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Perceived Network Structure, Self-Efficacy and Other Individual Motivations as Antecedents of Knowledge Exchange Intentions in Virtual Knowledge Communities

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ABSTRACT

This study investigates individual participants' underlying motivational factors with regard to their knowledge exchange intentions (intention to obtain and provide knowledge) in virtual community contexts. Perceived Network Structure, Self-Efficacy and Individual Motivations are suggested as the antecedents of knowledge exchange intentions. Hypotheses are developed and empirical test design is discussed.

INTRODUCTION

Most organizations do not have all knowledge required in their possession within their organizational boundaries and thus need to somehow connect to outside source at either organizational or individual level (Anand, Glick, & Manz, 2002; Wasko & Faraj, 2005). One way of making such connections to the external source of knowledge at individual level is by participating in virtual knowledge communities (Wasko & Faraj, 2005). Supported by today's unprecedented growth of electronic communication capability and infrastructure establishment, computer mediated communication (CMC) renders interpersonal networking more attractive and powerful by eliminating geographical and temporal constraints that exist in traditional face-to-face interaction.

Virtual community refers to "groups of people who communicate and interact with each other via electronic media" (Romm, Pliskin, & Clarke, 1997). And the notion of knowledge community is described as a group of people with a common interest, problem, experiences and practices. An important feature of knowledge communities is that they bring together knowledge and knower, typically supported and informed by knowledge bases provided over networks (Earl, 2001). The combination of these two concepts constitute virtual knowledge community and it has been labeled under different terms in the literature such as virtual communities of practice (VCoP), virtual teams, and electronic networks of practice (ENP) (Alavi & Tiwana, 2002; Ardichvili, Page, & Wentling, 2002; Chiu, Hsu, & Wang, 2006; Wasko & Faraj, 2005). Virtual knowledge communities use relational structures or networks, to share or pool knowledge. They exchange and share knowledge interactively, often in non-routine, personal, and unstructured ways, as an interdependent network (Earl, 2001).

Individuals benefit from virtual knowledge community connections by gaining access to new information, expertise, and ideas not available locally within an organization, free from constraints of hierarchy and organizational rules (Wasko & Faraj, 2005). Given these importance and potential of knowledge exchange in a virtual community, studies have been conducted in the information systems (IS) area. Findings from the studies, however, revealed inconsistent or sometimes counter intuitive empirical results (Kankanhalli, Tan, & Wei, 2005; Wasko & Faraj, 2005). This is because those studies have taken into account only one side of knowledge exchange, knowledge provision/contribution.

From the knowledge sharing perspective, intention to obtain knowledge should be handled as equally impor-

tant as intention to provide. Due to its reactive nature, knowledge provision intention needs the precondition of knowledge request. Without the initiation of particular knowledge request, intention to provide knowledge would be meaningless. Since virtual community situation eliminates the spatial and temporal constraints of interaction, participants with intention to obtain knowledge can choose any virtual community that best satisfies their knowledge needs (Butler, 2001; Kang & Shin, 2006).

For virtual communities to retain their knowledge interaction active and thus, manage their community successful a balanced consideration of members' intentions between obtaining and provision of knowledge is imperative and the need for an examination on both knowledge intentions with respect to their antecedents would be more salient. Drawing upon the gap in the literature, this study attempts to develop a model that explains knowledge exchange in virtual context by examining both knowledge exchange intentions simultaneously. One notable contribution of the current study is to introduce new concepts, Virtual Network Connectivity and Virtual Network Closeness. We believe that this is an important and innovative concept as evidenced by examples such as Linkedin.com which provides a networking tool that efficiently helps strengthen and extend community members' network of trusted contacts. This study further examines the model by empirically testing hypotheses developed from the model through an online questionnaire survey.

The organization of this paper is as follows. First, hypotheses are developed based on the relevant theories. Then, methodology including measurement scale development, survey design, data collection and analysis are briefly described. Finally, expected contribution of this study concludes this proposal.

THEORY AND HYPOTHESES

Self-Efficacy

In this study, two types of self-efficacies are of main interest; knowledge self-efficacy and the Internet self-efficacy. Within social cognitive theory, it is emphasized that self-efficacy should be assessed so that the beliefs of the actor correspond to the target performance and domains of interest (Joo, Bong, & Choi, 2000). Since the specific tasks and domain of interest in this study are knowledge exchange in virtual community circumstances via the Internet, knowledge self-efficacy and the Internet self-efficacy should be considered.

Knowledge self-efficacy

Typically, knowledge self-efficacy takes the form of people's belief that their knowledge can help to solve problems (Constant, Sproull, & Kiesler, 1996; Kankanhalli, Tan, & Wei, 2005), improve work efficiency (Ba, Stallaert, & Whinston, 2001), or make difference to a group they associated with (Kollock, 1992). Conversely, if one believes her knowledge is not useful to the community, she may decide not to provide it simply because it does not make a positive contribution to the community (Kankanhalli, Tan, & Wei, 2005). Empirical studies found that individuals with higher levels of expertise are more likely to provide useful advice on virtual networks (Constant, Sproull, & Kiesler, 1996) and at the same time, individuals who feel their expertise to be not useful enough are less likely to contribute their knowledge (Wasko & Faraj, 2000).

Since self-efficacy represents an individual's self-esteem towards specific tasks and domain of interest, it is reasonable to posit that individuals with low self-esteem (and thus self-efficacy) may tent to depend more on others' judgment and opinion in social interaction contexts. In personality literature, theories suggest that people with low self-esteem are more susceptible to persuasion since they lack confidence in their judgments and thus tend to rely on the opinions of others (Cohen, 1959; DeLozier, 1976). In the context of knowledge exchange in virtual communities, this dependency on others opinion due to the low level of self-efficacy can be reflected to the individual's intention to obtain knowledge from others. Integrating the findings of previous studies and corresponding reasoning addressed above, we advance the following hypotheses:

H1a: *Knowledge self-efficacy is positively associated with the intention to provide knowledge.*

H1b: *Knowledge self-efficacy is negatively associated with the intention to obtain knowledge.*

Internet self-efficacy

Research suggests that the predictive capability of a self-efficacy estimate is most accurate when determined by specific domain related measures rather than with general measures (Bandura, 1986). This implies that self-efficacy regarding the Internet usage should be assessed differently from knowledge self-efficacy. Furthermore, measures exist to evaluate computer self-efficacy in general but these instruments do not reflect specific tasks and domains of interest related to the Internet and World Wide Web (WWW) usage activities (Torkzadeh & Dyke, 2001). Regarding the context of knowledge exchange in virtual community circumstances via the Internet in this study, the Internet self-efficacy is necessary.

Drawing upon the definition of self-efficacy, the Internet self-efficacy can be defined as the belief in an individual's capabilities to organize and execute courses of the Internet activities required to produce given attainments (Hsu & Chiu, 2004). Those who are somewhat low in self-esteem for technology may find any form of Internet-based virtual community to be unfriendly and difficult to use, whereas individuals that easily adopt technology might perceive the same environment as easy and inviting (Wang & Fesenmaier, 2003). From this, it can be extrapolated that those who are more comfortable using the Internet are more likely to use Internet-based virtual communities to share knowledge (S.L. Jarvenpaa & Staples, 2000) while individuals with low self-esteem in using the Internet are less likely to use the Internet-based virtual knowledge communities either to obtain or provide knowledge of their interest. Hence, we suggest:

H2a: *Internet self-efficacy has a positive impact on the intention to obtain knowledge.*

H2b: *Internet self-efficacy has a positive impact on the intention to provide knowledge.*

Individual Motivations

Social exchange theory (Blau, 1967) posits that people engage in social interactions expecting that it will in some way bring social rewards such as respect, approval, and status. This suggests that one potential way an individual can benefit from active participation in a virtual community network is the perception that participation enhances one's personal reputation in the community(Wasko & Faraj, 2005). In addition to enhancing their reputations, individuals may also gain intrinsic benefits (e.g., enjoyment in helping others) from contributing knowledge. Theories suggest that self-evaluation pertaining to competence and social acceptance is an important source of intrinsic motivation that drives participation in activities for the sake of the activity itself, rather than for external rewards (Bandura, 1986). In this study, therefore, reputation and enjoyment in helping others are considered as individual motivations.

Reputation

An opportunity to improve an individual's reputation and self-image provides one of the important motivations to provide useful knowledge to other members in a virtual community. Reputation can be used as an important asset that one can leverage to achieve and maintain status within a collective (Jones, Hesterly, & Borgatti, 1997). Members of a knowledge community may perceive that they could gain status in the community by answering frequently and intelligently to the questions raised by other members. Knowledge providers of a community may feel improved self-concept when they contribute their knowledge to the community. By providing knowledge to the community, they can benefit from showing others that they possess valuable expertise and this earns them respect and a better image (Constant, Kiesler, & Sproull, 1994; Constant, Sproull, & Kiesler, 1996; Lakhani & von Hippel, 2003).

In organizational studies, employees have been found to share their best practice due to a desire to be recognized by their peers as experts (O'Dell & Grayson, 1998). Results from prior research on virtual networks of practice are consistent with the Social Exchange Theory and provide evidence that building reputation is a strong motivator for active participation (Donath, 1999). Thus, the community members' perception that provision of knowledge will enhance their reputation in the community may motivate them to contribute their useful, personal knowledge to others in the community. Hence, we suggest the following hypothesis:

H3: *Reputation has a positive impact on the intention to provide knowledge*

Enjoyment in helping others

Knowledge contribution incurs cost to the contributor. They have to invest their time and effort to provide their expertise and they may feel a loss of power by giving away their valuable knowledge to others. In this sense, motivation to provide knowledge to the community based on their enjoyment in helping others is related to altruism. Aside from the extrinsic motivation such as gaining reputation from others, some individuals simply gain pleasure by demonstrating their own altruistic and pro-social behavior, and often enjoy seeing the positive results of their efforts (Hall, 2001; Rioux, 2000; Wasko & Faraj, 2000). Individuals who are primarily motivated by this intrinsic process perform a task because they consider it a fun and challenge. They enjoy a task and feel rewarded simply by performing the task (Leonard, Beauvais, & Scholl, 1999).

Prior research in virtual networks suggests that individuals are motivated intrinsically to contribute knowledge to others because engaging in intellectual pursuits and solving problems is challenging or fun, and because they enjoy helping others (Wasko & Faraj, 2000). Researchers also found that individuals contribute their knowledge to virtual communities even when there is no tangible external reward to their contribution and they simply enjoy helping others (Kollock, 1992; Wasko & Faraj, 2005). Members of a virtual knowledge community may contribute

their knowledge to the community because they perceive that helping others with challenging problems is interesting and because it feels good to help other people. Drawing upon the findings of previous studies and corresponding reasoning addressed above, we advance the following hypothesis:

H4: *Enjoyment in helping others has a positive impact on the intention to provide knowledge.*

Perceived Network Structure

The concept of perceived network structure is based on the structural dimension of Social Capital Theory (Nahapiet & Ghoshal, 1998). It concerns the overall patterns of connections among individuals, including the presence or absence of network ties, density and strength of network ties (Nahapiet & Ghoshal, 1998). In this study, two aspects of perceived network structure are of main interest, namely, virtual network connectivity and virtual network closeness. The former focuses on the amount of connections an individual makes in the network and the latter concerns the intensity or strength of the connection tie.

Virtual network connectivity

From the perspective of knowledge seeking individuals, an efficient way of obtaining knowledge would be of great interest. The network connectivity among the members of a virtual community allows a cost-effective way of accessing a wider range of knowledge sources (Chiu, Hsu, & Wang, 2006). In the literature, it is argued that network ties provide access to resources (Nahapiet & Ghoshal, 1998). Research has also found that strangers (i.e., weak relational tie) often offer more help than acquaintances, due to their diversity of backgrounds (Whittaker, 1996).

Theories of weak ties suggest that useful weak-tie connection tends to have resources that are superior to those of seekers alone (M. Granovetter, 1973). Statistically, if weak ties are more numerous than strong ties, then calling on weak ties increases the probability that at least one connection will have useful knowledge (Constant, Sproull, & Kiesler, 1996). If the problem is of additive nature (the solution is made up of many parts), numerous replies could increase the total usefulness of contributed knowledge and thus a virtual knowledge community becomes a sort of 'group mind' for problem solving (Constant, Sproull, & Kiesler, 1996). In this sense, the number and range of ties are important considerations for an individual's intention to obtain knowledge. Based on the findings of the previous studies and corresponding reasoning addressed above, we advance the following hypotheses:

H5: *Virtual network connectivity has a positive impact on the intention to obtain knowledge.*

Virtual network closeness

Virtual network connectivity presented above may lead to knowledge search benefits but they may cause difficulties as well in exchanging complex form of knowledge. Hence, in the context of knowledge exchange in virtual community not only the amount of tie connections an individual have but also the strength of the tie needs to be considered.

Previous study found that frequency of communication across multiple communication modes (face-to-face, phone, and e-mail) was significantly related to the strength of relationship and perceived closeness in the relationship (Cummings, Butler, & Kraut, 2002). Another study found that time spent in communication is a valid measure of tie strength and perceived intimacy in interpersonal relationships (Marsden & Campbell, 1984).

Virtual network closeness may stimulate the trust aspect of the perceived network structure. Studies suggested that frequent and close social interactions permit actors to know one another, to share important information, and to create a common point of view (Tsai & Ghoshal, 1998). As individuals interact over time, their trusting relationship will become more concrete, and they are more likely to perceive each other as closer and more trustworthy (M. S. Granovetter, 1985). Moreover, within the network literature on tie strength, studies have documented the implications of association between strong interaction ties and trust and trustworthiness (Krackhardt, 1992).

Perceived closeness and trustworthy relationship appears to influence knowledge provision intention. Belief in the benevolence of others will influence knowledge exchange due to the reciprocal nature of communication interaction it implies (Ridings & Gefen, 2004). All participants are expected to contribute reciprocal rewards and have desire to do good to others. Participants will be less inclined to provide knowledge in online communities if they feel this adherence to benevolence is lacking (Ridings & Gefen, 2004). Integrating the findings of previous studies and corresponding reasoning addressed above, we advance the following propositions:

H6: *Virtual network closeness has a positive impact on the intention to provide knowledge.*

METHODOLOGY

Scale Development

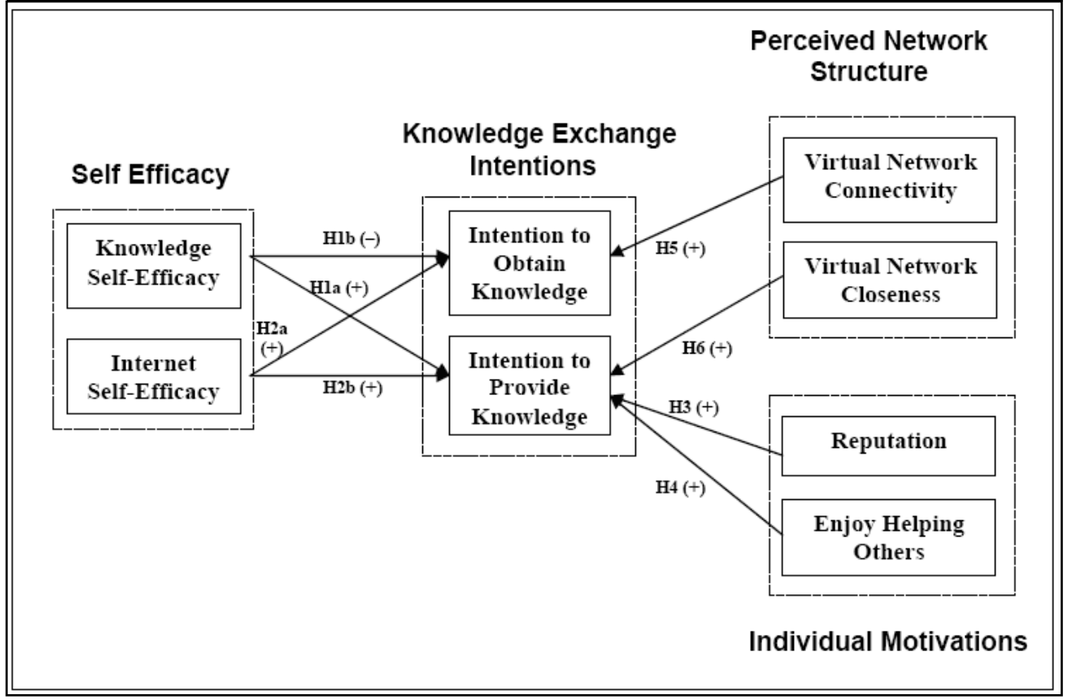
The survey items were derived from the existing literature based on previously published related studies and some items were developed based on theories and definitions in the literature. The items adopted from the existing literature were modified to fit the context of this study. For the dependent construct, intention to obtain knowledge (OK), three items were adopted from Ridings et al. (2002) and three additional items were developed based on the literature. Items for the other dependent construct, intention to provide knowledge (PK) were derived from Ridings et al. (2002) and Bock et al. (2005).

