a crisis period.

The Case Study:

A descriptive case study at a public institution was undertaken to explore the efficacy of various methods of engaging students in online teaching and learning during the Covid-19 crisis. Previous SWOT studies on online courses provided the framework for this study. A qualitative research method was deployed for a systematic review of secondary data on the subject literature from (a) journal articles, (b) research reports, (c) search engines, (d) institutional websites, (e) conference papers, and other academic (institutional) publications.

Discussion: SWOT Analysis of Online Teaching and Learning During Covid-19 Pandemic

Strengths	Weaknesses
1. Increased efficiency of content delivery using different tools embedded on LMS.	1. Adaptation of technological difficulties.
2. Making available and accessing specific learning materials specific to the targeted topic by creating hyperlinks of learning materials available on the internet—YouTube videos, research articles, and other learning materials.	2. Technical difficulties may cause a slow-down teaching-learning process--being unable to learn on their own due to isolation, weak technology skills, and lack of a work ethic.
3. Adaptation of varieties of students' learning styles.	3. Lack of face-to-face interaction/direct communication between teacher and learner.
4. Students may gain self-directed learning skills.	4. Learner's capability & confidence level may cause learning to be affected.
5. Time flexibility—students value flexibility; find time and place convenience results in increased efficiency.	5. Lack of opportunity to learn hands-on skills (especially in the STEM field).
6. Location flexibility--students are liberated from the constraint of place with asynchronous online learning (Sanford et al., 2017).	6. Distractions, frustration, anxiety & confusion may be unable to shift from a face-to-face learning model to an online interface.
7. Opportunity of catering to a wide audience.	7. Learners may undergo face-to-face separation anxiety.
8. Increased chance of achieving a four-year graduation goal.	8. Varied in their readiness for the tasks ahead (Comer et al., 2015),
9. Wide availability of courses & content.	9. Lack of awareness of the time commitment and organizational skills required for course completion (Fetzner, 2013).
10. Written detail feedback on assignments enhances improved student-professor interaction through faster information and direct feedback exchanges (Taylor, 2002).	
11. Improved transparent in multi-dimensional communication in course delivery.	

12. Increased attendance rate in Synchronous mode due to fixed scheduled time in WebEx class meetings.	
Opportunities 1. Scope for Innovation & digital development. 2. Designing flexible programs. 3. Strengthen skills: problem solving, critical thinking, & adaptability. 4. Users can be of any age. 5. An innovative pedagogical approach. 6. A radical transformation in all aspects of education. 7. Self-regulated learning.	**Threats/Challenges** 1. Unequal distribution of ICT Infrastructure. 2. Timely response to student's inquiry. 3. Creating community of learning: student-instructor and student-student interactions. 4. Teaching presence and social presence. 5. Prevent plagiarism. 6. Lack of digital literacy. 7. Lack of internet access/digital divide. 8. Technology cost & Obsolescence. 9. Quality of instruction. 10. Lack of Time management skill. 11. Lack of Self-regulation. 12. Lack of self-motivation. 13. Online learning is perceived as an easy method of learning by learners.

Fig 1: Illustration of SWOT for Online Teaching During Covid-19 Pandemic

Instructional Strategies to Engage Students in Learning Activities in Journalism and Mass Communications Students During Covid-19 at Savannah State University

1. **Introducing online orientation:**

    While adhering to social separation guidelines, by using WebEx, the author conducted online course orientation exercises for the students to "unfreeze" and make them comfortable in the virtual classroom environment. During the first week, students in all of the author's 4 classes gained proficiency in the use of online learning methods, navigation tools, and essential protocols of student-teacher interactions. The students also learned netiquette to function in an ethical digital environment. To engage students in the new instructional technology, the author remained available and accessible 24/7 via the varied media available to him and his students. Staying relevant, staying accessible, being always ready to help, and proactively monitoring students' progress worked well to get the students' buy-in. The author used a combination of WebEx, WhatsApp, e-mail, Discussion Board, Announcements, virtual forum, video feedback, video annotated lecture notes, and virtual team meetings to maintain a high-level student-faculty engagement in these classes.

2. **Setting expectations:**

    The author guided his students with an obvious set of expectations before they commenced their studies entirely online during Spring semester of 2020. These expectations included everything they could expect from the author as their teacher, as well as what will be required of them to complete during the remaining days (i.e., a month or so) to complete the course requirements, in addition to the syllabi, the specific expectations, content outlines, deadline for all assignments, assessments, quizzes and discussions. The author's communication frequency and (audio-video) feed-back methods, record keeping, and rewards for virtual participation were clearly narrated to them. The issues of student concerns were discussed in the regularly scheduled WebEx meetings.

3. **Developing personal rapport with students:**

    The author took several steps to create rapport with the students: **Step 1**: Before the start of the class, the author contacted and spoke with every student in his classes and assured them that he would be accessible to them by phone and e-mail 24/7. Students also got a chance to share their technology deficiencies, unpreparedness, lack of experience, apprehension, confusion, and personal and family uncertainties caused by the sudden pandemic disruption. In a genuine (in bold to emphasize) caring spirit, the author inquired about their personal wellbeing, safety, security, and finally, about their preparedness for the online classes. **Step 2:** Once the ice was broken and what may entail

in the course and what to be expected are known, Step 2 was set in motion. The author made WebEx and WhatsApp groups for each class. He ran mini workshops via WebEx on how to install and use Skype, read and respond to announcements, and how to use the Communication features (such as e-mails to all class participants or to selected participants or groups, and Discussion Board) in the D2L course platform. He also shared a dedicated personal phone line with them for instant and direct communication during the semester. **Step 3**: Students were asked to introduce themselves under the Discussion Tab's designated space (they were given the option to submit a video introduction as well, and many did them well). The class members were asked to share their background (including whether they have a favorite Football/Baseball/Basketball team, any shareable personal passion), experience, and at least ONE specific and favorite learning goal for the course. Of course, all students were asked to react and share their feedback/comments on the individual posts. This thus broke the ice and stimulated Individual engagement in the class. **Step 4**: Using the said communication tools, the author assured students to help accomplish the course objectives without compromising the quality and standards set for the course. This way, the author compensated for the perceived pedagogical deficiencies of online courses (relative traditional F2F pedagogy). Step by step the author demonstrated a caring attitude that did spell success in the student engagement. Of course, instructors always do and should show a caring attitude, but he did materialize "walking of the extra mile" for each of the students during the course's initial period. So, when crafting responses to assignments and other evaluations, the author employed the best tone in simple, clear, and polite, and positive (glass half full) comments. Clarity, conciseness, accuracy, and timeliness of information ensured student satisfaction, enhanced engagement, and commitment to the course.

4.   **Scheduled Virtual Classes (synchronous) and meetings via WebEx:**

The author conducted WebEx virtual classes during the first week of the semester and reinforced the course contents shared earlier with a series of discussion topics, including logistics and SSU's initiatives of the student. He also briefly went through the summary of the weekly lessons that would ensue, and the performance assessment methods: exams, quizzes, discussions, virtual team activities and video presentations, case analysis, and the like. The overall students' responses were always positive. They understood the situation and appreciated SSU's initiatives. Students enjoyed the virtual classroom and asked assessment questions about the content delivery/examination and the plan for the remaining part of the semester. He was pleased with 100% attendance during the week which helped them gain proficiency in the use of WebEx. The author reiterated and orally detailed the nature of course quizzes, assignments, discussions, major paper/case studies, and the importance of completing them by the due dates. He handled the student questions on the grading rubrics effectively until there was no more question from them.

Furthermore, the author sent the class a summary or transcripts of each virtual course at the end of the day and solicited feedback. He frequented communications

urging students to check for uploaded contents in D2L under specific folders and regularly monitored who accessed the material and when. He often sent a reminder to students who are yet to open the folders. In the subsequent weeks, the author posted annotated lecture slides and had held WebEx virtual discussions.

5.   **Engaged students effectively in the online environment:**

Many students struggled with online classes as they were more used to an intimate face-to-face teaching style. The author set clear expectations for his students to achieve engaged and participatory learning with the desired learner outcomes. He notes, increased expectations such as requiring students to submit regular formative assessments often help direct students' energies. The author allowed students to spend more time in the content areas by assigning creative problem-solving tasks about the specific chapter material. Gave honor badges for student-to-student discussion and for sharing creative ideas. He also guided them to find relevant resources, including YouTube videos and TED Talks, and apply them to weekly discussions. Although he remained the official grader of all student submissions, he encouraged them to participate in the grading of submitted assignments and held student-led discussions in the online forums. Since this online space was the new classroom environment, the author wanted the students to have the fun of learning in this environment and to take ownership of learning. This way, students are engaged and supported, and they feel they were empowered in learning.