As to the independent constructs of this study, four items of knowledge self-efficacy (KS) were adopted from Kankanhali et al. (2005) and eight items of the Internet self-efficacy (IS) were derived from Eastin et al. (2000) and Hsu et al. (2004). Items for reputation (RP) were adopted from Constant et al. (1996), Wasko et al. (2005), and Kankanhali et al. (2005). For enjoyment in helping others (EH), seven items were adopted from Constant et al. (1996), Bock et al. (2005), Wasko et al. (2005), and Kankanhali et al. (2005).

For the perceived network structure constructs, eight measurement items were developed based on the theories and definitions in the literature for virtual network connectivity (CN). Direct definitional relation with this network connectivity is the concept of centrality (Brass & Burkhardt, 1993). Within the network theory literature, this notion of centrality (one's embeddedness in the network in terms of how many others he/she interacts with or connects to and how complete the interaction connection is in the network) is commonly applied. Prior studies suggest that one way of measuring an individual's embeddedness is to determine the number of social ties the individual has with others in the network (Ahuja, Galletta, & Charley, 2003). Since the unit of analysis in this study is at individual level, virtual network connectivity is assessed with an individual's perceived level of such connectivity, which is also termed as 'asymmetric measure of centrality' in the literature (Brass & Burkhardt, 1993). It is measured by an individual's perceived degree of virtual connections in terms of how many members he/she interacts with or connects to and how complete the interaction connection is.

Prior research suggested that tie strength is represented by the amount of interaction time, the emotional intensity, and intimacy that characterize the tie connection (Stevenson & Gilly, 1991). The most common way of measuring tie strength has been to use indications of closeness of a

Figure 1
Structural Depiction of the Suggested Research Model



relationship (Marsden & Campbell, 1984). In this study, virtual network closeness represents the strength of the tie in terms of one's perceived intimacy, the amount of time spent, and communication frequency among members of the virtual knowledge community. For this construct, virtual network closeness (CL), four items were adopted from Chiu et al. (2006) and two additional items were developed based on the literature.

Through this item development procedure, a total of 51 measurement items were included in the initial pool. As new measurement models have been developed in this study, two rounds of Q-sort exercise were conducted (Moore & Benbasat, 1991) based on these items. Overall hit ratio of the items was 0.90 with each item's hit ratio higher than recommended level: OK (0.96), PK (0.80), KS (0.81), IS (0.97), RP (1.00), EH (0.96), CN (0.81), and CL (0.83). From the result of the Q-sort exercises, 39 final items were selected for the survey.

Survey Design and Sampling

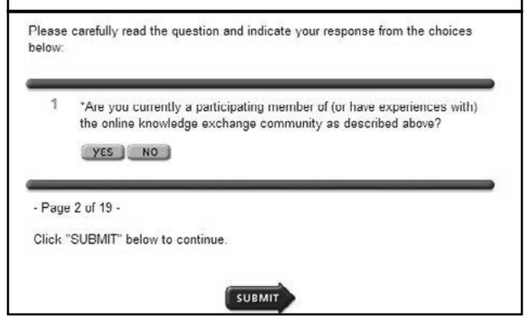
Since the units of analysis in this study are individual members of a virtual knowledge community, item questions are designed to capture the responding individual's perception. The survey participants are asked questions on their perceptions about the community they participate and other members they interact with in the community. General demographic information (age, occupation, location, gender, ethnicity etc.) is asked as well. For each item, seven-point Likert scale is used to measure the respondent's level of agreement to the item presented.

This survey employs online survey method considering the context of interest where knowledge is exchanged among members of virtual communities. The data is collected from a sample of subjects through online surveys e-mailed to participants of virtual communities. The survey is conducted by a paid third party vender. The vender recruits panelists through nationwide mailings and partnership with some direct-mail companies. The vendor maintains more than a 2.5 million nationally representative group of individuals.

In order to ensure the subjects of interest in the sample, incidence check procedure is employed. In the first screen of the online survey (see Figure2), the respondent is asked whether he/she is subscribed to a virtual knowledge community along with a detailed description about the nature of the virtual community. When the respondent is a member of such virtual community, he/she is asked to indicate the name of the community and address (URL) of the community. When the respondent passes this initial incidence check point, he/she continues to the actual survey questionnaire.

Data Collection and Analysis

Figure 2
Incidence Check Screen of the Survey.



Following these procedures, data collection is being undertaken for a pilot test with an intended sample size of 200 subjects. Then, initial reliability of the scale will be assessed and necessary adjustment such as purification of items will be performed based on the analysis of the pilot test. Following the pilot test, a full-scale survey with an intended sample size of 400 subjects will be administered.

With the data compiled from the online surveys, structural equation model analysis will be performed. In this study, partial least squares (PLS) structural equation analysis will be employed. PLS is a structural equation modeling technique that simultaneously tests the reliability and validity of measurement scales and estimates the relationships among the constructs including the ones between independent constructs and dependent constructs (i.e, hypotheses tests) (Wold, 1982). PLS is widely used in Information Systems (IS) research reflecting its analytical capability in assessing both measurement and structural models with multi-item constructs (Chin & Todd, 1995; Sambamurthy & Chin, 1994).

CONCLUSION

Drawing upon the visible gap in the literature, this study attempts to develop a model that better explains knowledge exchange in virtual context by examining both of knowledge exchange intentions simultaneously and taking some virtual interaction specific factors into consideration. The contribution of this study can be assessed in several points.

One, this study examines both intensions in knowledge exchange circumstances, namely, intention to obtain knowledge and intention to provide knowledge in virtual community contexts. Although, there have been studies with similar themes (Chiu, Hsu, & Wang, 2006; Kankanhalli, Tan, & Wei, 2005; Wasko & Faraj, 2005), intention to obtain knowledge has been ignored in those studies and thus, often encountered counter-intuitive empirical results and discussed this ignorance of intention to obtain knowledge as their limitations. Therefore, investigation of different effects of factors across the two intentions of knowledge exchange would be considered one of the contributions of this study.

Two, this study includes Internet Self-efficacy as a separate factor in virtual community interactions. Since the context of interest is virtual community knowledge exchange circumstance (through the Internet), unique aspects of online communication interactions should be factored in separately from those of face-to-face contexts. While employing theories and models into virtual context, related prior studies (Chiu, Hsu, & Wang, 2006; Kankanhalli, Tan, & Wei, 2005; Wasko & Faraj, 2005) are deemed to lack in this virtualization aspect of the model.

Three, this study introduces new measurement models, Virtual Network Connectivity and Virtual Network Closeness, assessing important characteristics of virtual knowledge networks. We believe that this is an important and innovative concept because these properties of virtual networks may generate substantial values to virtual knowledge communities.

Finally, from the practitioner's standpoint, this study provides a model for a better understanding of factors influencing knowledge exchange in virtual community. Tapping on the ever-growing potential of the Internet and virtual communities, organizations have been increasingly interested in facilitating knowledge sharing in the virtual community contexts either in intra-organizational, inter-organizational, or at the individual level (S.L. Jarvenpaa, Knoll, & Leidner, 1998; Sirkka L. Jarvenpaa & Leidner, 1999; McAfee, 2006; Ridings, Gefen, & Arinze, 2002). Implications of this study, therefore, may shed light in better understanding of the antecedents of intention to obtain and provide knowledge and their relationships for the practitioners in the area.

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Do I trust you enough to tell you what you don't want to hear? An Examination of the Moderating Effect of Trust on Job Satisfaction and Mum

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ABSTRACT

Communication is an essential function within organizations. Failure to communicate can have a negative impact on not only organizational performance but also organizational safety. This study examines two affective states that may influence employees' willingness to engage in mum behaviors, which are the intentional avoidance of delivering negative news. Our findings suggest that employees that are high in both job satisfaction and trust of their supervisor have a tendency to mum less. Implications and future research are discussed.

INTRODUCTION

It's easy to deliver a message that you know the other party wants to hear. However, many workplace environments require employees to deliver unfavorable messages such as declining sales or project failure. Some employees may avoid delivering the message or remain mum for fear of how the receiver may react. Tendency to mum is defined as the avoidance or unwillingness to deliver bad or negative information (Rosen & Tesser, 1970). This failure to communicate perceived negative information can have adverse effects not only on organizational performance (Greenbaum & Query, 1999); but in certain work environments can lead to injury and even death (e.g. Space Shuttle Challenger disaster, Deepwater Horizon explosion). Despite these adverse consequences, relatively little research has examined the affective drivers of one's tendency to mum, especially in situations involving upward organizational communication (Tourish & Robson, 2006). In this paper, we focus specifically on ways in which job satisfaction and trust in one's supervisor may impact one's tendency to mum.

LITERATURE REVIEW

A vast amount of research shows the importance of communication, both positive and negative, to successful organizational operations (Greenbaum, 1974; Roberts & O'Reilly, 1974; Eisenberg, Goodall, & Trethwey, 2010). Because the mum effect can have serious implications and sometimes dire consequences in the workplace, additional research is needed not only in understanding of the mum effect, but also in providing researchers with tools to better assess the occurrence of the precursors to mum.

The Mum Effect

The mum effect can be present in many organizational functions including information sharing, decision making, feedback, directives, and motivating (Myers & Sadaghiani, 2010). It affects both upward and downward communication. Gaining insight into the propensity to engage in mum and understanding the motivations to mum could help managers take preventative steps to mitigate the occurrences of mum in organizational communications. Individuals may choose to mum out of self-concern and/or concern for the recipient (Tesser & Rosen, 1975). Mum related to concern for the recipient

may develop from wanting to avoid feelings of guilt, stress, or anxiety, whereas mum related to self-concern tends to develop in relation to avoidance of negative evaluations by others as well as fear of possible retaliation (Keil, Im, Mahring, 2007). In situations of mum related to concern for others, an individual may not want to hurt the recipient's feeling or cause them to become upset. Conlee and Tesser (1973) note that an individual's perception of how a recipient of negative information might react can impact the decision of whether or not to share the negative information. Additionally, Longenecker, Sims, and Gioia (1987) found during interviews of executives that there were a variety of reasons for distorting performance appraisals of subordinates, but many dealt with concern for the employee, including giving poor performers a break, maximizing merit increases, avoiding making negative public impressions, and avoiding written records of poor performance. These types of reasons for withholding negative information fall clearly into the concern for recipient category.

As illustrated in the previous examples, mum based on concern for the recipient is more prevalent in cases of downward communication. For example, managers giving feedback or conducting an annual performance appraisal may be reluctant to share negative information that would cause the recipient to feel bad or stressed. Self-concern mum tends to be more prevalent in upward communication, that is, the process of transmitting information from a lower organizational level to a higher organizational level (Housel & Davis, 1977). For example, an employee may be reluctant to report to his manager that he turned the wrong valve which shut power down to the entire plant.

Studies have examined the difficulty of delivering bad news from several perspectives, including that of healthcare providers (Arnold, & Koczwara, 2006), managers giving feedback (Ilgen & Davis, 2000; Cox, Marler, Simmering, & Totten, 2011), and terminations and layoffs (Lind, Greenberg, Scott, & Welchans, 2000; Bennett, Martin, Bies, & Brockner, 1995). However, subordinates face their own set of challenges when faced with the prospect of sharing negative news. For the most part, employees do not readily desire to share negative information with their superiors. Indeed, career-related consequences can be much more salient in the case of a subordinate giving negative information to a superior as compared to a superior giving negative information to a subordinate. Unfortunately, this lack of upward information sharing can lead to severe adverse effects for the organization. One such example where the mum effect has been cited as a precursor to organizational failure is in software development. Several research articles have noted that the high rate of failure of software development projects can be partially explained by the mum effect (Smith & Keil, 2003; Keil & Robey, 1999; Keil et al., 2007). Employees working on software projects were subjected to escalation of commitment in the software development projects even when it became apparent that the projects were headed for failure on the stated path. This escalation of commitment may be attributed to an organizational climate where openly sharing negative information is discouraged either directly or indirectly (Marler, McKee, Cox, Simmering, & Allen, 2012). In such cases, employees may keep silent due to fear of retaliation, anger, loss of status, or even job loss (Bies, 2013). As such, the current study focuses on mum from the perspective of self-concern, since we are interested in precursors to mum behaviors in which employees fail to communicate vital information to organizational leadership (i.e., upward communication).

Job Satisfaction and Mum

Overall job satisfaction is one of the most widely cited measures of employee satisfaction (Dormann & Zapf, 2001). Job satisfaction can be defined as an employee's evaluation of their work or job (Weiss & Cronpanzano, 1996). It has been shown in the past to be correlated with motivation (Kinicki, McKee-Ryan, Schriesheim, & Carson, 2002), job involvement (Brown, 1996), organizational commitment, organizational citizenship behaviors (Organ, 1990), withdrawal cognitions (Hom & Kinicki, 2001), turnover (Fried, Shiron, Gilboa, & Cooper, 2008), and job performance (Judge, Thoresen, Bono, Patton, 2001). In cases of upward communication, negative conditions must be present in order for employees to have something negative to withhold, or mum. Thus, in order for an employee to have negative information to keep mum, there must be at least some negative factors present in the work environment. The more satisfied an employee is with the overall work environment, the fewer things that employee may have to keep mum about. Employees in very negative work environments, manifested in self reports of low levels of job satisfaction, may be more likely to mum since there may be more negative information to withhold.

H1: Job Satisfaction is negatively related to mum.

Supervisor Trust and Mum

Trust has been defined in a number of ways. Rousseau, Sitkin, Burt, Camerer proposed the following definition of trust as it has been conceptualized and studied across numerous disciplines: "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another (1998: 395)." A development of this definition includes the character-based perspective, which focuses on how perceptions of a leader's character impacts a follower. Mayer, Davis, Schoorman, (1995) provided a Trust in Leadership Meta-Analysis model proposing that when followers believe their leaders have integrity, capability, or benevolence, those followers will be more comfortable engaging in behaviors that put them at risk (e.g., sharing sensitive information). Indeed, a study by Mayer et al., (1995) defined trust as the willingness of a party to be vulnerable to the actions of another party based on the expectations that the other party will be able to fulfill his/her duties to the relationship (Mayer et al., 1995). A related study by Mayer and Gavin (2005) suggested that when employees believe their leader cannot be trusted (e.g., because the leader is perceived not to have integrity) they will divert energy toward "covering their back" which detracts from their work performance. Additionally, Reich & Hershcovis, (2011), noted that since trust is a key predictor of positive interpersonal relationships, grievances have the potential to seriously harm workplace relationships. In situations such as those mentioned above, particularly where employees fear negative downward consequences, we believe that an employee may be more likely to keep mum. In such situations, employees may disengage in a number of ways, including mum behaviors. Considering the scope of negative consequences resulting from a lack of supervisory trust, we expect mum behaviors, particularly self-concern mum, to be more prevalent where supervisory trust is lacking. Likewise, in situations where there are high levels of trust, the opposite should hold. Indeed, Tesser & Rosen, (1975) noted that an individual's relationship with the recipient may play a role determining if and how to share negative information. Generally, the closer the relationship, the greater the likelihood that negative information will be shared (Tesser & Rosen, 1975). Thus, the higher the level of trust, the less likely it is that an employee will feel the need to engage in mum behaviors.

H2: Trust in one's supervisor is negatively related to mum

Although trust in one's supervisor may make your job more bearable it does not grant an individual job satisfaction. Likewise, job satisfaction does not necessarily guarantee that an employee will have a trusting relationship with his or her supervisor. Although we expect both job satisfaction and supervisory trust to be negatively correlated with mum behaviors, we do not expect the two to work independently. In situations where employees have reason to mum, such as those in which employees have low job satisfaction and negative experiences, an employee's relationship with his or her supervisor may become even more important. Employees that are unhappy with their job but do not trust their supervisor may be more likely to mum due to the adverse consequences the communication of the negative information might result in. Additionally, those employees with lower job satisfaction will tend to have increased opportunities to mum, due to the increased negative work-related information that comes with lower levels of job satisfaction. In such cases, we expect supervisory trust to moderate the relationship between job satisfaction and mum.

H3: Trust moderates the relationship between job satisfaction and mum; whereby, employees high in job satisfaction but low in trust of supervisor are more likely to engage in mum.

Method

Participants. The data collection service Zoomerang was utilized, which recruits from a diverse population of over 30 million US-based respondents. Although Zoomerang includes safeguards to avoid low-quality data, we also included specific items to verify that respondents were not randomly responding and actually worked in a job role and organization that met our criteria. All participants worked in the mining, manufacturing and drilling industries.

Procedure. A sample of 179 participants was 53% female and the average age was 48.5. The race-ethnic makeup of the participants was predominately Caucasian (90%), followed by African American (5%) and Asian (3%). The industry makeup was predominantly manufacturing and mining related. All information collected was anonymously provided.

Measures

We administered a questionnaire designed to assess participants' feelings about their organization, jobs, and supervisors. Responses to the scales included in the study were recorded using a five-point Likert-type response format, with 1 = *strongly disagree*, 2 = *somewhat disagree*, 3 = *neither agree nor disagree*, 4 = *somewhat agree*, and 5 = *strongly agree*. A correlation matrix was generated to test the strength of relationships between variables. All expected correlations were significant.

Mum

Three items from Cox et al. (2011) scale were used to assess the tendency to mum. The scale is designed to assess an individual propensity to omit or avoid sharing negative information. In this study, the focus was on sharing information concerning safety. Coefficient α for the scale was .90.

Trust

Supervisory trust was measured using the Schoorman, Mayer, & Davis's (2007) measure. The seven-item measure assesses the extent to employees feel their supervisors are likely to behave in an unsupportive manner, using items such as, "It is important for me to have a good way

to keep an eye on my supervisor" (Schoorman et al. 2007). Coefficient α for the scale was .65.

Job Satisfaction

A three-item scale was used to measure the respondents' level of job satisfaction. This scale is used to measure general job satisfaction. A sample item from this scale included, "All in all, I am satisfied with my job." Coefficient α for the scale was .87.

Analysis

Hierarchical regression was used to assess the hypothesized relationships. We followed Barron and Kenney's, (1986) method for moderated regression analyses. Predictor variables assessed were centered to avoid the effects of non-essential ill-conditioning that can be encountered in moderated hierarchical regression (Aiken & West, 1991).

The summary statistics for the study variables, including correlations, means, standard deviations, and Coefficient alphas, are reported in Table 1. Scales demonstrated acceptable reliability. Variables under study were significantly correlated in the expected direction.

Table 1
Descriptive Statistics and Correlations

Variables	Mean	SD	1	2	3
Mum Avoidance	2.59	.92	(.90)		
Job Satisfaction	3.88	.95	-.28**	(.87)	
Supervisor Trust	3.27	.60	-.29**	.43**	(.65)

n= 179; **p<.001

RESULTS

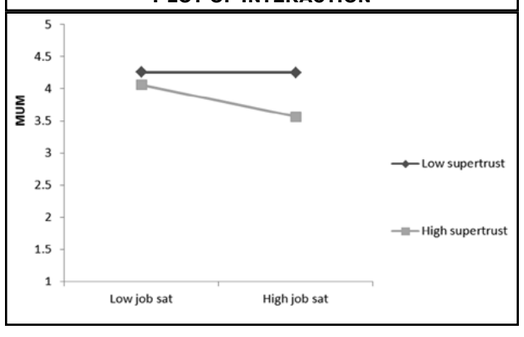
Hypothesis 1 was supported in that job satisfaction was found to be negatively related to mum (b= -.19; p <.02). Those individuals that felt satisfied in their job did mum less than those that reported being dissatisfied in their job. Supervisor trust was also found to have a significant relationship with mum tendencies (b= -.21; p <.01), thus supporting Hypothesis 2. Finally, the moderated relationship of trust and job satisfaction was found to be significant (b= -.15; p<.04). We plotted this interaction to visually inspect this relationship. It can be noted that individuals that reported being dissatisfied in their job whether they trusted their supervisor or not reported the highest levels of tendency to mum. Furthermore, those respondents that reported high levels of trust in their supervisor and high levels of job satisfaction reported the lowest levels of tendency to mum. The results are reported in Table 2.

Table 2
Regression Analyses of the Moderating Effect of Trust

	Step1	Step 2
Step 1: Main Effects		
Job Satisfaction	-.19*	-.24*
Supervisor Trust	-.21**	-.17*
R^2	**.12****	
Step 2: Interaction		
Job Satisfaction X Supervisor Trust		-.15*
R^2		**.14***
F-Value (Total *df*)	11.45 (176)	108.35 (175)

*Note. B is standardized beta coefficient. *p < .05; ** p < .01*

Figure 1
Plot of Interaction



DISCUSSION

The current study contributes to the body of research relating to mum by identifying two affective states that impact individuals' tendencies to mum. Trust in one's supervisor and job satisfaction were both significantly related to mum. Furthermore the interactional effect of these two constructs gave additional insight into the way in which job satisfaction and employee perceptions of supervisor trust may work together to influence employee tendencies to mum. Perhaps equally interesting is the direction of relationships in this study. While the intuitive perspective might indicate that dissatisfied employees might be more likely to complain about their job, our results show the opposite. These dissatisfied individuals feel instead that they should not speak up or complain. The findings of the current study suggest that trust plays a key role in this satisfaction-mum relationship. On a related note, a limitation in the current study is the inability to show causation. The methodology used here does not allow us to examine, for instance, if an employee's feelings of being unable to speak up may actually drive an increase in overall dissatisfaction. Future research is needed to further examine these causation-related issues.

The authors believe that the topics explored here may be important for managers looking for ways to help to mitigate the mum effect and increase vital upward communication. The findings highlight the importance of effective and open communication, particularly upward communication, in the workplace. High levels of mum can be detrimental to organizational effectiveness. Indeed, this study demonstrates how the two variables of trust and job satisfaction can influence employee tendencies to mum, which may result in serious implications for both organizational performance and even organizational safety. For instance, organizations that face high levels of safety concerns (i.e., manufacturing, petrochemical, mining industries) may benefit from the application of the findings above. Failure by employees to engage in upward communication regarding a safety risk or hazard, due to fear of negative consequences, may neutralize the last line of defense an organization has in preventing dangerous or even deadly safety threats.

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Factors in Transferring a Single Purpose Agricultural Structure Under the American Tax Payer Relief Act of 2012 and the Accounting Standards Codification of 2009

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ABSTRACT

Transferring a commercial structure is a common event, but the type of structure transferred can have a major impact on its treatment for financial reporting and tax reporting purposes. One type of structure that receives special treatment is a "single purpose agricultural structure" such as a hog breeding barn, a dairy barn, a chicken house, or a greenhouse. The paper examines areas of difference between financial accounting and tax accounting for such a building in light of the Accounting Standards Codification of 2009 and the American Taxpayer Relief Act of 2012, signed by President Obama in January 2013. This Act continues to allow the buyer of such a building to realize large tax savings in the expensing and depreciation limits provided under the Act. An understanding of the reporting techniques described in this paper will enable an accountant to provide better service when assisting a client involved in either the purchase or sale of a single purpose agricultural structure.

INTRODUCTION

Transferring real estate is a common event. In the majority of cases, houses, commercial buildings, and unimproved land are the most common types of transfers, but in rural areas of the country, another type of building can be the subject of a transfer: an agricultural or horticultural building constructed for one limited purpose. Such limited purpose structures include livestock sheds and greenhouses. The income-producing nature of this type of building differs significantly from other commercial operations; therefore, the conveyance of such a structure deserves closer inspection for both financial reporting purposes and tax reporting purposes. To have a better understanding of these types of transactions, a CPA should also have knowledge of local banking practices as well as of the industry in which his client operates.

Agricultural and horticultural operations are unlike any other businesses. The growth rates and shipment dates for animals in a particular breeding operation can be crucial factors in need of examination so that proper financial and tax reporting methods are used. A visit to a client's agricultural or horticultural business can also help equip the accountant with an additional level of useful knowledge.

This paper addresses four areas related to a transfer of this type of building: (1) sales value, (2) cost basis (including a discussion of depreciable basis), (3) date of sale, and (4) procedures for reporting the transaction on the seller's income tax return. While all four areas are discussed from a taxation perspective, the first three areas are also explored from the financial accounting standpoint. For the financial analysis, Topic 360 of the FASB Accounting Standards Codification (ASC) 360-20-40 relating to real estate sales (formerly Statement of Financial Accounting Standards No. 66) provides information on the proper method of recognition. For the tax analysis, a variety of sources were used to explain the proper treatment and reporting considerations.

DETERMINING SALES VALUE

All parcels of land are considered unique assets because no two parcels of land can occupy the same space. Since all land is unique, no two parcels can automatically be con-

sidered of equal value which makes the sales price negotiation a complicated process. As with any transfer of property, a willing seller and a willing buyer must agree upon a price acceptable to both parties. Once an acceptable sale price is established for the land and existing building, the actual transfer can be straightforward and uncomplicated. The seller provides an executed warranty deed in exchange for the negotiated sales price from the buyer. The buyer may choose to pay cash or to finance the transfer either by paying installment payments to the seller or by involving a third party lender. Sometimes, an inexperienced buyer who is entering a new venture will also negotiate for ongoing management or labor services from the seller until the buyer can develop the necessary skills to run the business operations. In these latter more complex relationships, the determination of a sales price for the assets transferred becomes difficult for accounting and tax purposes.

Financial Reporting Purposes

Typically, the money the seller receives from the buyer constitutes the sales value of the property being sold. When the seller's obligations do not end at the sale of the property, other factors will influence the final value of the transfer. ASC 360-20-40-8 specifies the additions and subtractions to arrive at the true property sale value.

Additions to Stated Sales Price

Completing a property sale usually requires at least a few days but can sometimes require several months. When a transaction can be completed within days (usually with a sale of raw land), the need for a written contract is diminished because a set of closing documents can be prepared almost as quickly as a written contract. The sale of a commercial building will likely require more than a few days to complete so a written document (normally entitled "Real Estate Sales Contract") will be needed. Most states will not enforce an oral promise to sell real estate. For illustrative purposes, the laws in Tennessee are used in the paper as a representative example because these laws are very similar to other state's laws on the topic. The Tennessee statute requiring a written contract for the sale of real estate is referred to as the Statute of Frauds. The statute's name is derived from the general principle that fraud is more likely to occur in the sale of unique property (such as land) or the sale of goods valued at $500 or more. To prevent that fraud from occurring, Tennessee (and most other states) requires a written contract on such agreements. The actual language in the Tennessee statute reads as follows:

> "No action shall be brought...upon any contract for the sale of lands...unless the promise or agreement...shall be in writing, and signed by the party to be charged therewith..." (T.C.A. §29-2-101(a)(4)).

A Real Estate Sales Contract binds the seller to sell and the buyer to buy the land described in the contract. In some cases, the buyer wants the seller to be bound to sell without the buyer being bound to buy. In that situation, the buyer would request an "Option to Purchase Real Estate." As with all valid contracts, consideration must pass between the parties. The seller agrees not to sell the property for a stated number of days in exchange for the buyer's payment of a non-refundable sum of money. Any payment by the buyer under an executed option contract is normally considered a part of the sales value of the land and must be added to the stated purchase price (ASC 360-20-40-8(a)). The accountant preparing the seller's books is therefore advised to inquire as to the existence and content of any executed option contract. Other payments to be added to the stated purchase price include management fees, points, prepaid interest, prepaid fees, and any other payments paid in advance to a third party which will benefit the seller at a later date.

Subtractions from Stated Sales Value

A seller of an agricultural building could agree to finance the transfer or to provide management services past the sale date. These continuing obligations by the seller require a discount to the sales value of the land. In seller-financed transactions, the seller transfers property for a note receivable and usually some cash as a down payment. To determine the sale value of the land, the seller must discount the note receivable to its present value (ASC 360-20-40-8(b)).

The value of future services to be performed by the seller can receive similar discounted treatment. In transactions involving a single purpose agricultural structure, the buyer may bargain for the seller's temporary continued service in order to aid in a smooth transition in operations. If the buyer pays either no money or a below market rate for the seller's services, the sale value of the property is affected. The seller must calculate the net present value of the future services required to be performed and reduce the value of the property accordingly (ASC 360-20-40-8(b)). In the event the buyer agrees to pay the market rate for the seller's future services, the stated purchase price of the property is not reduced. The seller will recognize the full purchase price in the period of the sale and will recognize the income earned in the appropriate future periods. The seller should carefully calculate the appropriate sales price to report that includes both the sale price for the structure and for the seller's continuing services.

Tax Reporting Purposes

The tax preparer's job is simplified when determining the sales price for reporting to the Internal Revenue Service. The correct sales value to use on the tax return is found in "Box 2" of the seller's 1099-S Form given to the seller by the closing agent. This figure should represent any cash received by the seller or to be received in the future by the seller including any note receivable for a portion of the principal selling price (Treas. Reg. §1.1001-1(a)). The figure does not include any barter transfer or any cash received for personal property sold with the real estate (IRS Instructions for Form 1099-S). A sale of a single purpose agricultural structure may be a part of a sale of the seller's entire agricultural business. The drafter of the contract should be diligent in separating the sale price of the structure from the price paid for any related items of equipment considered personal property.

DETERMINING COST BASIS

After establishing the asset's sales value, the seller must calculate the remaining cost basis in the asset to determine the gain or loss. For fully depreciated assets, the seller's basis is zero, and the amount of gain or loss recognized is equal to the sales price received. The gain or loss on a partially depreciated asset is the excess of the proceeds over the remaining basis. In both financial and tax reporting, the main consideration for determining basis is the method of depreciation used.

Financial Reporting Purposes

The financial records of the seller should reveal the remaining basis on the property when the asset's accumulated depreciation is subtracted from its original basis. Most large corporations use straight line deprecation to show a bigger return for shareholders, but smaller business operations often use an accelerated depreciation method. Regardless of the accounting deprecation method used, calculating the seller's remaining basis should be straight forward.