A wide variety of tools and formats (as mentioned earlier) for interpersonal and inter-group communication ensured that the coursework caters to all learning modes and all learner types. The creative and critical thinking process is a virtue that is expected to flourish among the students. The issue-based weekly group discussion by the assigned groups provided this outcome. Groups were charged to record and post the summary of discussions in the designated folders. The author routinely accessed these posts and provided substantive feedback and comments. This proved to be successful in the assurance of student learning.

6.   **Maintaining virtual office hours and the advising schedule with WebEx Meetings:**

The research shows the poor overall retention rate of contents by the students of online classes (Miller & Mills 2019). The study finds that the combination of face-to-face interactions with students via video tools such as Zoom, or Skype led to an improved retention rate in online course offerings. The video conference with students about their progress in learning, especially among the millennials and Gen Zs, confirms to them about their teachers' caring attitude toward them. That feeling dramatically improves students' motivation for learning. The author set three-hour virtual office hours daily (i.e.,

online direct access) for the students with an option for video conference via WebEx. This access allowed students and advisees' valuable opportunities to understand their lecture contents better and receive clarification on course expectations, exams and quizzes, and clarified any confusions they have had on an examination, assignment, or other class-related matter. They were instructed to set up an appointment either by EAB (Education Advisory Board is a best practices firm that uses research, technology, and consulting to address challenges within the education industry) or by sending an email for individual personal matters. Regarding the author's professional responsibility of student advising, he contacted all his advisees by email, WhatsApp, and WebEx. It was observed that after the video meetings, students' confusion was resolved/clarified, and this increased the enthusiasm and motivation to perform better in the courses. Additionally, it improved the retention rate for courses dramatically.

7.   **Student Engagement by using WhatsApp:**

It revealed that when technology and social media are used appropriately, the student engagement and overall learning are enhanced (Lvala & Gachago, 2012). In addition to all other communication tools available in D2L (news/announcements, chat, class list, discussions, and emails), to facilitate communication with the students in the classes, the author used WhatsApp to achieve faster and more seamless contact with students, and it proved to be highly effective. Simultaneously, it increased the level of interpersonal communication between students which opened up another venue for learning. It provided an advantageous reason to author to use WhatsApp for example, it allowed instructor free unlimited messaging; it can be used on Wi-Fi without a data plan in students' phones; it is a cross platform solution and it is very cost effective. The author used the following strategies to take advantage of the core attributes and abilities of WhatsApp in engaging students in the class:

- To stay in contact with students outside the classroom.
- To use the group chats, feature to create learning and study groups;
- To create audio lessons that can be sent directly to students.
- To send out problems or assignments to students even when they are not in class
- To stay in contact with parents.
- To send videos to students.
- To send graphics such as pictures or charts directly to students.
- To facilitate real-time communication between students and the instructor.

The most effective way the author used WhatsApp was to send an inspiring good morning message in the early morning to students to make them think positively and

remind them about the class and how the message's content is related to the specific class content of the day. The author started the class discussion by asking about the good morning messages and how they impact their thinking process. The response was 100% positive from all students in the classes. In other words, WhatsApp's most crucial feature was the good morning messages among the students that inspired them and made them think positively while reducing apprehension and anxiety. It also encouraged a congenial discussion environment and increased class participation.

As mentioned earlier that along with virtual office hours and advising schedules, the author also continued to send students reminders and alerts for quizzes, assignments, and discussions by email, WhatsApp, and D2L News to ensure that they do not miss any deadlines. A WhatsApp Class Group forum enhanced effective communication between the instructor and the students. An inspiring message every morning to the student (relevant to the topic of the day) increased the readiness of the students. It was a motivational exercise to make them engaged in-class participation. The author created a plan for each course module and uploaded course contents, accordingly, including revised syllabi to keep students on track.

8.   **Providing Detail Feedback on classwork**:

To enhance and improve student engagement in online learning, regular and constructive feedback and communication with students are essential –this is often called "supported engagement." The students appreciate the constructive and encouraging feedback with specific, detailed directions for future improvement. Students want that feedback and advice sooner rather than later. A recent study by Ragusa, A. T., & Crampton, A. (2018) revealed that the quality and timeliness of feedback on students' classwork by the faculty contributed more to students' satisfaction and engagement and effective learning connection. The missing instant feedback loop of the face-to-face interactions was compensated by WebEx class meetings of the online class. This has a definite learning impact on the students. Using technological tools embedded in D2L, such as regular formative response and group activities, the author gave constant feedback to students on assignments, quizzes, and discussions on D2L to improve their deficiencies and take advantage of the opportunity for further improvement. The author provided guidance and corrections or positive reinforcement after an exam on a written work to engage students in the online learning process. Such details and notes are to be included as part of the grading rubric (Allen, I. E., & Seaman, J. (2016). Students' learning through regular assessment was monitored while individualized feedback was provided to make students stay on track, personalize their learning, and build trust through communication.

9. **Dealing with students' problems:**

The author found that a few students had some difficulties during this crisis period. The most common was a problem with their internet access. He exercised the flexibility of deadlines to address this matter. Boredom, staying without friends, not having jobs, difficulty paying bills, and personal finance issues. Some of them were very personal ones—coming out of jail, pregnancy, and being a victim of family domestic violence beyond the prerogative and capacity of the instructor to help. Where appropriate, the author directed them to University resources via Helpline. The instructor appreciated the opportunity to be helpful to students in many ways possible.

10. **Collecting student feedback with a course closing activity:**

Finally, the author desired to end the course this semester with a bang. To make the course more meaningful to students, he gave students a final summary and assessment that helped them reflect on everything they had learned in a particular course. An offer of nominal extra credit worked as an excellent inducement for sharing their experience during this COVID-19 pandemic. This exercise was beneficial to reflect on the course content. Still, it gave the author a final opportunity to reinforce the critical skill set that they are to cultivate as the takeaways of the course.

Conclusion:

The author compared the overall student performance and satisfaction of fully online vs. traditional face-to-face courses of the previous semesters. The difference in the outcome/result was not significant. (In fact, pending further validation, in some instances, they seem to be slightly more positive for online instruction). However, while it was a satisfying experience in terms of outcomes, the workload of the instructor was simply doubled during this pandemic. Learning new technology as well as teaching through them was more stressful especially in a pandemic. The author stayed 24/7 accessible to students that required extraordinary commitment as this routine tax on his available free family time. As a necessity, he had to temporarily reduce his research commitment to cope with his major professional obligation, i.e. teaching. The author considered such a sacrifice as temporary until the students overcome the fear of new instructional technology and get used to higher education's evolving digital environment. Therefore, all as faculty members are obligated to continue to remain committed to doing their best to foster the treasured teaching mission of a small, student centered, and caring institution--Savanna State University in Georgia. It is hoped that the author's experience will benefit his colleagues of the teaching institutions.

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The Relationship Between Financial Performance of Companies and

Their Charity Giving: Empirical Study

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Abstract

This study investigates the relationship between financial performance and charitable giving of businesses. Two samples of businesses, one based on top 50 revenue earning, and another sample of top 50 business charitable giving companies were selected from the 2014 Fortune 500 company list. The top 50 companies from the *top ranked companies* by *total revenue* and their *charity giving* in 2014 were obtained from the **Fortune 500**. Another sample of 50 companies from the *top ranked companies* by *charity giving* and their total *revenue* in the year of 2014 were obtained from the **Foundation Center**. The total *revenue* the companies (independent variables) was regressed against the *charity giving* (dependent variables) in both samples (the sample from the Fortune 500 and the other sample from the Foundation Center) to find out whether a relationship exists between the revenue of both sample companies and their charity giving.

Keywords: Company revenue, profit, financial performance, revenue, charity giving

Introduction

Corporate charity giving in the form of resources or contributing a part of the earned revenue to the livelihood of the communities in which the corporations were conducting business. The combined charitable giving in the United States was predicted to rise to 4.8% in 2015 and a subsequent increase of 4.9% in 2016 (Philanthropy News Digest, 2015). The corporate giving was projected to increase to a sum of $17.3 billion between 2012 to 2016 in contrast to the decline of $6.7 billion during 2007 and 2011 (Philanthropy News Digest, 2015). To meet the projected amounts, the corporations participate in the matching of employee donations and participation in the volunteer programs. For example, Apple matched up to $10,000 per year in employee donations; Google matched $21 million in employee donations worldwide; Microsoft matched donations up to $15,000 per year; Pepsi matched up to $10,000 per year; and Shell matched $25 and $5,500 at a 1:1 ratio (Weinger, 2015). Do these corporations contribute to charity based on their financial performance? Existing literature documented two separate arguments: Some researchers claim that there is no conclusive evidence while other researchers notated a correlation between financial performance and generosity in corporations' charity giving. This study investigates whether companies contribute to charity giving based on their financial performance or not. Specifically, the purpose of this study is to determine whether there is a relationship between the financial performance (revenue) of companies and their charity giving. A sample of 50 companies from the top fifty ranked companies by total revenue and their charity giving in 2014 were obtained from the Fortune 500. Another sample of 50 companies from the top ranked companies by charity giving and their total revenue in the year of 2014 were obtained from the Foundation Center. Two samples of data (Appendix 1 and 2) were analyzed to

determine whether companies contribute to charity giving based on their financial performance or not.