Tax Reporting Purposes

All commercial real estate used in the production of income is considered nonresidential and is usually depreciated under the Modified Accelerated Cost Recovery System (MACRS). Only the structures located on the land can be depreciated; the land itself is not a depreciable asset because its useful life is not limited. Before performing any calculations to determine the cost basis, the tax preparer should ascertain the seller's original purchase price for the asset and the amount of that original purchase price attributable to the raw land. Although the land value cannot be depreciated, its originally assigned cost can be used to offset any gain realized when the seller disposes of the property.

First-Year Expensing

Qualifying a building as a "single purpose agricultural or horticultural building" brings an added benefit for the seller of such a building. For virtually all acquisitions of real estate, a buyer must capitalize and methodically depreciate for tax purposes the entire purchase price attributable to improvements over the asset's class life. One of the very few exceptions to the requirement to depreciate property so slowly involves these single purpose buildings.

Even though a single purpose agricultural structure is real property, the Code treats its costs as being more closely related to equipment. The Code specifically includes such a structure as §1245 property offering favorable tax treatment (IRC §1245(a)(3)(D)). In the year of purchase, the buyer is eligible to expense part of the cost of acquiring the building as a §179 expense up to $500,000 as long as (a) the total assets acquired is less than $2,000,000 and (b) sufficient business income exists during the current tax year. This benefit, combined with the shorter depreciable life for tax purposes has encouraged the building and /or transfer of these single-purpose structures. For a portion of the agricultural community with a need for an initial or an additional single purpose structure, this legislation offers an opportunity to realize a much smaller tax burden if the taxpayer acquires and places in service such a building prior to December 31, 2013.

The buyer of an existing agricultural or horticultural building is not allowed to take advantage of another large tax benefit; however, that benefit deserves a brief mention here. On January 2, 2013, President Obama signed into law a new tax bill entitled American Taxpayer Relief Act of 2012" which continues to allow 50% additional first-year (or "bonus") depreciation under §168(k) if he chooses a general depreciation system of cost recover. Under the Act, a taxpayer with a new single purpose agricultural structure could take additional first-year depreciation, but an existing structure does not qualify.

Depreciation Method

With MACRS, the property owner usually has the option of using the General Deprecation System (GDS) or the Alternative Depreciation System (ADS). ADS usually imposes a longer class life. For most agricultural buildings, GDS will apply; however, ADS is required if the real estate is: (a) used predominately in a farming business and (b) was placed in service in any tax year during which an

election not to apply the uniform capitalizations rules to certain farming costs (such as land clearing costs or excessive custom hire for land improvements) was in effect (Treas. Reg. §1.263A). For either system, the process of determining the class life and depreciation schedule is basically the same.

Class Life

Generally, nonresidential real estate has a long class life. Most such structures placed in service after May 13, 1993, must be depreciated over a period of 39 years, but an agricultural structure may qualify for shorter depreciation schedule. For a small percentage of agricultural buildings, the deprecation period is only ten years under GDS and fifteen years under ADS (IRC §168(e)(3)(D)(i) and §168(g)(3)(B) respectively). The definition of "single purpose agricultural or horticultural structure" is set forth in IRC §168(i)(13). A building that satisfies this definition allows a taxpayer to use either of the two shorter depreciation ranges. According to the definition at IRC §168(i)(13), the term "agricultural" refers to the housing, raising, and feeding of a particular type of livestock or the housing of the equipment necessary to achieve this objective. Common examples of single purpose agricultural structures activities include hog operations, dairy operations, equestrian breeding, and poultry operations.

Interestingly, a specialty agricultural building that does not meet the specific definition of a single purpose agricultural structure is a grain bin since its use involves the storing of grain not feed; however, a silo has a better chance to qualify. A silo is a specialty building for the storage of silage used to feed livestock (mostly cattle). Although this type of building is not normally constructed in today's farming operations, a silo could be an existing part of a farm that is the subject of a sale. The code language states that a building can qualify as a single purpose livestock structure if it is specifically "designed, constructed, and used...for housing the equipment...necessary for the... feeding" of livestock (IRC §168(i)(13)(B)(i)(II)).

The term "horticultural" is defined in IRC §168(i)(13)(B)(ii) refers to either (1) a specially designed and constructed greenhouse used for the commercial production of plants or (2) a specially designed and constructed building used for the commercial production of mushrooms.

DETERMINING THE SALE DATE

A sale of real property will involve the execution and recording of a deed. The date of sale is determined quite differently for accounting purposes and for tax purposes. While the date of the deed and the delivery of the deed are vital facts in determining the date of sale for tax purposes, many more factors are required for the recognition of a sale for accounting purposes.

Financial Reporting Purposes

In most situations, the full accrual method of profit recognition on a land sale is preferable because it offers the seller a more attractive income statement and balance sheet which may enable the seller to obtain financing for another venture. Under ASC 360-20-40-3, the majority of land sales qualify for the full accrual method of profit recognition and reporting (as opposed to the installment method, cost recovery method, deposit method, or reduced-profit method) because most land sales allow the seller to receive cash with no further obligations to the buyer after the delivery of the deed. Even if the seller has a difficult time satisfying the provisions of ASC 360-20-40-3, a seller may still qualify to use the full accrual method under ASC 360-20-40-5 if he presents sufficient evidence that (a) a sale is consummated, (b) the buyer's initial and continuing investments are adequate to demonstrate a commitment to buy property, (c) the seller's receivable is not subject to future subordination, and (d) the seller has transferred to the buyer the usual risks and rewards of ownership in a transaction that is in substance a sale and does not have a substantial continuing involvement with the property. Each of these four items are discussed more fully hereinbelow.

Criterion #1: Consummation of a Sale

To satisfy the requirement of a sale, the seller must demonstrate that both the seller and the buyer are subject to the terms of a contract in which all consideration for the transaction has been exchanged and all conditions necessary for closing have been performed. ASC 360-40-20-7 also requires that "any permanent financing for which the *seller* is responsible has been arranged" (emphasis added). Although rare, some lenders may require the seller to assist in obtaining financing for the buyer. In this circumstance, the sale is not deemed to be complete until the seller fulfills all obligations.

Criterion #2: Buyer's Initial and Continuing Investment

In the event the seller is providing private financing for the buyer, the buyer's initial investment and continuing investments past the transfer date must be analyzed. As with any transaction, a seller should strive to realize as large of a down payment (i.e., "initial investment") as possible to increase the buyer's motivation to work toward a successful venture; however, in certain economic environments, a buyer may only be able to purchase property with the aid of extensive financing. Anticipating this situation, ASC 360-20-55-2 sets for the buyer's minimum initial investment for the seller to able to report the transaction in the current period. Although not specifically mentioned, single purpose agricultural or horticultural buildings fall within the Commercial and Industrial Property category of "other income-producing properties." This category requires a minimum initial investment of fifteen percent if cash flow from the building's operation is sufficient to service the indebtedness. Traditionally, the income flow from agricultural operations is extremely unpredictable. In "start-up situations or [situations involving] current deficiencies in cash flow," a twenty-five percent initial investment would be required before full recognition could occur (ASC 360-20-55-2).

The term "continuing investment" refers to the principal payments on the buyer's outstanding loan balance. The Codification requires consultation of customary banking practices to establish a reasonable payout of a loan on improved property and a payout no longer than twenty years for land (ASC 360-20-40-19). Rural northwest Tennessee has many agricultural and horticultural structures and is used in this section as a representation example. Normally, a commercial lender considers basic factors to determine a reasonable loan repayment for one of its customers such as that customer's (1) past payment history, (2) other outstanding direct obligations, (3) credit score assigned by Equifax Bureau and based on the credit report, (4) previous history of bankruptcy, and 5) earning capacity and physical health.

Criterion #3: No Future Subordination of Seller's Receivable

On occasion, the buyer may require 100% financing in order to purchase the real estate. Very few, if any, commercial lenders will advance a 100% agricultural loan; therefore, a buyer is likely to ask the seller to accept a promissory note and regular payments to satisfy the remainder of the sale price over the available commercial loan. The seller should beware. If the buyer receives any third-party primary financing which subordinates the seller's interest, the seller will be required to use the "cost recovery method" of property recognition as opposed to the full accrual method (ASC 360-20-40-36). The objective of ASC 360-20-40 is promoted because the seller must present clear evidence of his likelihood to collect this profit from the buyer before the transaction can be deemed complete. With another creditor having priority over the collateral (i.e., the real estate and improvements), the seller's chances for full payment are significantly reduced.

Criterion #4: Transfer of Usual Ownership Risks and Rewards

The seller is required to transfer to the buyer all the usual risks and rewards of ownership without substantial continuing involvement in the property. Although this transfer appears similar to the first criterion of a consummation of a sale, the accountant should carefully examine the contract terms to determine any ongoing commitments by the seller toward the real estate such as repurchase obligation, partnership status, guarantees as to the buyer's return on investment for any length of time, continuous support obligation, the retention of any underlying land or amount of equity interest in the property, leaseback requirements, and obligation to develop future expansion of property, (ASC 360-20-40-26 and 360-20-40-37 through 63). A finding of any of these items may delay the financial recognition the seller's profit until such time as the seller is assured of receiving profit on the transaction and has fulfilled all obligations regarding the real estate. Notwithstanding the above signs of the buyer not having received the usual risks and rewards of ownership, the seller is allowed to use the full accrual method to report the sale of property even if the seller is allowed to participate in future profits as long as the seller does not bear any of the future losses from said property (ASC 360-20-40-64). These contingent profits would be recognized in future periods as received. Practically speaking, the buyer of an operation is not likely to agree to allow a seller to participate in enjoying potential profits without also suffering potential losses.

In the event that any one of the four criteria listed above is not satisfied the seller must choose an alternate method of reporting the transaction for financial purposes. The alternative methods of reporting (mentioned above as including the installment method, cost recovery method, deposit method, and reduced-profit method) may not be as satisfactory for a seller. If any of these other methods are used to recognize profit, the seller's chances for obtaining financing with a commercial lender for a separate venture could be diminished due to a less attractive income statement and balance sheet.

Tax Reporting Purposes

The sale date to be used on the seller's tax return is found on the 1099-S form for the transaction. In the event a closing statement was issued for the transaction, the closing date should be the settlement date as reported under the Real Estate Settlement Procedures Act of 1974 ("RESPA"). If no settlement statement was issued, the date reported on the 1099-S should be "the earlier of the date title transfers or the date the economic burdens and ben-

efits of ownership shift to the transferee (IRS Instructions for Form 1099-S).

DETERMINING TAXES DUE

The sale of a single purpose agricultural structure will involve the seller recognizing either a taxable gain or a tax deductible loss. In either event, the seller will report the transaction on Form 4797 as an attachment to his Form 1040 in the year the sale is reported. The tax preparer must know whether to report the gain or loss as ordinary or as capital. The hyper-accelerated depreciation allowed on single purpose agricultural structures makes the possibility of depreciation recapture more probable when a sale occurs; however, wear and tear inflicted by these types of agricultural businesses often prohibit the property from maintaining its original market value.

A gain on the disposition of a single purpose structure does not always receive the favorable capital gain treatment. If all or a portion of the structure has been expensed under §179 or has been the subject of depreciation, the owner may be required to recognize ordinary income at the time of the property's sale. The structures are considered §1245 property (IRC §1245(a)(3)(D)). The amount taxed at ordinary gain rates is the lesser of (1) the depreciation allowed or allowable on the property or (2) the difference in the amount realized and the adjusted basis of the property. Capital gain treatment is available on the amount of gain not previously taxed an ordinary income.

The fact that the property qualifies as §1245 property has no bearing on the treatment of a loss realized at the time of sale. A loss on the sale of such a structure will be subject to ordinary loss treatment if the seller held the property for one year or less. The sale at a loss of property owned for longer than one year results in capital loss treatment.

The placement of the transaction on Form 4797 depends on the seller's holding period for the asset. If the property being sold has been owned by the seller for less than one year, the transaction should be reported in "Part II" of Form 4797. If the property was owned for more than one year, the transaction is reported in "Part III" if sold at a gain or "Part I" if sold at a loss (IRS Instructions for Form 4797).

CONCLUSION

Knowledgeable use of the Internal Revenue Code makes the purchase of a single purpose agricultural or horticultural structure an attractive investment for potential buyers. As the above discussion indicates, the sale of such a structure should be carefully considered by the seller. Additional commitments by the seller or timing issues may present problems regarding the seller's ability to recognize currently the sale of the structure on the seller's financial statements. The difficulty could cause a strained relationship with the seller's financial lending institution. Lack of planning of the property sale could also result in additional income tax liability for the seller if (1) the sales price for the structure is not clearly identifiable in a contract that also involves the sale of personal property, (2) incorrect depreciation methods are used to determine cost basis, and (3) if the seller maintains some form of ownership in the asset. Careful development of a sales contract and proper reporting of the transaction can lead to as successful venture for both parties.

REFERENCES

Accounting Standards Codification 360-20-40 (as updated) (formerly the Statement of Financial Accounting Standards No. 66 (1982), Accounting for Sales of Real Estate).

American Taxpayer Relief Act of 2012

Internal Revenue Code of 1986 (as amended), §§168, 179, 1245.

Internal Revenue Service Instructions for Form 1099-S, Form 4797.

Internal Revenue Service Form 4797.

Real Estate Settlement Procedures Act of 1974.

Tennessee Code Annotated §29-2-101(a)(4).

Treasury Regulation §§1.1001-1(a) and 1.263A.

The Subordinate FVP Scale: Factor-Analytic Results and Presentation of the Final Version of a Self-Report Measure of Fractal Vertical Polarization from the Perspective of the Lower Dyadic Node

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ABSTRACT

This paper introduces a working scale to measure fractal vertical polarization (FVP) from the perspective of the lower node in the vertical dyad, which corresponds to the subordinate in the supervisor-employee context. The paper first outlines FVP theory, highlighting its relationship in the systems-complexity paradigm with leader-member exchange (Graen & Cashman, 1975) and team member exchange (Seers, 1989), as developed conceptually in prior work. The discussion then proceeds to lay out the logic of scale development, given the tight nomological structure of the construct. The paper presents a factor analysis of developed scale items based on a survey of midcareer undergraduate and graduate business students with varying levels of experience in the lower node. Results from this first factor analysis subsequently serve as a basis for refinement of the scale and expansion with additional LMX and TMX items, followed by a new factor analysis based on a new, larger sample of respondents. The paper concludes by presenting the resulting self-report scale in two dimensions, along with distinct LMX and TMX subscales, and then gives recommendations for future research.

As laid out in Voss and Krumwiede (2012), fractal vertical polarization (FVP) is a common type of dysfunction in organizational settings, consisting of distortions of various kinds in the vertical lines of communication. Its fractal quality indicates that it occurs within the elemental structure of the complex system (*cf.* Chua, 2005; Mandelbrot, 1967, 1977). Therefore, it appears to spread or replicate through the organization in the direction defined by the flow of system-maintaining resources, upward in the case of a tree, or downward in the case of an organization (*cf.* Chatterjee & Yilmaz, 1992; Fitzgerald & van Eijnatten, 2002; Frankhauser, 1998). As in the cases of leader-member exchange (LMX) and team member exchange (TMX), FVP emerges conceptually from the systems, complexity, or chaordic paradigm (*cf.* Emery, 1969; Graen & Cashman, 1975; Hock, 1995; Katz & Kahn, 1966, 1978; Seers, 1989). The primary theoretical cause is excessive power asymmetry (*cf.* Esteban & Ray, 1994; French & Raven, 1959; Raven & French, 1958; Tedeschi, 1968), but it may also result from excessive cultural asymmetry between vertically differentiated units, the latter being a product of corporate acquisitions (Voss & Krumwiede, 2009).

Because information flow or exchange constitutes the central dynamic of interest in FVP theory, communication theory serves to objectify the noted disturbances in the encoding, decoding, and transmission of information (Phelps, 1942; Pollack, 1953). Meanwhile, role theory clarifies the nature of FVP as fitting in the domain of social psychology, while also demonstrating how the psychological consequences of erosion of trust and perceptions of injustice occur (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; Merton, 1945, 1957; Roethlisberger &

Dickson, 1939). Thus, as in the cases of LMX and TMX, FVP addresses the question of core relational exchange in an organizational setting from the perspective of a basic chaordic dynamic, rather than focusing on one or more epiphenomena of self-organizing complexity, as by attempting to study the forms of justice, trust, or confusion by themselves. In this respect, there is little difference in result from approaching the construct specifically within systems, complexity, or chaos theory (Anderson, 1999), despite the independent development of the respective vernaculars (*cf.* Bertalanffy, 1937, 1949, 1950; Lorenz, 1972; Prigogine, 1947, 1955).

To date, the conceptual development of FVP has been quite thorough, including both an internal and an external nomological net, the latter referring to the standard view of causal dynamics, as they would appear to relate to a precise operationalization of the construct (Voss & Krumwiede, 2010; *cf.* Voss & Krumwiede, 2009; Voss, Krumwiede, & Duncan, 2010). At the present point in time, it is therefore appropriate to begin a process of scale development. In analogy to the use of self-report measures to operationalize LMX and TMX, which constitute analogous constructs in the paradigmatic sense, the project undertaken herein is to do the same, at least as an initial step in the larger agenda to measure FVP as a true chaordic construct. As argued in prior work (Voss *et al.*, 2010), the manifestation of a phenomenon of this kind at one node is unlikely to occur if it is absent at the other node, because it is systemic in nature and exists in the communication line between the nodes, rather than in the node itself. Therefore, a self-report measure that captures one node's experience captures by definition the analogous or converse experience in the other node. This explains why LMX researchers quickly discovered that one self-report measure at the lower node in a dyad obviates the pursuit of additional self-report measures at the upper node of the dyad. Accordingly, this study has the aim of presenting the results of a self-report measure of FVP from the point of view of the lower dyadic node, namely, that of the subordinate.

REVIEW OF THE LITERATURE

The FVP construct is the product of conceptualization in the larger paradigm of self-organizing complexity, informed by the specific vernacular forms of systems theory, complexity theory, and chaos theory. Systems theory was historically the first of these, with its origins in observations of biological systems and therefore more concrete assumptions than later paradigmatic vernaculars (Bertalanffy, 1937, 1949, 1950; Katz & Kahn, 1966, 1978; Miller, 1978). Complexity theory was next, embedded in chemistry rather than biology and therefore emphasizing nonlinear dynamic in change processes and a more diffuse set of assumptions, particularly with regard to observations at system boundaries (Anderson, 1999; Chua, 2005; Dooley & Van de Ven, 1999; Holland, 1962, 1975; Lichtenstein, 2001; Morel & Ramanujam, 1999; Prigogine, 1947, 1955). Chaos theory was the final contribution to the triad of source material for the current vernaculars of the larger self-organizing paradigm, with its governing assumptions of highly volatile, highly diffuse, and even transient types of systems (Chatterjee & Yilmaz, 1992; Fitzgerald & van Eijnatten, 2002; Hock, 1995; Lorenz, 1972; Mandelbrot, 1967, 1977). In general, these scientific conceptual structures inform how to formulate theory (Emery, 1969). The theorist thus formulates theory based on the view that the object of analysis manifests the properties of an open, complex, or chaordic system and therefore draws on the associated vernaculars to derive the appropriate insights.

To date, very little behavioral research has undergone formulation strictly within the paradigm of self-organizing complexity. LMX, TMX, and FVP are exceptions. The premise of this area of research is the observation that organizations obey scientific laws that are quite different from those that operate in the natural sciences. For example, the law of entropy is the second law of thermodynamics in traditional physical sciences, but an opposite law, originally called negative entropy and later called negentropy, operates in systems theory (Bertalanffy, 1950). Katz and Kahn (1966, 1978) simply referred to this property as the natural propensity for an open system to grow, but this facet of systems theory reflects an inveterate complex of interactive dynamics that render open systems completely unlike the standard material of traditional physical science. Consequently, theorists such as Cashman, Dooley, Graen, Holland, and Seers have explored the potential for developing specific theories within the paradigm of self-organizing complexity itself (*cf.* Dooley & Van de Ven, 1999; Graen & Cashman, 1975; Holland, 1962; Seers, 1989). These efforts have emphasized information exchange among system agents in behavioral applications. FVP falls into the category of theories developed within the systems paradigm.

Past research of relevance to the process of developing self-report scale items includes studies from various sources that offer logic to help predict expectations regarding the antecedents and outcomes of FVP. Incompatible media at opposite ends of a communication channel (Brannen, 2004), communication channel obstructions (Daft, Lengel, & Treviño, 1987; Sperber & Wilson, 1986), or excessively directive leadership styles (Gómez & Rosen, 2001; Muczyk & Reimann, 1987; Voss & Krumwiede, 2009; *cf.* also French & Raven, 1947, 1959; Tran, 2007) are likely to constitute conditions sufficient to instigate an FVP condition (Voss & Krumwiede, 2010). In essence, FVP constitutes incompatible communication flow dynamics between lower and upper dyadic nodes (*e.g.*, between subordinates and supervisors), so whatever causes such differences causes FVP by definition. For example, if supervisors have one set of expectations regarding organizational functioning, while subordinates have a different one, and no one knows that this is the case, messages traveling along vertical linkages will inevitably suffer distortion.

The primary outcomes of FVP include the erosion of trust, performance misattribution, patterns of bypassing formal communication channels (Voss & Krumwiede, 2009), emergent reliability nodes or growing inequity in real work roles (Voss *et al.*, 2010), withholding effort, increasing unit attrition, and leaders' disconnection from the company mission (Voss *et al.*, 2010). Trust theoretically suffers at both ends of the dyad, rather than just among subordinates. The erosion of trust is thus apparently an affective outcome from FVP, rather than a facet of FVP itself, but the information flow along vertical power linkages includes both cognitive and affective elements. Performance misattribution may occur in the form of a supervisor's taking credit for the work of a subordinate, but FVP may more broadly cloud the ability of organization decision makers to measure performance in general. Patterns of bypassing formal communication channels are a logical outcome of FVP, given that formal channels suffer from noise, causing communication efforts either to cease or to seek alternative routes. Reliability nodes refer to individuals in the organization become favored points of contact across units or with outside organizations and are symptomatic of the effort to bypass formal channels. Related to these outcomes, the erosion of perceptions of both procedural and distributive justice is also a natural byproduct (*cf.* Homans, 1961; Thibault & Walker, 1975).

FVP is different from LMX, which is otherwise also similar in that it focuses on vertical lines of communication, in more than one way. First, LMX focuses on one unit at a time, while FVP also considers the potential for the noted information exchange dynamic to spread across units (Voss & Krumwiede, 2012). The latter observation comes from the fact that open systems are fractal in nature, a concept that originates in chaos theory (Mandelbrot, 1977). Thus, the distorted dynamic may indeed be observable within each dyad but may originate far above the dyad under analysis and replicate itself downward across organization levels. Second, the polarization suggested in FVP represents a phenomenon qualitatively different from simply low levels of vertical-exchange quality. Rather than the absence of communication, a high-FVP condition represents the presence of contrary dynamics, reshaping messages transmitted along vertical linkages, rather than merely failing to communicate them.

Of relevance to scale development is the manner taken in the original development of the LMX (vertical-exchange) scale. Graen, Dansereau, Minami, and Cashman (1973) factor-analyzed 60 scale items reflecting the richness perceived by subordinates in their respective leaders' style of interaction and drew therefrom a reliable list of 21 items in all (p. 617). The procedure entailed principle-components analysis with varimax rotation, using the Kaiser criterion (*i.e.*, Eigenvalues greater than one) to select the number of factors to retain. The first factor appeared to be vertical exchange and resulted in the unidimensional model used in Graen and Cashman (1975), Graen, Cashman, Ginsburg, and Schiemann (1977), Liden and Graen (1980), and other work. Dienesch and Liden (1986) saw the selection of only the first dimension as problematic, insisting that there must be a theoretical reason for it. Nevertheless, the logic of the approach predicted that the long list of items would reflect both LMX and constructs related to LMX and thereby draw non-LMX items away from LMX items in the actual analysis. That is, the researchers are likely to contrive items reflective of LMX as well as related constructs, rather than LMX alone, in the construction of an LMX scale. The development of FVP produced a similar observation, that the distinctions between the phenomenon of interest and related phenomena in systems theory are subtler than in traditional organizational behavior. This observation influences some of the choices made in the current study as well.

PHASE I

This project consisted of two phases. The first phase used a 42-item survey. The factor-analytic results of this phase suggested the emergence of factors resembling LMX and TMX, respectively, along with a third factor (*viz.*, the primary one), which seemed to reflect a generalized variety of dissonance. Pursuing generally the same approach as that taken by Graen *et al.* (1973), the procedure used in this first phase involved listing several items that seemed to reflect the FVP condition from the perspective of the subordinate, based on prior conceptual models (Voss & Krumwiede, 2009, 2010, 2012; Voss *et al.*, 2010). Factor analysis with varimax rotation served as the sorting procedure. The approach imitated that of Graen *et al.* (1973), wherein the analysis sought to separate items from related constructs away from those of the core LMX construct. The goal was thus to find a unidimensional model by including items associated with nomologically related but theoretically independent constructs, anticipating that this approach would create factors in the solution separate from the core FVP factor and draw off peripheral items. The initial survey used in the present study thus included items with wording from the related constructs in the external nomology presented in Voss and Krum-

wiede (2010). For example, erosion of trust is a predicted outcome in the nomological net, so the initial list of items included an item related to trust. The intent in doing this was to induce the factor analysis to separate the trust item in this case from core FVP items, along with any items that correlate too closely with the trust item. Each of the other related constructs according to the external nomology likewise found a place in the initial list of items, with the same objective in mind.

METHODOLOGY

Sample

In Phase I, the sample consisted of a combination of N = 80 graduate and undergraduate students from two different locations in the United States (Southeast and Northwest), enrolled in business programs and mostly of the midcareer type, having returned to school after participating in the workforce for a number of years. Of the combined sample, 10% reported an intention to respond to survey items with their instructor in mind, rather than either a prior or a current supervisor in a regular employment setting. A plurality of the respondents (46%) reported on their current jobs, while 26% reported on a previous job. In addition, 31% of the sample held either supervisory or managerial positions, while 60% held wage-grade jobs. The sample was modestly international in nature, only 85% hailing from the United States. Of the total sample, 30% consisted of graduate students, while the remaining 70% were in a bachelor's degree program. The median age was 27, and 43% of the sample was female. A majority of respondents (61%) were European American, with 14% African American, 5% Arab, and 3% Chinese.

Instrument

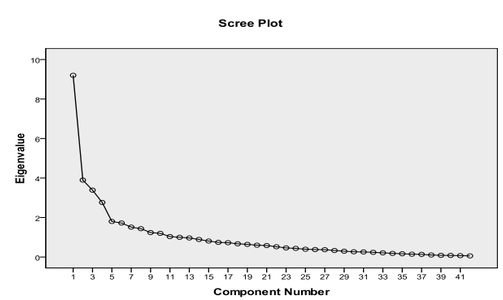
The initial survey instrument featured 42 items in a 5-point Likert format (1 = strongly disagree; 5 = strongly agree). Using a spreadsheet-based randomization procedure, the researchers created three variants of the survey beyond the original, each a random ordering of the original. This step had the goal of mitigating the growth in random error expected as each respondent continues to answer items while growing fatigued, an effect that tends to undermine the strength of statistical findings among the final survey items in the list. The researchers then administered the surveys by randomly distributing the four versions among respondent groups in classroom environments and then used a spreadsheet protocol to reconcile the four versions after the fact. The instrument also featured both positively and negatively keyed items, of which two-thirds were in a positive key, such that the item's semantic wording corresponded to the presence of an FVP condition and therefore a normatively negative observation. The procedure for integrating the negatively keyed items into the statistical program involved recoding the responses by subtracting them from six, so the factor analysis shows no keying effects by mathematical sign, as was the case in Graen *et al.*'s (1973) study.

Results

The factor analysis took place across several iterations, with varimax rotation. The first run used the Kaiser criterion (Eigenvalues greater than one), but the rotated model failed to converge. The Eigenvalue rule suggested 11 factors, while the scree plot suggested five. Figure 1 reproduces the scree plot. The limited sample size (N = 80) seems to be responsible for the uneven distribution of the first five factors in the illustration. The researchers set the number of factors to five in the second run, and the results permitted the elimination of cross-loading variables. The criterion for eliminating a variable involved identifying the absolute value of item loadings and eliminating any item thus loading on more than one factor within a range of r <.19, which corresponds to the smallest correlation with a p-value of less than the α = .05 at this sample size. The result was the removal of 16 items in the first run.

With the elimination of each set of items, a new analysis showed more items to delete, prompting a repetition of the process. With each run, the researchers followed the principle of always setting the number of factors to the smallest of three criteria: (a) the scree plot; (b) the Kaiser criterion; and (c) the number of factors adopted in the previous run. Regarding this last criterion, although the Kaiser criterion never produces a new outcome with more factors than the preceding one, the adoption of a smaller number of factors in one run might result from a conceptual decision, hence the logic of including this third criterion.

Figure 1
Scree Plot, Initial 42 FVP Scale Items



Using the noted method, the number of factors suggested by the Kaiser criterion gradually fell. As it did so, the new Kaiser number dictated a new run before eliminating factors. The model at last proved stable after four runs. All items loaded at r = .6 or greater on their respective factors. At this point, it was reasonable to label the factors based on their manifest content. This process, however, led to the conclusion that two factors were conceptually identical. The factors included: (a) strategic alignment (7 items); (b) vertical dissensus (5 items); (c) information obstruction (4 items); (d) leadership quality (3 items); and (e) information openness (2 items). In the judgment of the researchers, Factors 3 and 5 were identical in meaning but in opposite keys, so there was a suspicion that these factors were wording artifacts. This observation led to a decision to rerun the analysis with only four factors.

As expected, Factors 3 and 5 from the previous run merged after specifying four factors instead of five. However, the new factor distinctions seemed rather unclear, considering their constituent items. The new factors included: (a) strategic alignment; (b) vertical dissensus; (c) information flow; and (c) leadership quality. A consideration of the constituent items seemed to suggest that the last category might be insufficiently stable. A rerun of the analysis with three factors resulted in an opportunity to eliminate two items from the leadership quality factor, which confirmed the apparent weakness of that potential subscale. The final solution consisted of three factors in all: (a) strategic alignment or *gestalt* exchange quality; (b) vertical dissensus or exchange quality; and (c) information flow. Table 1 depicts the final factor structure.

From a theoretical point of view, the resulting factors each appear to capture an important aspect of FVP. Meanwhile, with one exception, items reflective of a related but

Table 1
Factor-Analytic Results
FVP Scale, Phase I

	F1	F2	F3	Key	Item
1	.727			–	I can usually tell what my organization's strategic goals are.
2	.704			–	This company believes in fairness and justice.
3	.693			+	I often feel that there is no way for me to satisfy my boss with how well I do my job.
4	.677			+	Supervisors are disconnected from the company mission.
5	.666			+	I find my manager's practice of seeking information from just a few in the unit to be divisive.
6	.648			+	The boss will take credit for your work.
7	.634			+	I often feel overwhelmed in my job.
8		.774		+	The organization's leaders have little conception of the challenges we face in the line units.
9		.697		+	Many workers just watch the clock, waiting to go home.
10		.664		+	There is usually disagreement between top managers and local managers on what to do.
11		.627		+	Managers too often blame subordinates for failure.
12		.623		+	Our boss should discuss company issues with us more.
13		.518		–	The leadership in my company usually takes responsibility for its own mistakes.
14			.679	+	This organization's leaders appear to disagree among themselves over mission priorities.
15			.669	+	It would be a good idea to invite some rank-and-file workers into managerial meetings sometimes.
16			.627	–	There is good understanding among top management of what the average worker faces in this company.
17			.611	+	I have difficulty understanding my co-workers' motives.
18			.599	–	We receive plenty of news and information about what is going on in our company.
19			.578	+	There seem to be obstructions in the normal channels through which messages and directives should flow.