Literature Review

Corporations face pressure from the critics and consumers to be socially responsible to be profitable (Mohr, Webb, & Harris, 2001); even under such a pressure from critics and consumers Porter and Kramer (2002) reported that there was a 14% decline on charitable contributions from corporations in the US during 2002. The decline was linked to pressure from the investors to capitalize on short-term profits. Mitigating the two opposing pressures from diverse stakeholders seems to be a corporate managerial challenge. Research as far back as the 1990s conducted to estimate charitable giving used data from 159 prominent UK charities from the range of 1983 to 1990. The findings confirmed that overseas health, and religious entities charity revenue donations were maximized while social revenues fell short of net revenue maximization (Khanna, Posnett, & Sandler, 1995). Similarly, Posnett and Sandler (1989) used data from the top 300 UK fundraising charities for the fiscal year 1985-1986 to determine the differences in donated amounts. The research findings confirmed that donations given were relatively elastic in comparison, to the US, the UK charities were net revenue maximums (Posnett & Sandler, 1989).

Charitable donations from small businesses do make an impact in the community. An exploratory study (Thompson, Smith, & Hood, 1993) of 181 organizations from the Southwestern USA, revealed that organizations with 15 to100 full time employees and with less than $10 million annual sales that the small businesses gave for personal satisfaction with tangible reasons that included the owner's partiality to a certain event such as their personal connection to the charity and the reputation held in the community about the charity (Thompson et al., 1993). Similarly, a research conducted by LeClair and Kelly (2000) by using data from 1984 to 1994 to explore why donations were given to civic, education, and health and human services versus cultural and arts industries. The findings confirmed that corporations donated to cultural and artistic organizations to gain publicity, thus the donations became a significant expense ~~in~~ for advertising; while the donations to health, educational, and civic organizations were not to promote the firm but to contribute toward a positive impact in their respective communities (LeClair & Kelly, 2000).

The determining motivating factor for other organizations to donate to charity is solely based on their need for exposure in the community; attorney law firm led by Bun and Forman in Birmingham, AL looked for a way to make major impact in their local community (Constance, 2000). The reporting confirmed that the ability to impact local communities and be recognized as a contributor to others welfare was the reason behind the charitable contributions by the attorneys Bun and Forman (Constance, 2000). The attorneys sponsored Kid One Transportation systems, a nonprofit company that handled the transporting of children in Alabama for routine or urgent medical needs. Their motivation for this charitable act was to receive publicity, get positive recognition from the local community and clients as an organization that gave for a good cause (Constance, 2000). On the contrary, charitable donations in the US that exceed $200bn are given based on humanitarian reasons and not to receive recognition; for example, the victims of

September 11 terrorist attacks whereby more than $700 million was raised for the victims (Knight, 2001).

A recent investigation on the Chinese firms ~~took place~~ to determine if the state ownership and political connection had any influence on the amounts given to charity found supportive evidence. Li, Song, and Wu (2015) used data from companies listed in the Shanghai and Shenzhen stock exchange from 2004 to 2011. The research results confirmed that there existed evidence that corporations with political connections or those seeking to get access to government officials gave higher donations. Based on these similar other studies, it appears that the political connections have an impact on charity giving by corporations (Capps, 2005; Li, Song, & Wu, 2015). On a different global platform, a regression analysis was conducted by Wong, Vincent, Chua, & Vasoo, (1998) in Singapore to examine the factors that deceived the number of donations given to charitable organizations. Their research study results concluded that giving of donations to charities was dependent on the age and size of their organization; additionally, their findings confirmed that government funding to social services had a direct impact on what was given from private donations (Wong et al., 1998). The researchers also confirmed that governments can encourage private donations from civilians to charities by lowering individual taxes and giving incentives to those donors who give to charities (Wong et al., 1998). Further investigations were done by Campbell, Gulas, and Gruca (1999) to determine why some companies gave to charitable events while others did not. The findings confirmed that the human elements were an essential in a corporation's ability to give to charity. Additionally, the results confirmed that personal attitudes and values of the decision makers influenced the final determination of the amounts given towards charity.

The relationship between financial performance and charitable giving was conducted by Wang, Choi and Li (2008). The authors used data from 817 firms obtained from Taft Corporate Giving from fiscal years of1987 to 1999. The finding confirmed that charitable giving was dependent on the firms' environmental operations and not necessarily its financial performance. Similarly, Seifert, Morris and Bartkus (2003) confirmed that there existed no relationship between corporate charitable giving and the corporation's financial performance, but there was a relationship between the cash resources available and cash donations. In a similar study, Amato and Amato (2007) examined the relationships between firm size, industry, and its charitable contribution. The findings confirmed that small and large corporations both give charitable contributions; however, the smaller corporations gave relatively higher contributions because of their proximity and involvement with the local communities.

To further confirm the relationship between performances and corporate philanthropy, Chen, Patten, and Roberts (2008) analyzed data from 384 U.S. companies from 1998 through 2000. The findings confirmed that the better financial performers made less charitable contributions than the worse financial performers. Thus, the companies that ranked worse in financial performance had higher contributions because of their social perception issues Specifically, the results confirmed that corporations with noted social performance problems made higher donations, thus they used charitable giving as a tool of legitimization and image restoration. Similarly, using a sample of 160 corporate foundations Werbel and Carte (2002) studied to determine if the CEO's had an influence on corporate charitable giving. The results

confirmed that the CEO's interest and participation on the foundation board affected charitable giving.

Seifert, Morris, and Bartkus (2004) used structural equation modeling to investigate Fortune 1000 corporations' financial contributions to charity. The findings confirmed that the cash flow issue was a major determinant of the Fortune 1000 ability to donate cash but that didn't impact their financial performance, and the corporations' profits were not affected (Seifert, Morris, & Bartkus, 2004). A comparison between state owned and private enterprises in China reported that both enterprises don't willingly donate money to charitable organizations; moreover, the private enterprises that are led by ultimate controllers aren't willing to part with their money (Tan & Tang, 2016). The researchers shared that even though there is evidence that charitable donations contribute to the enterprise's profits and growth, the ultimate controllers of the enterprises were in hesitancy to donate to the 2008 Wenchuan earthquake but donated the minority shareholders' shares (Tan & Tang, 2016).

Zhang, Yang, Wang, & Wang (2012) examined 542 privately run cooperatives in China to determine their political involvement and their decision to donate towards the Wenchuan earthquake. The findings confirmed that those family run cooperatives were more likely to contribute towards the social responsibility events like the Wenchuan earthquake when they had a connection with the political apparatus or the communist party. The research findings also confirmed that when the family run business contributed to charity it received a positive upward trend on their stock prices. Thus, both the mechanism in the market and the political connection both have association with charitable contributions in China (Zhang et al., 2012). In a similar study to determine the decision to give to charity conducted in China, Wang et al., (2015). They used independent variables including CEO attitude, size, and age of company, type of industry, previous history of donations, and the ownership type. The findings confirmed that the pressure from the employees, CEO attitude and perceived values, and personal factors of the decision makers all contributed to the hindrance of company contributions to charitable organizations (Wang et al., 2015). Huang and Tsai (2015) examined if philanthropic decision making was dominated by morality, and their findings confirmed that giving to charity was intertwined with dilemma-related circumstances (Huang & Tsai, 2015).

In the awake of the catastrophic events what is the likelihood of companies' involvement in charitable donations(?) in a research conducted by Zhang, Zhu, Yue, and Zhu (2010) using data from the companies that responded to the 2008 Sichuan earthquake in China; researchers wanted to determine if the decision to contribute to charity was related to industry rivalry and the respective advertising intensity (Zhang et al., 2010). The findings confirmed that even during catastrophic events, corporations that had intensity in advertisements had the likelihood to make donations to charitable organizations; the results also noted that corporate giving was stronger in firms that were in competitive environments (Zhang et al., 2010). In a research conducted by Caviola et al., (2014) to evaluate the bias on charitable contributions and confirm if the donors would donate based on the overhead reasons that include using the money for administration or saving lives. The findings confirmed that corporations' decision to contribute to charity was based on the specific charities overhead cost, this means that the donating team would compare between charities and would decide of donating to a charity that had low not high administrative

costs because they wanted the money to go towards the cause i.e. saving lives (Caviola et al., 2014)

Fidelity charitable organization fosters and encourages donors to give by making the programs more accessible. Their reports showed that donations for Alzheimer's Association, medical research, and healthcare saw a 39% increase in charitable contributions from companies and individuals that included retirees (Fidelity Charitable, 2016). Cojoc and Stoian (2014) conducted an experiment to determine if the organizational contribution to charitable organizations in the current period had a link that specifies organizations' possibility of cheating in the past because they could contribute the earnings to charity. Their findings confirmed that corporations would not shy away from partaking in unethical behavior if they could donate some of the earnings to charitable organizations in the upcoming future; thus the opportunity to donate to charitable organizations was linked to dishonest behavior by organizations decision makers (Cojoc & Stoian, 2014). Additionally, the researchers confirmed that both honest and dishonest organizations contribute less to charity in the first period as they have an opportunity to donate in the upcoming period; in this period the dishonest corporations give larger sums to charity to cover their unethical conduct (Cojac & Stoian, 2014). The phase of technology has contributed and will continue to mass growth in 'egiving through social media platforms. E-giving has been made possible by the ability for individuals to donate right away by a click of a button by eGiving cards, donating via credit cards, and even sending of free online greeting cards (PR Newswire, 2001).

Hypotheses

H1: There is a positive and significant relationship between revenue earning and charitable giving among the top ranked revenue producing Fortune 500 companies.

H2: There is a positive and significant relationship between revenue earning and charitable giving among the top-ranked companies by Charity Giving Foundation Center.

Methodology

Sample and Data Collection

Appendix 1 presents a sample of the top-ranked companies by revenue and their charity giving in 2014. Appendix 2 presents another sample of the top-ranked companies by Charitable Giving Foundation Center and their total revenue in 2014. The first sample and its data are obtained from the Fortune 500 companies and the amounts they contributed to charity. The annual corporate and citizenship reports of the sampled companies were used for the needed data for this study. Similarly, for the second sample we used the following two sources for the data: (i) annual charitable donation data obtained from the Foundation Center and (ii) the revenue data was retrieved from Marketwatch.com. Appendixes 1 and 2 contain two different samples of data that were used to test the above hypotheses.

Measurement of Variables and Data Analysis

The performance of companies was measured by the "revenue" of each company. The "charity giving" was measured by the amount of dollars donated by each company. Earned (total) revenue in 2014 is the independent variable, and Charitable giving amount in the same year constitutes the dependent variable for both hypotheses.

The independent variables in companies of both samples are their financial performance measured by their revenue. The dependent variables in both samples are their charity giving measured by the amount of dollars donated. The charity of both samples will be regressed against their revenue to find out if there is a relationship between the revenue of the sample companies and their charity giving. To test on a smaller sample, the regression was conducted using two samples of data (Appendix1 and 2) with revenue and charity giving data from Fortune and Foundation Center.

Study Findings

Descriptive Statistics

The main purpose of this study was to determine whether there exists a relationship between the corporation's financial performance and their charity giving. The data was analyzed, and results of the regression analysis were reported for both samples. Sample 1 Data listed in Appendix 1 contained top 50 Fortune 500 companies and Sample 2 had data from Foundation Center and listed in Appendix 2. Data from Appendix 1 that contains a list of top 50 Fortune 500 companies by revenue was used was Sample 1; the basic features of the data used in the study is shown in Table 1. The minimum of giving was reported by General Electric at USD 6 Million and the highest total giving was reported by Berkshire Hathaway with USD 2.80 Billion. The data also revealed that Lowes had the lowest revenue at USD 56, 223 Billion, while Walmart had the highest revenue of USD 485651.00 Billion

Descriptive statistics provides details of the research analysis data and confirms if the data is dispersed over a wide range or clustered around the mean (Dunn & Clark, 1986; Wonnacott & Wonnacott, 1990). The two data sets were compared, the first data set contained Fortune 500 top 50 companies (Appendix 1) that contained Revenue and Total Giving). The descriptive result confirmed that the Fortune Revenue Std. Deviation was higher than the Total Giving, which means that the Fortune 500 revenue data was more dispersed from the mean than Total Giving data (which had a closer grouping).

Table 1. Fortune 500: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Total Giving Millions	50	5.90	2.00E9	5.2194E7	2.83006E8
Fortune Revenue Billions	50	56223.00	485651.00	115268.8200	75637.47660
Valid N (listwise)	50				

The data from Appendix 2 contained the Foundation Center data (Sample 2) had the top 50 companies in charity giving. The amount of variation of the data in Appendix 2 was analyzed and measured using Std Deviation in Table 2 (Aiken, West, & Reno, 1991; Garson, 2012); the structure of the data in the descriptive statistics shown in Table 2. The analysis revealed that the Total Giving (Foundation Center) data had a small Std. Deviation with data clustering around the mean and the respective company revenues had a higher Std. Deviation that confirmed that the data was spread out about the mean.

Table 2. Foundation Center: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Total Giving Found Center Millions	50	18335180	456825176	54564152.56	7.091E7
Revenue Billions	50	3	434479095	1424860.84	7226077.128
Valid N (listwise)	50				

Correlations

Pearson correlation measures the degree of correspondence among tested variables and the multiple regression is used to test the independent and dependent variable to test the relationships (Driscoll, 1978; Weaver & Wuensch, 2013). Sample 1(Fortune 500) data was analyzed as shown in Table 3 the correlation coefficient shows the strength of the linear relationship between the variables as a positive correlation r=.225, with a moderate correlation between Fortune top 50 companies by Revenue and their Total Giving amounts to charity. However, the strength of the relationship denoted by the test of significance provides an unacceptable 0.117 value. The result concludes that there wasn't enough evidence to confirm a linear correlation association between the revenue of top ranked Fortune 500 companies and their charitable giving. Using the level of significance chosen for this test ($p<.05$), the study results confirm that the p value was greater than 0.05 and thus there was not enough evidence that the correlation was significant.

Table 3. Fortune 500 Correlations

		Fortune Revenue Billions	Total Giving Millions
Fortune Revenue Billions	Pearson Correlation	1	.225
	Sig. (2-tailed)		.117
	N	50	50

Total Giving	Pearson	.225	1
Millions	Correlation		
	Sig. (2-tailed)	.117	
	N	50	50

Sample 2 data from the Foundation Center (Appendix 2) was tested for its correlation with significance level rule $p<.05$ (Hinton, McMurray, & Brownlow, 2004; Yong & Pearce, 2013). The Total Giving data from the Foundation Center and Revenue revealed a Pearson r correlation of -.097 and the p value is. .502 as shown in Table 4. Using an alpha rule of ($p<.05$) in a two-tailed test, the data revealed a higher p value that was higher than significance level of .05. The results confirm that there existed no significant relationship between the Total Giving (Foundation Center) and the Total Revenue for the respective companies, r (48) = -.097, p =.502.

Table 4. Foundation Center Correlations

		Total Giving Found Center Millions	Revenue Billions
Total Giving Found Center Millions	Pearson Correlation	1	-.097
	Sig. (2-tailed)		.502
	N	50	50
Revenue Billions	Pearson Correlation	-.097	1
	Sig. (2-tailed)	.502	
	N	50	50

Anova and Model Summary

Anova and Model Summary looked at the overall regression analysis to test the hypothesis around the charity giving means by analyzing the p value and looking at the r square in the model summary to determine the strength of the variables (Kvanli, Pavur, & Guynes, 2000; Stockburger, 2001). Using Sample 1 (Appendix 1) data the result findings from Table 5 confirmed that the R Square was significantly lower than 0 this means that the predator (Fortune Revenue in Billions) couldn't account for a significant amount of variance in Total Giving in Millions (charitable donations).

Table 5. Fortune 500 Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
dimension0 1	.225[a]	.050	.031	2.78635E8

a. Predictors: (Constant), Fortune Revenue Billions

b. Dependent Variable: Total Giving Millions

ANOVA was relevant in this analysis and evidence from the review of existing literature and reporting results were used to test the hypotheses. Research confirms that ANOVA was used to determine if the alumni involvement and communication contributed to their charitable donations with research by Tsao and Coll (2004); another research by Fennis, Janssen, and Vohs (2008) and Sargeant, Ford, & Hudson (2008) reviewed charitable contributions and analyzed and reported their findings using ANOVA table. The ANOVA table was tested using alpha =.05 rule (Aiken et al., 1991). The Sig results revealed that the p value was greater than .05 thus confirming that the regression model wasn't significant F (1,48) =2.55, p>.117, R^2=.05.