Notes: F1 = strategic alignment; F2 = vertical dissensus; F3 = information flow.

independent construct (*e.g.*, trust or coercive leadership) disappeared from the solution, instead of surviving in the form of another factor, an outcome suggesting that they were unique in their statistical properties from the other items and therefore failed to draw any other items toward them. The exception is the justice item, which survived in the first factor and seems to indicate that respondents are unable to see any difference between the concept of justice and leaders' working harmoniously with the mission, goals, and trajectory of the organization. While FVP may validly be construable as a unidimensional construct in the context of the associated larger paradigm, these results suggest that it may show up psychologically in more than one subsidiary forms. Consistent with Dienesch and Liden's (1986) observation, the solution may merit identifying a multi-factor structure, even if the logic of the theory suggests a single-factor structure. That is, a single complexity dynamic may be perceptible to people in a multifaceted way, despite its theoretical singularity, if it affects people in perceptibly distinct ways simultaneously. The semantic proximity among the resulting factors further reinforces this observation, as is evident from the variety of items that the analysis has retained.

Accordingly, in these results, each form of the underlying construct may capture a type of logic that has some resonating power with respondents. Specifically, strategic alignment refers to the perception of the leader's character and behavior as integrating with that of the organization as a whole in the form of a *gestalt*, with a sense of harmony throughout. Vertical dissensus focuses on a view of the leader as manifesting some richness of interaction with the subordinate. Therefore, this factor may actually be construable as a negative version of LMX itself (*cf.* vertical exchange; Graen *et al.*, 1973). Lastly, information flow seems to emphasize horizontal linkages, whether among one's leaders or between oneself and others. Thus, this third factor seems to be a variant of a negative version of TMX that includes additional observations outside of one's own team.

Correlation Matrix

Based on the factors defined as given above and using the average of the corresponding item values to constitute each factor (subscale) score, Table 2 gives the correlation matrix, including those demographic items that are construable in interval or binary form. The intercorrelations among the three factors are rather low, although two of them are significant, so the factors seem to be distinct from one another. The interpretation that Factors 2 and 3 are similar to LMX and TMX (in negative form), respectively, seems apt here. By that interpretation, the true (or core) FVP scale is Factor 1, which also has the strongest reliability (r = .825). Among the demographic variables, the only notable outcome is the correlation between education and Factor 3, suggesting that the higher one's education, the more likely is one to perceive information flow obstructions.

PHASE II

Methodology

As noted previously, the Phase I study seems to have produced two factors resembling LMX and TMX, along with an FVP factor. Phase II therefore expanded the survey by adding items directly adapted from LMX and TMX, respectively (five items each), to highlight any potential difference that emerges between LMX and FVP narrowly defined on the one hand, and between TMX and a horizontal variety of dissonance (FHP; *cf.* Voss & Krumwiede, 2012) on the other. In addition, the researchers reworded certain items that seemed confusing based on the prior factor-analytic results. The new scale consisted of 52 items.

Table 2
Correlation Matrix
Demographics and FVP Subscales (Phase I)

		1	2	3	4	5	6
1	**Education**	—					
2	**Age**	.237*	—				
3	**Gender**	–.071	–.114	—			
4	**F1 (Strategic Alignment)**	–.090	.020	–.003	[.825]		
5	**F2 (Vertical Dissensus)**	.117	–.131	.117	.314**	[.767]	
6	**F3 (Information Flow)**	.323**	.254*	.013	.185	.358**	[.754]

*p < .05; **p < .01; ***p < .001 (2-tailed tests)

Notes: Bracketed items on the diagonal are reliability coefficients (Cronbach's alpha). Demographic variables: education (1 = some college; 2 = bachelor's degree; 3 = master's degree); age (actual age); gender (1 = female, 2 = male).

Sample

The Phase II sample consisted of N = 346 midcareer graduate and undergraduate students from several locations across the United States, enrolled mostly in business programs (85%), as well as many other areas, such as the healthcare fields, aviation technology, and radiography. Of the combined sample, 21% reported completing the survey with their instructor in mind, rather than a prior or current supervisor. Most respondents (58%) reported on their current jobs, while 22% reported on a previous job. In addition, 39% held supervisor or managerial positions, while 61% held wage-grade job positions, of those reporting on work experience. As in Phase I, most of the sample (88%) was from the United States. Of the total sample, 92% were in a bachelor's degree program. The median age was 28, and 53% of the sample was female. A majority of respondents (59%) were European or European American, with 26% of African heritage, 5% Asian or Indian, 5% Hispanic or from Latin America, and 3% Arab.

Instrument

The new survey instrument consisted of the original 42-item scale with rewording in response to evidence of confusion in some cases based on the Phase I study, augmented by five LMX items from Graen *et al.* (1973) and five TMX items from Seers (1989). Qualtrics™ served as an online delivery medium for the survey in this case, which approach enabled respondents to complete it in various random permutations. It was therefore unnecessary in this case to create randomized versions of the survey. The instrument featured 30 positively and 22 negatively keyed items, the positively keyed items worded to reflect the presence of an FVP condition or negative LMX or TMX condition.

Results

The researchers again employed a principal-components factor analysis across several iterations with varimax rotation. The procedure in this case entailed reducing the set until attainment of a clean solution, followed by an interpretation of the solution. The interpretation was much easier to make this time, so after attainment of a clean solution, which showed the number of factors to expect, the researchers reran the analysis from the beginning while specifying the correct number of factors. The criterion for determining cross-loadings in this case was a difference of r = .11, which corresponds to α = .05 with a sample size of this order. A clean solution emerged at four factors, interpretable as: (a) a generalized variety of LMX quality; (b) a vertical-exchange variety of FVP; (c) a generalized variety of FVP; and (d) TMX quality. The LMX items included notions of fairness, equity, and taking responsibility for mistakes, in addition to what appeared to be core LMX items. This was the first factor, however, which naturally draws the most items, so it was unclear prior to rerunning the analysis whether this factor would emerge as LMX *per se*. Between the two FVP factors, the first (Factor 2) addressed managers and management more specifically than the second and was clearly a reference to vertical relationships. By comparison, the second (Factor 3) included items reflecting a general lack of information sharing, with little specificity as to the direction of that information. It also included references to inequities among organization members' task loads. The TMX factor consisted entirely of original TMX items, adapted to the purposes of the survey.

As noted, the researchers reran the analysis from the beginning to reach the same point of a stable solution, but with the expectation of losing fewer items in the process. That is, the quest to find a stable number of factors tends to cause the elimination of some items that might instead remain in the solution if the analysis adopts a consistent number of factors from the beginning. Upon the attainment of a stable 4-factor structure, the researchers decided to balance the number of items in each factor by eliminating the weakest Factor 1 loadings first to match the number of items in Factor 2, then the same with Factor 2. The result was an equal number of items in the first three factors. The exception was Factor 4 (TMX), which only retained three factors, as the goal of the study was to create an FVP scale, rather than a TMX scale. Meanwhile, the reason for reducing the LMX scale (Factor 1) was to remove any weight from that factor that might be affecting the item loadings in the two FVP factors.

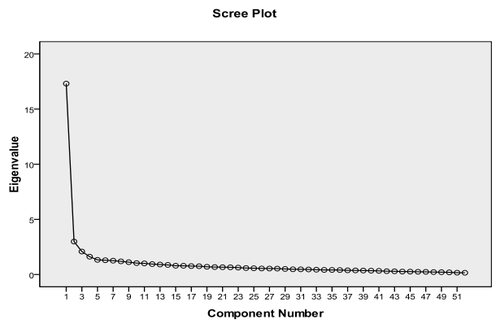
The result was eventually eight items in each of the first three factors, and the original three items in the fourth (TMX) factor. This procedure was especially important in terms of clarifying Factor 1, as the surviving items were more clearly LMX *per se*, without the admixture of the other items previously present. The first factor retained three of the original five LMX items. One LMX item from the original list loaded onto Factor 2. All items loading onto Factor 1 had positive wording (and keying, since LMX is a normatively positive condition), while all FVP items (both Factors 1 and 2) had negative wording (hence

positive keying). However, the difference is unattributable to wording confounds, because the randomizing procedure used in survey administration eliminated that possibility. To confirm this fact, the researchers attempted to create a single LMX-FVP scale out of LMX and the first FVP factor by way of reliability analysis (eliminating the more poorly fitting item in successive iterations until attainment of a reliability coefficient of at least r = .80). However, the result was the complete elimination of LMX items rather than a composite of LMX and FVP items. This result showed that the two scales were measuring two different phenomena. An additional semantic difference between the scales is that the LMX items specifically address leadership (along with fairness, equity, and responsibility), while the FVP items refer instead to management, emphasize dissensus between managers and subordinates, and imply only one-way directives rather than participative leadership processes. FVP consequently reveals the presence of dysfunctions along vertical lines of communication, rather than merely the absence of LMX qualities. The second FVP factor functions similarly, but with respect to general communication patterns, with no specification of direction.

From a theoretical point of view, the resulting factor structure greatly clarifies the results of the first study, showing that FVP is qualitatively different from negative LMX, while there evidence of both a direct and an indirect version of FVP, representing FVP *per se* (Factor 2) along with the immediate after-effect of FVP (Factor 3). Interestingly, items referring to fairness, justice, and a sense of responsibility have now clearly loaded with the LMX construct, rather than FVP. This is an important observation for LMX *per se*, but it also emphasizes that FVP reflects a more active dynamic than merely the absence of such desirable conditions in the workplace.

Reflecting on Phase I, the idea of *gestalt* information flow, representing perceptions of functional or dysfunctional information exchange without reference to direction, appears as a facet of both LMX and FVP. As a facet of LMX, the *gestalt* information flow dynamic refers to justice, equity, fairness, and responsibility, which are evidently observations about the organizational leadership, as they are part of the LMX factor structure. The LMX reliability coefficient (r = .887) suggests that these items are essential to the semantic structure of LMX, rather than aspects of some other construct that happen to have loaded on the LMX factor by accident. The *gestalt* quality emerges again in the second FVP factor (while leaving the first unaffected), where the semantic structure is different, this time referring to general unevenness in task allocation, information availability, and sense of inclusion in decision making.

Figure 2
Scree Plot, Expanded 52 FVP Scale Items



Correlation Matrix

Using the same methods as in Phase I of the study, Table 4 gives the correlation matrix with the same demographic items as before. The intercorrelations among the two FVP components, LMX, and TMX provide convergent validity among these dynamics (they are negative because FVP is a normatively negative condition, while LMX and TMX are normatively positive). Age correlates negatively with FVP and positively with LMX quality, implying that older people are more likely to find themselves in positions of responsibility and thus less often on the receiving end of a high FVP condition than will be the case among younger people. The statistically positive relationship between LMX and TMX further suggests the presence of a spillover effect from organizational dysfunctions, such that a poor LMX condition is likely to exist where there is also a poor TMX condition. Similarly, such cases also correlate with high FVP conditions, as is evident from the strong negative correlations between FVP and both LMX and TMX.

DISCUSSION

This paper presents a sequence of two scale development studies to operationalize FVP and thus enable cross-sectional research to confirm the theoretical validity of the construct. The first study tested 42 items, including selected items designed to reflect variables theoretically related to FVP but operationally distinct from it, to produce a 3-factor structure featuring possibly a version of FVP, one of LMX (*cf.* Graen *et al.*, 1973), and one of TMX (*cf.* Seers, 1989). These factors were difficult to interpret clearly, possibly due to the lack of clear LMX and TMX items in the original scale for comparison. The second study used the results from the first to revise some of the item word-

Table 3
Factor-Analytic Results, FVP Scale, Phase II

	F1	F2	F3	F4	Key	Item
1	.717				+	I have a lot in common with the people who run my company.
2	.717				+	This company believes in fairness and justice.
3	.708				+	Leaders treat all persons under them as their equals.
4	.668				+	Supervisors deal fairly with all of their subordinates.
5	.655				+	Leaders actively seek input on ways to make the organization function better.
6	.649				+	The leadership in my company usually takes responsibility for its own mistakes.
7	.648				+	Supervisors are very reasonable about how to handle mistakes when they occur.
8	.645				+	Management is willing to make changes.
9		.736			–	I don't usually expect my manager to carry out the real duties of management.
10		.716			–	This company's managers expect subordinates to do their jobs for them.
11		.694			–	The boss will take credit for your work.
12		.649			–	To get along, you have to pretend to respect the boss.
13		.551			–	Managers too often blame subordinates for failure.
14		.550			–	The use of threats and penalties is normal around here.
15		.531			–	My supervisor often makes unreasonable requests of me.
16		.465			–	The boss rejects suggestions for changes.
17			.668		–	Some people seem to do everything, while others seem to do nothing.
18			.622		–	There is too much secrecy in this company.
19			.610		–	Managers should come down into the trenches more often to see what it's like down here.
20			.605		–	I am too often left in the dark about what my organization is up to.
21			.584		–	Our boss should discuss company issues with us more.
22			.582		–	Many workers just watch the clock, waiting to go home.
23			.560		–	The organization's leaders have little conception of the challenges we face in the line units.
24			.523		–	There is usually disagreement between top managers and local managers on what to do.
25				.780	+	We often make suggestions about better work methods to our team members.
26				.666	+	I usually have no problem helping to finish work assigned to coworkers when necessary.
27				.552	+	In busy situations, team members openly ask one another for help.

Notes: F1 = LMX quality; F2 = FVP I (vertical exchange or direct effect); F3 = FVP II (Gestalt exchange or immediate after-effect); F4 = TMX quality. Item keying in this table reflects LMX & TMX normative keying, so positively keyed FVP items appear negative.

Table 4
Correlation Matrix—Demographics and FVP Subscales (Phase II)

		1	2	3	4	5	6	7
1	**Education**	—						
2	**Age**	.145**	—					
3	**Gender**	–.010	–.125*	—				
4	**FVP I (vertical)**	–.138**	–.015	–.084	[.848]			
5	**FVP II** (*gestalt*)	–.115*	–.040	–.004	.651***	[.806]		
6	**Generalized LMX**	.109*	.105	–.102	–.610***	–.580***	[.887]	
7	**Generalized TMX**	.103	.047	–.009	–.387***	–.345***	.598***	[.611]

*p < .05; **p < .01; ***p < .001 (2-tailed tests)

Notes: Bracketed items on the diagonal are reliability coefficients (Cronbach's alpha). Demographic variables: education (1 = some college; 2 = bachelor's degree; 3 = master's degree); age (actual age); gender (1 = female, 2 = male).

ing for clarity and added five LMX and five TMX items on purpose. The second study used an appreciably larger sample and produced a clear solution that was easy to interpret, including unambiguous LMX and TMX factors, along with two FVP factors. The latter consisted of FVP as originally construed, with a purely vertical orientation, and evidently a secondary FVP factor reflecting the immediate after-effects of an FVP condition. The second FVP factor ignored any questions of vertical or horizontal information flow, but rather addressed only an undifferentiated form of information exchange dissensus.