Table 6. Fortune 500 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.979E17	1	1.979E17	2.549	.117[a]
	Residual	3.727E18	48	7.764E16		
	Total	3.925E18	49			

a. Predictors: (Constant), Fortune Revenue Billions
b. Dependent Variable: Total Giving Millions

Sample 2 data located in (Appendix 2) consists of the Foundation Center data; ANOVA results confirmed that the R Square value of .09 (Table 7) confirmed that the predictor (Revenue Billions) didn't account for significance in the Total Giving from the Foundation Center.

Table 7. Foundation Center Model Summary[b]

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
dimension0	1	.097[a]	.009	-.011	7.131E7

a. Predictors: (Constant), Revenue Billions
b. Dependent Variable: Total Giving Foundation Center Millions

Table 8 findings contained the value of Sig at .502 concluding that the regression analysis model wasn't significant, F (1, 48) = .457, p>.502, R^2 = .009.

Table 8. Foundation Center ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.325E15	1	2.325E15	.457	.502[a]
	Residual	2.441E17	48	5.085E15		
	Total	2.464E17	49			

a. Predictors: (Constant), Revenue Billions

b. Dependent Variable: Total Giving Found Center Millions

Regression

To report the hypothesis testing for Sample 1 data from Appendix 1that contained the top Fortune 500 companies in revenue was analyzed against and their charitable giving.

H1: There is a positive and significant relationship between the revenue of the top-ranked companies by revenue and their charity giving from the Fortune 500 companies.

The Coefficient helped in the review of each of the predictors individually, the Fortune Revenue (Billions) was evaluated at an alpha of .05. The results confirmed that the Sig was at .117 (Table 9) which was higher than .05; summarizing the results that $p>.05$ which confirmed that the predictor wasn't statistically significant.

Table 9

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.466E7	7.234E7		-.617	.540
	FortuneRevenue_Billions	840.241	526.261	.225	1.597	.117

a. Dependent Variable: TotalGiving_Millions

Sample 2 data from the Foundation Center shown in Appendix 2 was analyzed to determine a relationship existed between charitable giving and revenue for below hypotheses.

H2: There is a positive and significant relationship between revenue of the top-ranked companies by charity giving and their total revenue from the Foundation Center.

The results confirmed that the Foundation Center (Total Giving) predictors Sig value was at .502 where $p>.05$. The data findings confirm that the predictor Total Giving (Millions) wasn't significant to the company's revenue.

Table 10

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.592E7	1.028E7		5.438	.000
	Revenue_Billions	-.953	1.410	-.097	-.676	.502

a. Dependent Variable: TotalGiving_FoundCenter_Millions

Sample 1data from the Fortune 500 in Appendix 1 and Sample 2 data from Total Giving Appendix 2 were used to test the relationship between revenue and charity giving using a significance level of *p*-value <.05. In this research each hypothesis was not significant and didn't show any influences thus the findings confirm that the high *p* value >.05 for both *H1* and *H2* were not supported.

Concluding Remarks

The purpose of this study was to analyze the relationship between revenue and charitable donations using Sample 1 data consisting of the top ranked Fortune 500 companies by revenue and their charitable donations in (Appendix 1) and Sample 2 data from the Foundation Center. (Appendix 2). Corporate charitable giving enhances the livelihood of people and their communities; explicitly the resources and revenue giving contributes to wider social impacts in both local and global societies (Marx & Carter, 2014; Pharoah & Walker, 2015; Sargeant, 2014). The statistical analysis performed to test *H1*and *H2* of their relative positive and significant relationships between the revenue and charity giving of both the Fortune and Fortune Foundation data revealed no significant relationship.

Corporate charitable giving enhances the livelihood of people and their communities. They make wider social impacts in both local and global societies (Marx & Carter, 2014; Pharoah & Walker, 2015; Sargeant, 2014). In this research, the purpose was to conduct an analysis using recent data (Appendix 1 and 2) to determine if there existed a correlation between corporations' financial performance and their charitable giving. We found no evidence of support for the hypotheses. In other words, high revenue earning does not mean they will also proportionately contribute to charity. From the descriptive data, this makes sense. For instance, Wal-Mart was the highest revenue earner in Fortune 500 list but was ranked third in charitable donations. In fact, Wal-Mart with $182,859,236 was ranked 3rd and was outranked by Novartis Patient Assistance Foundation, Inc. (NJ) with $ 452981816 and Wells Fargo Foundation at $186775875. Who is much lower in rank for revenue?

On the contrary, Chevron, Berkshire Hathaway, Apple, Phillips 66, General Electric, and CVS did not rank in the top 50 for charitable giving, yet they were ranked top 10 in financial

performance by Fortune 500. To reiterate, the analysis Novartis Patient Assistance Foundation, Inc. (NJ) ranked the highest in charitable giving with $452981816 but was not ranked top 50 in revenue. The research study findings had evidence that confirms that there existed no direct relationship of corporations' financial performance to their corporate charitable giving. So, what explains corporate giving behavior? Is it their values? commitment of social responsibility? Stakeholder's values? Future research may take up these aspects of organizational behavior.

It is important to note that this study was limited by the sample (size) criteria of Fortune 500 and within it the top 50 revenue makers. Entire list of Fortune 500 could be used for the study. Additionally, the entire list of organizations of Charitable Foundation Center could be the second sample. In addition, organizational mission, values, stakeholders' concerns, organizational age, and size, and the like could be included for a multivariate analysis in a future study.

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Appendix 1

The selected Fifty companies from the Fortune 500 Rank based on Their High Revenue

Rank	Company Name	Revenue $ Billions	Total Giving (Millions)
1	Wal-Mart	485651	168582621
2	Exxon Mobil	382597	75212563
3	Chevron	203784	225
4	Berkshire Hathaway	194673	2000000001
5	Apple	182795	70
6	General Motors	155929	30821026
7	Phillips 66	149434	7875
8	General Electric	148321	5.9
9	Ford Motor	144077	30222388
10	CVS Health	139367	90
11	McKesson	138030	7.3
12	AT & T	132447	120.1
13	Valero Energy	130844	38
14	UnitedHealth Group	130474	20.5
15	Verizon	127079	89.1
16	AmerisourceBergen	119569	95
17	Fannie Mae	116461	174
18	Costco	112640	48607
19	HP (Hewlett-Packard)	111454	129953050.4
20	Kroger	108465	219.2
21	JP Morgan Chase	102102	236.5
22	Express Scripts Holding	100887	5425.6

23	Bank of America Corp.	95181	183.14
24	IBM	94128	109
25	Marathon Petroleum	91417	17.2
26	Cardinal Health	91084	150
27	Boeing	90762	188
28	Citigroup	90646	142.8
29	Amazon.com	88988	20
30	Wells Fargo	88372	317.54
31	Microsoft	86833	100.6
32	Proctor & Gamble	84537	80
33	Home Depot	83176	15
34	Archer Daniels Midland	81201	4034750
35	Walgreens	76392	8377875
36	Target	74520	215.5
37	Johnson & Johnson	74331	66469618
38	Anthem	73874	49.7
39	Metlife	73316	41068034
40	Google	71487	100.17
41	State Farm Insurance	71160	27
42	Freddie Mac	69367	37610800
43	Comcast	68775	17298463
44	Pepsi	66683	110.5
45	United Technologies	65100	11
46	AIG (American International Group) Inc	64406	23.5
47	UPS	58232	59.1
48	Dow Chemical	58167	57.4

49	Aetna	58003	412
50	Lowe's	56223	28

Appendix 2
The Selected Fifty-Charity Giving Companies Based on Their High Giving Ranked by the Foundation Center

Rank	Foundation Name	Total Giving (Millions)	Revenue (Marketwatch _in Billions)
1	Novartis Patient Assistance Foundation, Inc.	456825176	47.99
2	Wells Fargo Foundation	189380780	47.55
3	The Bank of America Charitable Foundation, Inc.	175729430	50.92
4	The Wal-Mart Foundation, Inc.	168582621	476.29
5	The JPMorgan Chase Foundation	130855483	51.53
6	GE Foundation	108401652	117.24
7	The Coca-Cola Foundation, Inc.	90518700	46
8	Citi Foundation	78000000	61.68
9	ExxonMobil Foundation	75212563	364.76
10	Bayer U.S. Patient Assistance Foundation	58474547	41.34
11	George Lucas Family Foundation	55486655	50.1
12	Caterpillar Foundation	49640075	55.18
13	The PNC Foundation	48597927	90.43
14	Johnson & Johnson Family of Companies Foundation	46445669	74.33
15	The UPS Foundation	42895860	58.26
16	MetLife Foundation	41068034	72.3
17	Intel Foundation	39047597	55.87
18	Publix Super Markets Charities	38602791	30.8
19	The Goldman Sachs Foundation	37245807	8.6
20	Emerson Charitable Trust	36181743	24.53
21	The Prudential Foundation	34835423	56.41
22	General Motors Foundation, Inc.	30821026	155.93
23	The Merck Company Foundation	30691387	42.11
24	Verizon Foundation	30628914	127.08