Both FVP factors and the LMX factor showed strong internal-consistency reliability results, and each consisted of eight items. The two-factor FVP measure is thus a 16-item scale. Reducing the number of items on the LMX factor (Factor 1 in the second study) turned out to be very helpful to interpreting it. The TMX scale had better reliability properties when reconstituted in the form of its original five items, but it still fell short of r = .80. Strictly speaking, the LMX and TMX factors reflect generalized varieties of LMX and TMX properties, rather than the unit-specific properties contemplated in the original scales. That is, LMX in the second study reflects vertical exchange quality as the respondent perceives it generally to occur throughout the organization, rather than consisting of opinions about one's own supervisor. Similarly, TMX in the second study reflects horizontal exchange throughout the organization, rather than strictly within one's own team. These constructs are therefore different from LMX and TMX, respectively, as strictly construed, in a sense analogous to the emergence of other constructs in the literature in both a specific and a generalized form (*e.g.*, specific self-efficacy *versus* generalized self-efficacy; *cf.* Gardner & Pierce, 1998).

The most important conclusion in the present study is that FVP is qualitatively different from a negative construal of LMX by itself. While the measures correlate negatively with one another, confirming their theoretical relationship (*cf.* Voss & Krumwiede, 2010), the effort to combine the scales is self-defeating, as applying reliability analysis to the process by eliminating poorly fitting items results in the removal of all LMX items anyway (to attain a reliability coefficient of at least r = .80). Meanwhile, it is also incorrect to construe FVP as merely one subsidiary facet of LMX. This is because low LMX quality represents the lack of desirable vertical exchange properties in leader-member dyads, while a high FVP condition (using only the first FVP factor) represents the presence of outright dysfunctions in the vertical information flow. Moreover, the differentiation between ingroup sycophants and outgroup mavericks in vertically polarized units (*cf.* Voss *et al.*, 2010), due to leader mission dissensus, suggests a qualitatively different phenomenon from the construal of ingroup members as cadre and outgroup members as hired hands, as noted in early studies (Dansereau, Graen, & Haga, 1975). In the latter construal, hired hands consist of those members of a unit whose level of motivation to participate corresponds to transactional rather than relational expectations. They believe that they have work to do, according to their rational contract with the organization, but assert their right to depart company at the requisite hour.

The hired hand's level of motivation is one of indifference, rather than one of deep tension. By contrast, a high FVP condition may manifest itself in the form of outgroup members who sorely wish to have an opportunity to do great work but only experience frustration due to the polarized nature of their units and consequent feelings of exclusion from core organizational processes. In such a condition, outgroup mavericks are actually more in tune with the organization mission than is the unit's leader. The difference in value delivered to an organization in a low-LMX and a high-FVP structure can be considerable. In the former, outgroup members could certainly apply greater energy to their roles, but they withhold that extra effort. Meanwhile, ingroup members and the unit leader are indeed energetic. In the latter, it is the unit leader and ingroup members that are withholding effort, effectively delivering only that level of value to the organization that is necessary for them to maintain the appearance of effectiveness, while outgroup members may also underperform, but due to a lack of support, rather than to any kind of indifference.

Thus, while LMX addresses the potential for developing strong leaders within the paradigm of systems theory, FVP addresses the initial conditions that must be present before an organization is likely to be able to set up an effective LMX program. The presence of outright organizational dysfunctions along the vertical power linkages poses problems for prospective LMX operations, in part because of the fractal nature of such dysfunctions. That is, according to FVP theory, the manifestation of FVP conditions in one unit typically reflects the same manifestation elsewhere in the organization, notably in superordinate units. Any effort to overcome FVP conditions in one unit therefore depends on somehow blocking the interference coming from the information flow above the unit in question. Similarly, if a high-FVP organization hires a leader with strong LMX competencies, that leader will have to carry out the leadership role under the constant pressure of superordinate information dysfunctions. The expectations among the present researchers is that the individual will typically either succumb from the pressure and cease to bring forth the energy necessary to persist in that role or leave the organization altogether.

Future research should proceed to make further comparisons and contrasts between LMX and FVP, in addition to those comparisons between FVP and other constructs identified previously as causing FVP or manifesting themselves as likely outcomes. In the present factor analysis, there was originally a trust item, for example, based on the nomological net introduced in Voss and Krumwiede (2010). The fact that the model failed to retain this item suggests that it is probably external to FVP, as theorized. Studying whether there is the expected relationship between trust and FVP is therefore an important part of the recommended research agenda.

The potential utility of generalized varieties of LMX and TMX is also worth consideration for future studies. Scales of this kind may be useful for gauging an organization's general condition in terms of vertical and horizontal information exchange, regardless of the type of leadership structure generally present in the organization, and regardless of the prevalence of true team structures. Thus, a generalized-LMX scale may be useful for comparing even a hierarchical organization to others of the same kind to assess whether the LMX level appears appropriate. A generalized TMX scale may be even more useful in that it could gauge horizontal information flow even in organizations that reject team-based performance structures.

A limitation in the present study consists of the paucity of TMX items that the factor solution retained. The result was a factor consisting of only three items, such that adding the other two items actually increased the reliability coefficient and therefore was necessary for incorporating a TMX scale into the study for purposes of correlational analysis. Deeper insights may be feasible with the use of a more solid scale to measure generalized TMX. Strictly speaking, an analysis of horizontal dynamics lay outside the parameters of the present study, but the poor properties of TMX were a mild concern.

On the other hand, the present study seems to make a particularly important contribution, in that proper organization diagnosis to determine how to improve leadership conditions may require an FVP analysis first, followed by corrective measures that address the FVP condition, rather than the immediate application of LMX as a training program to improve leadership talent. Given the common symptoms that are likely in a high-FVP condition, using LMX alone to try to reconnect unit leaders to the organization mission may backfire. Instead, new leadership may be necessary, and a complete restructuring of the roles held by the outgroup mavericks may have to follow to lay the basis for proper LMX development. The same kind of attention to the FVP structure will probably also be necessary before any other major leadership undertaking is possible, including training initiatives for transformational leadership (Bass, 1990), servant leadership (Greenleaf, 1977), or the five leadership levels of Collins (2001).

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Corporate Social Responsibility and Earnings Predictability

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ABSTRACT

The current study examines the association between corporate social responsibility (CSR) and earnings predictability. It draws on theory from economics and management to hypothesize and test how CSR may impact earnings predictability. The hypotheses are tested by examining the association between properties of analyst forecasts and two CSR measures (CSR Strengths and CSR Concerns from KLD STATS data). Results show firms that are more socially responsible, when CSR is measured in terms of CSR Concerns, have less error and less forecast dispersion. When CSR is measured in terms of CSR Strengths, more socially responsible firms have more error and more forecast dispersion.

INTRODUCTION

Despite the prominent role of corporate social responsibility (CSR) in today's business environment, there is substantial debate over its merits. Some maintain that CSR obfuscates negative social and environmental impacts of business operations (Grow et al., 2005). Others claim CSR may diffuse management's attention into projects with uncertain future benefits, allocating resources that could be better invested elsewhere (Jensen, 2001; Karnani, 2010). A lengthy stream of academic research on the CSR /financial performance relationship has failed to settle the debate. The preponderance of evidence suggests a positive association between CSR and financial performance; however, methodological problems and mixed results have beleaguered this area of research, limiting the conclusions that can be drawn.

Much prior research focused on the link between CSR and financial performance. Current accounting research in this field, however, is addressing how CSR affects accounting information and by implication, how sophisticated users of accounting information and capital providers are using CSR information. The increased accessibility of CSR information in today's business environment has fueled research examining how CSR is associated with cost of capital (Dhaliwal et al., 2011), earnings quality (Kim et al., 2012); and financial reporting quality (Kim and Venkatachalam (2011).

The current study applies economic and management theory to examine the link between CSR and earnings predictability, a critical area of concern to managers (Graham et al., 2005). Hypotheses are tested by examining the association between properties of analyst forecasts and two CSR measures. This study incrementally contributes to the current literature in two major ways. First, it integrates prior research in CSR across multiple disciplines and delineates how CSR potentially impacts accounting outcomes. Second, it investigates how sophisticated financial statement users may be using CSR information in earnings forecasts.

HYPOTHESES DEVELOPMENT

Defining CSR

The term corporate social responsibility (CSR) has been used in both academic literature and popular press for decades, but lacks a precise definition. There are several issues contributing to difficulties defining the construct. First, there is disagreement over what a corporation's responsibility towards society is. Second, this disagreement spans across multiple domains including legal, economic, business, political, social, and ethical. Finally, theoretical frameworks, within the academic disciplines that study and debate this issue, have evolved. Generally accepted and popular theories change, as does the terminology within disciplines. Consequently, definitions are proposed and modified as researchers grapple with CSR-related questions.

Carroll (1999) reviews the evolution of the CSR construct incorporating definitions dating back to the 1950s. Several common characteristics emerge from the definitions of CSR reviewed by Carroll. The definition being adopted in this paper is consistent with these characteristics. For the purpose of this research, CSR is defined as: the extent to which a corporation manages the social and environmental impacts of business activities on corporate stakeholders. It implies voluntary actions that go beyond legal

and regulatory compliance. Finally, CSR must be viewed relative to the business environment within which a firm operates.

Earnings Predicability

Examination of analysts' forecasts provides a means to evaluate potential effects of CSR on predictability of earnings by sophisticated users of accounting information. Two analysts forecast properties, error in the mean forecast and forecast dispersion, have been interpreted by accounting researchers to indicate uncertainty (Barron and Stuerke, 1998; Daley et al., 1988; Imhoff and Lobo, 1992; Lang and Lundholm, 1996; Ziebart, 1990). Barry and Jennings (1992) and Barron et al., (1998) argue forecast dispersion reflects uncertainty or a lack of consensus over future events. Barron and Stuerke (1998) find greater incidence of analyst-forecast updating after earnings announcements when dispersion is greater. They argue greater uncertainty for future firm economic performance leads to more informational demand. Analysts seek and find private information and then update their forecasts based on private information.

Hypotheses

CSR may enhance earnings predictability for two major reasons. First, firms that are more (less) socially responsible, relative to their peers, face less (greater) uncertainty in future earnings due to contingent costs and/or contingent lost revenues. More specifically, firms that are more socially responsible engage in behaviors to reduce conflicts and seek to realign corporate and social goals (Heal, 2005). Resources are allocated to addressing operational issues with social and environmental impacts proactively, reducing the likelihood of negative externalities being realized. This reduces the likelihood of future payouts associated with such externalities and consequently reduces the likelihood that firms will realize related expenses in future accounting earnings. There is less uncertainty in future earnings, enhancing earnings predictability. Firms that are less socially responsible ignore some environmental and social impacts of their operating activities and are more likely to incur future payouts associated with negative externalities. To the extent that such externalities are material, there is increased uncertainty in accounting earnings for less socially responsible firms and therefore less earnings predictability.

The second reason one might expect a positive association between CSR and earnings predictability comes from intangible value creation and operational efficiency gains (Orlitzky, 2003). More socially responsible firms yield competitive advantage to the extent that these firms can attract/retain customers and can offer innovative products/services, more efficiently than less socially responsible industry peers. Over time, this competitive advantage may be realized in more permanent earnings, enhancing earnings predictability.

However, one can argue that being more socially responsible decreases earnings predictability, particularly as operationalized in analyst forecast properties. It is possible that the creation of intangible value gained by more socially responsible firms creates greater uncertainty. Intangible assets are difficult to value and projecting how and when intangible value generated from CSR will be realized in accounting earnings is a task that may increase uncertainty and, consequently, have the opposite effect on earnings predictability. Prior research on CSR and financial performance suggests smoother revenue generation over the long term (Clark and Hebb, 2005); however, empirical evidence to back up such claims is lacking. In addition, the potential realizations of private-social cost conflicts in accounting earnings may be so uncertain that they are generally ignored by sophisticated users of accounting information. Finally, firm-level information on CSR varies widely in terms of content, format, and assurance. It is possible that these issues raise uncertainty, increasing the need for analysts to acquire private information, leading to greater differences in individual analysts' beliefs, and, consequently, greater dispersion. Consequently, these hypotheses are stated with no expected direction:

H1: Corporate social responsibility is associated with error in mean analysts' forecasts.

H2: Corporate social responsibility is associated with dispersion in analysts' forecasts.

RESEARCH DESIGN

CSR Measures

KLD Research & Analytics, Inc. (now part of RiskMetrics Group) provides comprehensive data on the social and environmental performance of large US firms. KLD analysts compile CSR information from direct communication with company officers, news sources, public documents, governmental documents, and other sources to evaluate social and environmental performance. KLD data is the most often cited data used in CSR research (Deckop et al., 2006; Mattingly and Berman, 2006; Ruf et. al., 1998; Sharfman, 1996; Waddock, 2003).KLD STATS is a set of 0/1 indicators for more than 50 social and environmental criteria for large US firms. The criteria are stated as outcomes rather than intentions or goals, a critical aspect of CSR measurement (Ruf, et al., 1998; Wartick and Cochran, 1985; Wood 1991). The 0/1 indicators are classified by dimension (environment, diversity, community, etc.), and further categorized as strengths or concerns. For example, if a company has a strong pollution prevention program in place, it is scored 1 for the Pollution Prevention Strength Indicator, 0 otherwise. If a company has material liabilities for hazardous waste sites, it is scored 1 for the Hazardous Waste Site Concern Indicator, 0 otherwise. Indicator scores for firms evaluated by KLD are available annually. KLD analysts specialize by sector and have processes in place to assure criteria are impartially applied to the population of firms evaluated. As a result, KLD STATS provides objective, summary data indicating the presence or absence of distinct social and environmental criteria for a predefined population of US firms on an annual basis.

Generally, in prior research with KLD data, CSR scores were created by calculating the total number of strength indicators scoring 1 in a given year, calculating the total number of concern indicators scoring 1 in a given year, then finding the difference between the two (Graves and Waddock, 1994; Griffin and Mahon, 1997; Johnson and Greening, 1999; Waddock and Graves, 1997). Thus, the CSR score was a net measure of CSR strengths and concerns. More recent literature argues against this practice (Mattingly and Berman, 2006). Netting strengths and weaknesses potentially obfuscates social or environmental performance. For example, Firm A may be socially responsible with regards to community and employee relations, scoring high on strengths, yet have a number of environmental concerns. If the CSR score is computed by subtracting total number of concerns from total number of strengths, Firm A may appear neutral. Understanding the nature of these differences is the subject of continuing research and is beyond the scope of this study. The purpose of the current research is to investigate the relationship between CSR and properties of analysts' forecasts. KLD data provides information considered to be valid for assessing CSR. Analyses in the current study are performed using two CSR measures; each firm-year observation has a CSR Strength score and a CSR Concern score. Both measures are used in hypotheses testing.

The following steps describe how CSR measures were calculated.

1. Concern indicators scoring one were aggregated for each firm-year. Strength indicators scoring one were aggregated for each firm-year. Therefore, for each firm-year observation, there were two raw scores—*Total Strengths* and *Total Concerns*.
2. Firms were then assigned to one of 12 industries based on SIC codes using Fama-French 12 industry portfolio assignment (French, 2010).
3. Market value of equity (*MVE)* data was collected when available. Of the original 17,752 firm-year observations in KLD STATS, 16,317 had accompanying *MVE* data. *MVE* is calculated as the price per share at the end of the fiscal year multiplied by number of outstanding shares (Compustat data items PRCC_F x CSHO).
4. For each industry, firms were sorted into quintiles by *MVE*. With 12 industries and 5 size levels, there were 60 groups. Industry averages for CSR *Total Strengths* and CSR *Total Concerns* were calculated for each year for each of the 60 groups. Similarly, the standard deviation of CSR *Total Strengths* and CSR *Total Concerns* were calculated for each of the 60 groups.
5. The size-industry-year averages were subtracted from each firm's raw scores. Then raw scores were divided by the standard deviation of strength and concern scores for each size-industry-year. Consequently, the CSR measures for firm-year observations are relative to an industry with mean 0, and standard deviation of 1. The measures *saSTR* and *saCON* provide CSR scores relative to a firm's size, industry, and year.