25	Ford Motor Company Fund	30222388	144.08
26	Illinois Tool Works Foundation	30052539	14.48
27	Duke Energy Foundation	29644844	23.93
28	The PepsiCo Foundation, Inc.	29363526	66.68
29	General Mills Foundation	29202088	17.91
30	The Medtronic Foundation	27934597	17.01
31	The Bristol-Myers Squibb Foundation, Inc.	27852584	15.88
32	Reckitt Benckiser Pharmaceuticals Patient Help Foundation	27706541	80.84
33	Newman's Own Foundation	26500000	80
34	Nationwide Insurance Foundation	26275186	25.3
35	Valero Energy Foundation	26101224	130.84
36	Eli Lilly and Company Foundation	26009097	19.62
37	The Dow Chemical Company Foundation	25301801	58.11
38	IBM International Foundation	24999021	92.79
39	U.S. Bancorp Foundation, Inc.	23287622	12.23
40	Alcoa Foundation	22348825	23.88
41	Blue Shield of California Foundation	21471190	162
42	Monsanto Fund	21329404	15.85
43	The Rare Disease Charitable Foundation	21134001	27791803
44	The Allstate Foundation	20956441	34.87
45	Freeport-McMoRan Foundation	20749223	21.23
46	The Capital Group Companies Charitable Foundation	19805818	43447905
47	Harold Simmons Foundation	19381096	10
48	American Express Foundation	19272925	36.29
49	The M & T Charitable Foundation	18800607	3.01
50	Amgen Foundation, Inc.	18335180	20.04

Automated Verification of Machine Learning Inferencing for the Testing of Behaviors in Data Breach Systems

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Abstract

Software systems based on Machine Learning (ML) and Artificial Intelligence (AI) has shortcomings based on the shift in the development process that is intrinsic to these technologies. Traditional software applications are constructed deductively as program code that governs the system's behavior. In the case of ML rules are derived from training data from which programmatic requirements are generated inductively. This paradigm difference makes the behavior of a software system with ML Components more difficult to understand. We are faced with new situations that are challenging to test and verify as a result of this programming difference. Another risk is that human beings become more reliant on AI assistance and therefore incur in deficient decision-making. In the case of data security several studies have addressed this risk, but there has not been an efficient solution proposed for applications using ML. This study presents a prototype with a Component that acts as a verifier of requirements for testing and validation of ML-supported applications. The logic of this automated Component is to compare the training data set key predictor variables against a set of data breach rules that have been originally vetted by cybersecurity subject matter experts. A signal is sent to the breach detection engine and the cybersecurity expert for examination of the rules or the machine learning model.

Keywords: DBD, DBL, data breach detection, data leak detection, test oracle, ML, machine-learning SE, software engineering, AI, artificial intelligence, IDS, intrusion detection systems.

I – Introduction

The reliance on Machine Learning supported systems has become ubiquitous in the past few years. As we depend more on these applications for decision-making tasks, it becomes more important to ensure their reliability. The process of verifying that these applications are functioning correctly is a challenge: their logic is based on patterns "learned" from data sets that do not exactly specify the correct behavior that is expected. As a result of this situation, a group of software engineers met on June 12th and 13th of 2018, at the Polytechnique Montréal, to formally address key issues in this area. And so, the First Symposium on Learning Applications was held, where participants met and "discussed the accuracy of systems built using ML and AI

models, the testing of those systems, industrial applications of AI, and the rift between the ML and SE communities.[3]

II – Current research

The awareness that conventional software testing processes do not always apply has been documented by several researchers like Murphy et al. [4] [5]**.** Even though there has been research that compare machine learning techniques to software engineering and software testing - specifically, the work of Cheatham et al., [6] – there are just a few published essays delving into the opposite situation: the application of software testing approaches to ML software. There has been quite a lot of effort into the creation of test suites for regression testing [7] and generation of test data sets [8] [9], but not applied to machine learning instances. Some stores of "reusable" data sets have been collected, like the UCI Machine Learning Repository [10], for comparing result quality, but not in the software engineering sense of testing as described by [11] and [12] which are two of many setups that assist machine learning software developers. The testing functionality they provide is focused on comparing the quality

[3] F. Khomh, B. Adams, J. Cheng, M. Fokaefs,G. Antoniol, "Software Engineering for Machine-Learning Applications: The Road Ahead", IEEE Software (Volume: 35 , Issue: 5 , September/October 2018.

[4] Christian Murphy and Gail Kaiser Improving the Dependability of Machine Learning Applications

[5] Christian Murphy and Gail Kaiser and Marta Arias An Approach to Software Testing of Machine Learning Applications

[6] T.J. Cheatham, J.P. Yoo and N.J. Wahl, "Software testing: a machine learning experiment", *Proceedings of the 1995 ACM 23rd Annual Conference on Computer Science*, Nashville TN, 1995, pp. 135-141.

[7] G. Rothermel *et al*., "On Test Suite Composition and Cost-Effective Regression Testing", *ACM Transactions on Software Engineering and Methodology, vol.13, no.3*, July 2004, pp 277-331

[8] B. Korel, "Automated Software Test Data Generation", *IEEE Transactions on Software Engineering vol.16 no.8*, August 1990, pp.870-879.,

[9] C.C. Michael, G. McGraw and M.A. Schatz, "Generating Software Test Data by Evolution", *IEEE Transactions on Software Engineering, vol.27 no.12*, December 2001, pp.1085-1110.

[10] D.J. Newman, S. Hettich, C.L. Blake and C.J. Merz, UCI *Repository of machine learning databases*, University of California, Department of Information and Computer Science, Irvine CA, 1998.

[11] J. Demsar, B. Zupan and G. Leban, *Orange: From Experimental Machine Learning to Interactive Data Mining*, [www.ailab.si/orange], Faculty of Computer and Information Science, University of Ljubljana.

[12] I.H. Witten and E. Frank, Data Mining: *Practical Machine Learning Tools and Technique*s, 2nd Edition, Morgan Kaufmann, San Francisco, 2005.

of the results, <u>not</u> evaluating the validity of the implementations. These researchers indicate that future work could include the investigation of automatically generating data sets such as in work done by Dalton [13]. The general class of software systems with no reliable test oracle available is sometimes known as "non-testable programs" as described by Weyuker [14]. It is this need to have a reliable test oracle for data-driven ML processes that have generated several proposals like this one.

III – Current shortcomings to improve ML test oracles in DBD/DBL systems

The need for reliable test results is especially true of ML-based systems which verify detected data breach alarms generated by anomalous behavior of internal entities.

Test oracles for these types of systems can become ineffective as the cyclical training process re-occurs. The problem has become very important for those involved in handling the resolution of security breaches. Large volumes of false alarms that are produced by security monitoring systems create serious challenges as described by Tjhai1 et al., in their work "The Problem of False Alarms: Evaluation with Snort and DARPA 1999 Dataset [15]." However, there is a persistent tendency in the use of breach detection systems to favor the majority of false positive instances in order to minimize the occurrences of false negatives. This trend is supported by the belief that allowing a false negative - allowing a real danger to go unnoticed - is more pernicious to an organization than having to deal with an excess of false alarms. This tendency generates more false positives than true positives; the experts that need to confirm the nature of alarms are spending time confirming bogus events instead of finding true violations. To this point, R. Francis points out "if you design indicators based only on currently available information, rather than seeking out additional intelligence or adding industry and company-specific context, the result will be low-quality alerts. In other words: while most alerts are triggered from known, malicious activity, the quality of these alerts is entirely dependent on the established indicators" [16].

The tendency to "play it safe" can be linked to the "Precautionary Principle" which has been influencing the way technological advances are implemented in the last few years. "The

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13 E. Walton, *Data Generation for Machine Learning Techniques*, University of Bristol, 2001.
14 E. J. Weyuker, "On testing non-testable programs," Computer Journal, vol. 25, no. 4, pp. 465–470, November 1982.
15 N. L. Clarke, S. M. Furnell, M. Papadaki1, G. C. Tjhai , "The Problem of False Alarms: Evaluation with Snort and DARPA 1999 Dataset", TrustBus '08 Proceedings of the 5th international conference on Trust, Privacy and Security in Digital Business, pp 2-3, University of Plymouth, Plymouth, United Kingdom, 1999
16 R. Francis, "False positives still cause threat alert fatigue,"https: //www.csoonline.com/article/3191379/data-protection/false-positives-still-cause-alert-fatigue.ht ml, 2018

Precautionary Principle holds that since every technology and technological advance poses *some* theoretical danger or risk, public policy should be crafted in such a way that no possible harm will come from a particular innovation before further progress is permitted. In other words, the law should mandate "just play it safe" as the default policy toward technological progress." [17]   K. E. Drexler observed also that "It is desirable to minimize errors of both kinds, but where uncertainties remain, it is better to bias analytical models and criteria toward safe, false-negative conclusions. [18]

False alarms have the extra dimension of being produced in large volumes as a result of the constant security monitoring of internal data access Besides the legal and financial risks, data breaches can negatively affect customers' perception of a company's image by decreasing its reputation. As a consequence, practical research has focused on the detection of false alarms that occur either as a result of   a) external cyber attacks, or b) malicious internal access of data, with the former research having a larger share of investigative work than the latter. "The most common false positives exist in network intrusion detection/prevention, endpoint protection platforms, and endpoint detection and response tools" [19].

Data leakages are typically propagated by insider threats. "The most dangerous threats faced by organizations are insider attacks. Since insiders are aware of the underlying systems, handling insider attack is a most challenging task since it can be intermingled with many non-malicious, accidental breaches. The volume of violations by insiders on private cloud repositories is higher than the traditional systems', as the attack vector and scope is higher [20].

The possible causes of invalid alarm generation are a) incorrect or incomplete rules used by the DBD/DBL program, b) incorrect or incomplete logic in the program code of the DBD/DBL, or c) a combination of both causes. This paper focuses on providing a practical solution to the first cause, and it relies on the basic assumption that the security expert has the ultimate knowledge in verifying that an alarm is valid based on the rules it has violated. It follows that if any alarms are being generated after the rules have been corrected using the patterns vetted in the training set, then the program code in the DBD/DBL should be examined for possible code inconsistencies. This paper leverages the experience acquired in previous

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[17] www.precautionaryprinciple.eu

[18] K. E. Drexler, Nanosystems P, 1st Edition by 1998 by John Wiley & Sons, Inc

[19]   R.   Violino,   "Security   tools'   effectiveness   hampered   by   false-positives" https://www.csoonline.com/article/2998839/data-protection/security-tools-effectiveness-hampered-by-false-positives, p 1-2, published November 2015

[20] B. Babu , M. Bhanu, "Prevention of Insider Attacks by Integrating Behavior Analysis with Risk-based Access Control Model to Protect Cloud," Eleventh International Conference on Communication Networks, ICCN 2015, pp1-3, Bangalore, India, August 21-23, 2015

research of a data breach detection process that relies on ML support for the improvement of alarm prioritization [21] [22].

Figure 1 shows a Data Breach Detection/Data Leak Detection (DBD/DBL) process <u>without</u> the support of a machine learning model. Component C is the DBD/DBL application that generates alarm records when it detects anomalous behavior in the querying of data repositories. Component E is the file of alarms that needs to be reviewed and verified by risk analysts to determine which ones are real violations or false alarms in order to take appropriate action.

Figure 1 - Current state of DLD alarm handling.

[21] E. Amlie, P. Gelsomino, J. Rodriguez, P. Vasseur, "Big Data False Alarms: Improving Data Leakage Detection Solutions," Proceedings of Student-Faculty Research Day, CSIS, Pace University, Pleasantville, pp A6-1-A6-9, New York, May 5, 2017

[22] S. Barabassi, T. Branker, D. Mody, A. Ossi, P. Vasseur, A. Vyas, "A Generic Approach to Big Data Alarm Prioritization," Proceedings of Student-Faculty Research Day, CSIS, Pace University, May 5th, 2017, Pleasantville, New York

Figure 2 shows the same DBD/DBL process utilizing an ML Component F. The F Component relies on a decision tree to classify alarms   based on pre-classified observations during the training phase.
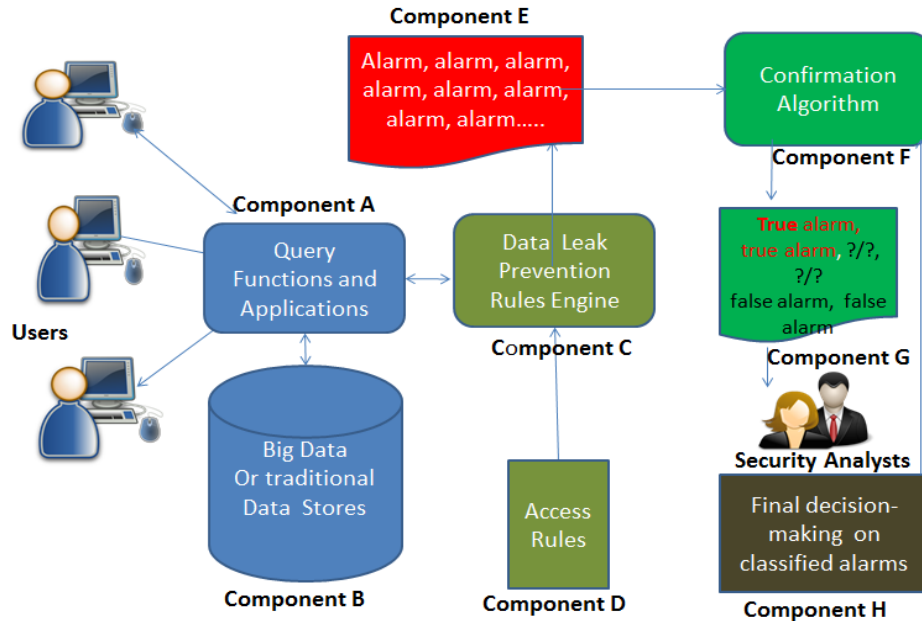

Figure 2 – Machine Learning Data Breach Verification Process

Figure 2 depicts the prototype that can improve the manual verification of large numbers of false alarms reported by DBD/DBL engines. This framework addresses a specific area of the general data breach problem: every alarm should be subject to *a posteriori* inspection by security experts whose time to verify them is limited by organizational constraints.

Component H depicts the improved activity of manual verification based on the prioritization of true alarms reported by the ML Component F. The security expert inserts the correction in the training data set whenever he or she discovers an incorrect alarm. This step ensures that the training algorithm keeps absorbing the expertise of the security analyst. Note that there is no immediate feedback to the DBD/DBL application of any corrections made to the training data set. It is the DBD/DBL application that generated the incorrect alarm and unless the correction is made in the detection task, the alarm will be generated again when a similar event occurs.

IV – Component for Verification of Machine Learning Inferencing

The new Component is included in figure 3, Component I, to remedy the lack of automated feedback to the DBD/DBL application. The idea of using an automated Component for the verification of ML inferencing of alarm corrections was introduced in a previous work

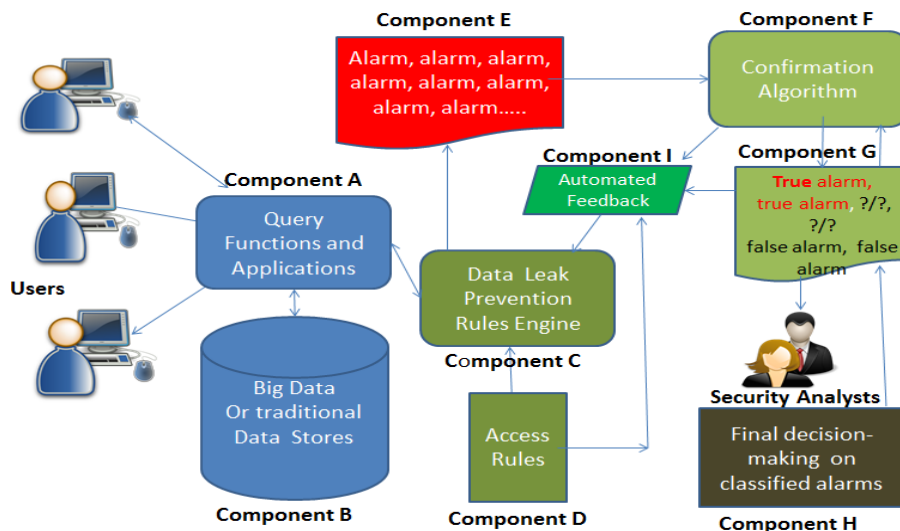[23]. The concept is part of a prototype that can assist security personnel in the verification of alarms.

Figure 3 – Automated verification of Machine Learning Inferencing.

Component I is the program that compares the ML training data set variables against the list of access   rules variables, Component D. A warning record is sent to the DBD/DBL application when there is a new   discrepant pattern that has been verified by the subject matter expert. This action happens when the program's logic in Component I finds that there is a missing entry in the access rules set that should match the corect true alarm status in the training set. Component I uses a formula described in pseudo-code in figure 4 that looks for a mismatch between a) the set of variables in each of the rules lists against, b) the predictor variables and their corresponding score in the training dataset of the machine learning model.

```
For each entry in the Training Data Set with a score of a TRUE alarm
   Then for each entry in the Access Rules Set
      Compare the pertinent predictor values in the Training Data Set
      to their equivalent  values in the Access Rules Set
         If the values in the Access Rules Set are consistent with the
         values in the Training Data Set (a true alarm),  continue with
         the next row in the Access Rules table
         else
          If the values are not consistent, create a  Discrepancy
         record with the values of the entry in Training Data Set.
```

Figure 4 – Pseudo code of the Component I logic.

The logic described in the pseudocode will produce a discrepancy record that indicates that a specific Access Rule pattern is not in agreement with its corresponding pattern in the Training Set. We must keep in mind that the new pattern in the Training Set has just been confirmed by the security expert. The new discrepancy needs to be reviewed and a determination made for its cause.   Either the Component C's software or Component D's access rules need to be corrected.

V – An application of Component I.

The   application of this prototype is shown in the following scenario. We can use this database schema consisting of the following tables shown in figure 5. We have used output test data from an ID3 (Iterative Dichotomiser 3) model, Component G, (see figure 6 for a partial sample), and a simple access rule set, Component D, (see figure 7). ID3 was chosen because of the mostly categorical nature of the data, but any other ML model can be used that produces highly accurate results.

Access Rules table

Field Name	Description
Role	ex: Analyst, Administrator, etc
Allowed Start time	Earliest time of the day access is allowed , ex: 08:00:00
Allowed End time	Latest time of the day access is allowed , ex: 17:00:00
Component	ex: Element, Table, Node, Cluster, etc
Request type	ex: Select, Append, etc

Model table

Field Name	Description
Time	Time of day of the transaction, ex: 18:00:00
Requestor	ex: Tom, Harvinder, Sally, User A, etc
Role	ex: Analyst, Administrator, Business, etc
Component	ex: Element, Table, Node, Cluster, etc
Request type	ex: Select, Append, etc
Violation type	ex: Non-Normal Time, No Authorization, etc
Score	ex: True or False

Discrepancies table

Field Name	Description
Time	Time of day of the transaction, ex: 18:00:00
Requestor	ex: Tom, Harvinder, Sally, User A, etc
Role	ex: Analyst, Administrator, Business, etc
Component	ex: Element, Table, Node, Cluster, etc
Request type	ex: Select, Append, etc
Violation type	ex: Non-Normal Time, No Authorization, etc
Score	ex: True or False

Figure 5 – Schema of tables used by Component I.

Timestamp	Requestor	Role	Component Accessed	Request type	Violation type	Alarm
8/10/2016 6:15	User B	Business user	Table 2	Select	No authorization	FALSE
8/10/2016 6:29	User B	Business user	Table 2	Select	No authorization	FALSE
8/10/2016 6:43	User B	Business user	Table 2	Select	No authorization	FALSE
8/10/2016 6:58	User C	Administrator	Element 1	Select	No authorization	FALSE
8/10/2016 7:12	User A	Analyst	Element 2	Select	No authorization	TRUE
8/10/2016 7:27	User A	Analyst	Element 2	Select	No authorization	TRUE
8/10/2016 7:41	User A	Analyst	Element 2	Select	No authorization	TRUE
8/10/2016 7:55	User A	Analyst	Element 3	Append	No authorization	TRUE
8/10/2016 8:10	User A	Analyst	Element 1	Select	No authorization	FALSE
8/10/2016 8:24	User B	Business user	Table 2	Select	No authorization	FALSE
8/10/2016 8:39	User B	Business user	Table 2	Select	No authorization	FALSE
8/10/2016 8:53	User B	Business user	Table 2	Select	No authorization	FALSE
8/10/2016 9:07	User C	Administrator	Element 1	Select	No authorization	FALSE
8/10/2016 9:22	User C	Administrator	Element 1	Select	No authorization	FALSE
8/10/2016 9:36	User A	Analyst	Table 1	Select	No authorization	FALSE
8/10/2016 9:51	User A	Analyst	Table 1	Select	No authorization	FALSE
8/10/2016 10:05	User C	Administrator	Element 1	Select	No authorization	FALSE
8/10/2016 10:19	User C	Administrator	Element 1	Select	No authorization	FALSE
8/10/2016 10:34	User A	Analyst	Table 1	Select	No authorization	FALSE
8/10/2016 10:48	User A	Analyst	Table 1	Select	No authorization	FALSE

Figure 6 – Sample records of the Model data set

Times when access is allowed	Id	Role	Component allowed for access	Request type allowed
00:00:00 to 23:59:59	User A	Analyst	Table 1	Append
00:00:00 to 23:59:59	User A	Analyst	Table 1	Select
00:00:00 to 23:59:59	User A	Analyst	Element 1	Append
00:00:00 to 23:59:59	User A	Analyst	Element 1	Select
00:00:00 to 23:59:59	User B	Business	Table 2	Append
00:00:00 to 23:59:59	User B	Business	Table 2	Select
00:00:00 to 23:59:59	User B	Business	Element 2	Append
00:00:00 to 23:59:59	User B	Business	Element 2	Select
00:00:00 to 23:59:59	User C	Administrator	Table 1	Append
00:00:00 to 23:59:59	User C	Administrator	Table 1	Select
00:00:00 to 23:59:59	User C	Administrator	Table 2	Append
00:00:00 to 23:59:59	User C	Administrator	Table 2	Select
00:00:00 to 23:59:59	User C	Administrator	Element 1	Append
00:00:00 to 23:59:59	User C	Administrator	Element 1	Select
00:00:00 to 23:59:59	User C	Administrator	Element 2	Append
00:00:00 to 23:59:59	User C	Administrator	Element 2	Select

Figure 7 – Access rules table.

The automated execution of Component I takes place after Component H has completed (the manual confirmation of the new unconfirmed patterns). An example of the steps of the execution is as follows:

1. The latest contents of the training data set (Component G) is loaded into the table called Model,

2. The contents of the Access Rules file (Component D) is loaded into the table called Access Rules table,

3. The logic of the code described in figure 4 is executed inserting any new discrepant records between the Model and Access tables into the Discrepancies table.

4. A communication containing new discrepant records is sent to Component C for any pertinent corrections of Component C or Component D.

As step 3 compares records in this example it will find the fourth through the seventh records classified as TRUE, highlighted in yellow. The fourth through the sixth entries highlighted in green, have no discrepancy with the independent variable patterns in the Access table, but the seventh record has a discrepancy with the value on the Component Accessed column, Element 3, highlighted in red. There is no entry in the Access table for Element 3. Therefore, the program will insert a record with the seventh record contents into the Discrepancy

table and then continue comparing the next instance in the Model table.
When step 3 is finished executing, step 4 will   send an automated communication to the Component C application with all the discrepant records.

 It should be the prerogative of the organization to allow for the automatic corrections to Component C or D, or to review and apply manually what they consider appropriate based on the organization's security and risk standards.

VI – Contribution to the improvement on ML-based inferencing

The primary purpose of the original ML-based prototype in figure 2 is to reduce the amount of time of verification   of an alarm, and therefore reduce the risk of missing a malicious instance. This paper presents an improved prototype. The improvement captures the current security analyst'   behavior and stores it.   The knowledge is being iteratively "learned" by the model via a mechanism that will permit adjustments to the key predictor variables of the training set. As the ML model becomes more "knowledgeable," any new patterns of true alarms call for the review of the DBD/DBL engine's behavior and its access rules. As described already, Component I uses logic that compares the state of all the key predictor values and target variables in the training set against the access rules set. Any discrepancy that is discovered is a possible error in the definition of the access rules or the software of the DBD/DBL application. The discrepancy list performs the role of a "test oracle."

VII –Future Work

The goal of this paper has been an improvement of the reliability of an ML based verification system. It aims at closing the performance gaps between its current behavior and its original intended design. It does that by means of an automated mechanism, Component I, that checks for inconsistencies between the ongoing system's inferencing and its original software requirements. The study assumes that the DBD/DBL system, figure 1, does not use an ML supported application for carrying out the   verification tasks and that the access rules are the original source of its "test oracle." In the case of a DBD/DBL engine that relies on an ML supported application, the paradigm is slightly different. In that case, the discrepant records will have to be compared to the records generated by the DBD/DBL application itself, Component C. Possible future work can entail the application of the Component I approach to new scenarios, such as Intrusion Detection Systems that use ML verification Components.

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