Other variables and models

Based on the method used in Lang and Lundholm (1996) and Barron et al., (1999), this study estimates cross-sectional, multiple regression models of analyst forecast properties on measures of CSR and other explanatory variables generally accepted as determinants of analyst forecast properties. The analysts forecast properties being investigated are analysts' forecast error and dispersion in analysts' forecasts. The models are below followed by discussion of variables included. Model 1 is the similar to Model 2, except for the inclusion of change CSR variables.

Model (1)

$$LN(Forecast\ Properties_{it}) = \lambda_0 + \lambda_1 saSTR_{it} + \lambda_2 saCON_{it} + \lambda_3 LnMVEbeg_{it} + \lambda_4 StdROE5_{it} + \lambda_5 Loss_{it} + \lambda_6 EL_{it} + \lambda_7 FinDistress_{it} + \lambda_8 Surp_{it} + \lambda_9 Avg\%New_{it} + \lambda_{10} AvgNumest_{it} + \lambda_{11} Split_{it} + \epsilon_{it}$$

Model (2)

$$LN(Forecast\ Properties_{it}) = \lambda_0 + \lambda_1 saSTR_{it} + \lambda_2 saCON_{it} + \lambda_3 LnMVEbeg_{it} + \lambda_4 StdROE5_{it} + \lambda_5 Loss_{it} + \lambda_6 EL_{it} + \lambda_7 FinDistress_{it} + \lambda_8 Surp_{it} + \lambda_9 Avg\%New_{it} + \lambda_{10} AvgNumest_{it} + \lambda_{11} Split_{it} + \lambda_{12} chSTR_{it} + \lambda_{13} chCON_{it} + \epsilon_{it}$$

where, *Forecast Properties* include, and are measured as follows:

AvgAFE = Simple average of forecast error over the twelve months in a given fiscal year. For each of the twelve months of a given fiscal year, analyst forecast error (*AFE*) is calculated as: *AFE* = Abs (Actual EPS-consensus forecast)/pricet where pricet is the price reported for that month's I/B/E/S statistical period (generally a day or two preceding the 3rd Thursday of each month). The simple average of all *AFE*s of a fiscal year is taken to find *AvgAFE*. A minimum of 8 months of *AFE*s is required.

AvgDisp = Simple average of dispersion in analysts' forecasts over the 12 months in a given fiscal year. *Disp* is measured as the standard deviation of analysts' forecasts in a given month, divided by the absolute value of the mean forecast for that month. The simple average of all *Disp* values of a fiscal year is taken to find *AvgDisp*. A minimum of 8 months of *Disp* values is required.

Explanatory variables are defined and measured as follows:

saSTR = CSR measure of strengths for a given firm-year, relative to industry, year, and size. Total number of strengths for a given firm-year are standardized by industry, year, and size (*MVE*), with mean = 0 and standard deviation = 1. Year, in this analysis, is the year corresponding to the fiscal year-end.

saCON = CSR measure of concerns for a given firm-year, relative to industry, year, and size. Total number of concerns for a given firm-year are standardized by industry, year, and size (*MVE*), with mean = 0 and standard deviation = 1. Year, in this analysis, is the year corresponding to the fiscal year end.

LnMVEbeg = Natural log of *MVEbeg*. *MVEbeg* is equal to the firm's total market value of equity at the beginning of the fiscal year. This is determined by multiplying price per share at the beginning of the fiscal year x number of outstanding shares (Compustat data items PRCC_F x CSHO).

StdROE5 = the standard deviation of the previous five years' return on equity, not including the current year's ROE. ROE is determined using Compustat data items IB and CEQ and is equal to IB/avgCEQ. AvgCEQ is defined as the beginning equity value plus ending equity value divided by 2.

Loss = 1 if actual EPS is negative, 0 otherwise. EPS value came primarily from I/B/E/S data item fy_0actualeps. When data from I/B/E/S was not available, Compustat data item IB was used.

EL = earnings level which is the actual earnings per share value. It is defined as I/B/E/S data item fy_0actualeps.

FinDistress = Zmijewski's Financial Distress score, defined as -4.3 – 4.5(IB/AT) + 5.7(LT/AT)-.004(ACT/LCT), where IB, AT, LT, ACT, LCT are Compustat data items income before extraordinary items, total assets, total liabilities, total current assets, total current liabilities, respectively (Zmijewski, 1984) .

Surp = Earnings surprise, defined as I/B/E/S data items (fy_actualepst–fy_actualepst-1)/upricet-1.

Avg%New = Sum of *%New* for a given fiscal year/ # months for which the data was available, minimum 5 months. *%New* = Percent of new forecasts, defined as (#new estimates + # Revisions)/number of estimates for month.

AvgNumest = Sum of *Numest* for a given fiscal year/ # months for which the data was available, minimum 5 months. *Numest* = # of analysts providing forecasts (for firm *i*, fiscal year *t*, annual eps).

Split = Indicator variable equal to 1 if firm-year had stock split, 0 otherwise. Stock split determined by comparing Compustat data item for adjustment factor (AJP) to prior year's adjustment factor. A change from prior year's factor indicates split.

chSTR = Change in *saSTR* level during year, measured as *saSTRt – saSTRt*-1, where *t* denotes year.

chCON = Change in *saCON* level during year, measured as *saCONt – saCONt-1*, where *t* denotes year.

The CSR measures capture levels of CSR strengths and CSR concerns for each reported year. There is no specific date on which KLD data is made available. Consequently, there is no significant date on which one might expect the CSR information to play a more significant role (similar in nature to the information disclosure FAF measure used in Lang and Lundholm, 1996). As a result, the dependent variables are averages of forecast measures, using monthly reporting periods available from I/B/E/S during the company's fiscal year. Unadjusted data is used for all analyst forecast measures (Payne and Thomas, 2003).

The control variables included are suggested by prior research. Size has been shown to have a significant, negative effect on forecast error and dispersion (Lang and Lundholm, 1996; Barron et. al., 1999). The log of the beginning market value is used to control for size. The precision associated with prior earnings information has also been associated with analyst forecast error and dispersion (Lang and Lundholm, 1996). It is controlled for using the standard deviation of return on equity over the preceding five-year period (Lang and Lundholm, 1996; Barron et al., 1999; Behn et. al., 2008). The *LOSS* variable is included because analysts' forecasts are expected to be less accurate for loss firms (Hwang et al., 1996). Actual EPS is included as a control variable because Eames and Glover (2003) show earnings level *(EL)* to be associated with forecast error and earnings predictability. A control variable was included for financial distress as analysts' forecasts are likely to be less accurate for firms with greater financial distress (Behn et al., 2008). Earnings surprise has been shown to be associated with analyst forecast properties (Lang and Lundholm, 1996; Barron et al., 1999). It is controlled for in this study using the absolute value of the change in EPS, scaled by price per share at the beginning of the year. The *Avg%New* variable is included to control for recency effects on forecast error. More recent forecasts are likely to be based on new information and are likely to have less forecast error than forecasts that have not been revised. The percentage of new forecasts, however, may proxy for important events. Lang and Lundholm, (1996) and Barron et al., (1999) found the percentage of new forecasts was positively associated with dispersion and error in the mean forecast. Finally, the number of analysts following a firm is likely to be associated with the disclosure environment (Lang and Lundholm, 1996). Consequently, the average number of analysts following a firm over a given year is included as a control variable.

The inclusion of *Split* as a control variable merits explanation. When measuring analyst forecast properties over time, prior research has shown unadjusted I/B/E/S data eliminates potential bias issues that may occur in adjusted data due to rounding issues in stock split factors (Payne and Thomas, 2003). The current study uses averages of monthly analyst forecast error and dispersion for each fiscal year. The determination of when analysts update their annual EPS forecasts for stock splits is difficult to ascertain in a large sample study. Consequently, analyst forecast error is likely to be higher for firm-year observations when a stock split has occurred. For example, assume a firm announces a stock split in month 6 of the fiscal year. Analyst forecasts of earnings per share for the first five to six months of the year would be based on the outstanding shares at the beginning of the fiscal year. Comparing forecasted earnings to actual earnings per share at year-end would increase forecast error, regardless of actual performance, because the number of outstanding shares is different in actual earnings per share compared to the number of outstanding shares when forecast was originally made. Since stock splits are not random events (Payne and Thomas, 2003) and may be correlated with CSR measures, there is greater likelihood of biased results without appropriate control. Stock splits are included in the model with a dummy variable indicating 1 if the firm experienced a stock split in a given year, and 0 otherwise.

The empirical tests of *H1* and *H2* examine whether the coefficient estimates for CSR-related variables are different from 0, for Model 1 and Model 2. Estimation is performed using OLS with robust standard errors (White, 1980).

EMPIRICAL RESULTS AND ANALYSIS

H1 Analysis

The derivation of the sample used for testing H1 and descriptive statistics are shown in Table 1. The overall sample contains 6,531 firm-year observations, between the years 1991-2005. The sample used to estimate Model 2, with changes in CSR measures, contains 5,341 firm-year observations, between the years 1992-2005. Firm size, measured as *MVE* at the beginning of the fiscal year, ranges from approximately $4 million to $467 billion, with mean and median of approximately $8 billion and $2 billion, respectively. The number of analysts following firms ranges from 1 to 48. Approximately 8% of the sample had a loss during the sample period and approximately 11% of the sample had a stock split.

Table 2, Panels A and B, shows the Pearson correlation coefficients for variables used in H1 analysis for samples with and without change variables, respectively. In Panel A, as one might expect, the forecast error measure (*LnAvgAFE*) is strongly and negatively correlated with both size and analyst following. The correlation between the *Avg%New* and *LnAvgAFE* is significantly positive, as was found in Lang and Lundholm (1996). The relationship between *LnAvgAFE* and other control variables including *Loss*, *StdROE5, Surp,* and *FinDistress,* show significant correlations in the direction expected, based on prior research. The correlation between *LnAvgAFE* and *Split*, of .1437 (p-value <.0001) supports the use of *Split* as a control variable.

Regression results for H1, Model 1 are shown in Table 3, Panel A. The parameter estimate for *saSTR* is equal to .031 with t-statistic equal to 2.52 (p-value equal to .012), indicating a firm with a level of CSR strengths one standard deviation greater than its peers, on average, has increased average forecast error of 3.1%, all else being equal. The parameter estimate for *saCON* is equal to .117 with t-statistic equal to 8.62 (p-value less than .001), indicating a firm with a level of CSR concerns one standard deviation greater than its peers, on average, has increased average forecast error of 11.7%, all else being equal. These results are consistent with the argument that less socially responsible firms, in terms of CSR concerns, are associated with greater uncertainty, less predictable earnings, and consequently, greater forecast error. Results also indicate firms that are more socially responsible, in terms of CSR strengths, are associated with increased analyst forecast error, after controlling for observable determinants of analyst forecast error. These results contradict one another, but lend support to differing information being captured with CSR strengths and CSR concerns.

Table 3, Panel B shows regression results estimating Model 2 (includes changes in CSR variables). This reduces the number of usable observations to estimate the model from 6,531 to 5,341. The *saSTR* parameter estimate, t-statistic, and p-value, using robust standard errors are equal to .025, 1.78, and .076, respectively, indicating marginal significance. The estimated coefficient on *saCON*, is .14 with p-value less than .001. Results indicate that a firm with CSR concern levels one standard deviation higher than its peers, on average, will have 14% higher average forecast error, all else being equal.

Table 3, Panel B shows the coefficient on *chSTR* variable is equal to .025 and is not statistically significant. The parameter estimate for *chCON* is -.043, with t-statistic and p-value equal to -2.06 and .039, respectively. Results indicate an increase of CSR concerns of one standard deviation during a fiscal year, on average, is associated with a decrease in average analyst forecast error of 4.3%, all else being equal. This result may appear counterintuitive, particularly given the positive association between levels of CSR concerns and forecast error. Recall, higher levels of CSR concerns are associated with higher forecast error, all else being equal. The result on the change in CSR concerns measures suggests firms that are becoming *less* socially responsible, in terms of CSR concerns (i.e., are experiencing an increasing level of CSR concerns), are associated with less forecast error, all else being equal. A likely explanation is that firms experiencing greater changes in CSR have received more exposure in the media, providing more public information to analysts, thereby resulting in less forecast error. In sum, larger changes in CSR may be associated with new information becoming publicly available, leading to less uncertainty, and less forecast error; however, the empirical evidence indicates an association with less forecast error exists only with changes in CSR concerns.

H2 Analysis

The derivation of the sample used for testing H2 and descriptive statistics are shown in Table 4. The overall sample contains 6,514 firm-year observations, between the years 1991-2005. The sample used to estimate Model 2, with changes in CSR measures, contains 5,336 firm-year observations, between the years 1992-2005. The sample is very similar to the one used in H1 analysis, differing due to data constraints from the dependent variable. For H2, the dependent variable is the natural log of average dispersion. The dispersion measure requires at least three analyst forecasts in any given month. This added constraint yields a sample that is similar in all material respects to the one used in H1 analysis, with slightly fewer firm-year observations.

TABLE 1
DERIVATION OF SAMPLE AND DESCRIPTIVE STATISTICS FOR SAMPLE USED IN H1 ANALYSIS

Panel A: Derivation of the sample

Firm-year observations in KLD STATS, 1991-2005	17,752
Firm-year observations not included because:	
Missing *MVE* data to calculate *saSTR, saCON,* and *LnMVE*	(1,435)
No match in I/B/E/S	(3,636)
Observations with less than 5 months of *AFE* in a given firm-year	(315)
Missing data to calculate beginning *MVE*	(868)
Missing data to calculate *Surp*	(3,011)
Missing data to calculate *FinDistress*	(1,353)
Missing data to calculate *StdROE5*	(603)
Firm-year observations used in testing H1, Model 1	6,531
Missing prior year CSR data to measure change in CSR	(1,190)
Firm-year observations used in testing H1, Model 2	5,341

Panel B: Descriptive Statistics for sample used in estimating H1, Model 1

Variable	Median	Mean	Std. Dev	Minimum	Maximum
AvgAFE	0.005	0.012	0.070	0.000	3.249
LnAvgAFE	-5.326	-5.406	1.357	-11.032	1.178
saSTR	-0.234	0.020	0.988	-2.050	7.432
saCON	-0.227	-0.020	0.964	-2.144	4.545
LnMVEbeg	7.652	7.721	1.515	1.282	13.054
Loss	0	0.084	0.277	0	1
StdROE5	0.026	0.050	0.089	0.001	2.341
EL	1.480	1.641	1.828	-16.280	34.570
SURP	0.011	0.027	0.189	0.000	9.860
FinDistress	-1.575	-1.587	1.441	-5.538	18.028
Avg%New	0.414	0.423	0.126	0.100	1.000
AvgNumest	12	13.916	8.596	1	48
Split	0	0.111	0.315	0	1

Panel C: Descriptive Statistics for sample used in estimating H1, Model 2

Variable	Median	Mean	Std. Dev	Minimum	Maximum
AvgAFE	0.005	0.011	0.063	0.000	3.249
LnAvgAFE	-5.386	-5.467	1.355	-11.032	1.178
saSTR	-0.163	0.061	1.012	-1.984	7.432
saCON	-0.169	0.006	0.977	-1.990	4.518
LnMVEbeg	7.873	7.927	1.475	1.282	13.054
Loss	0	0.071	0.256	0	1
StdROE5	0.025	0.045	0.075	0.001	2.341
EL	1.550	1.747	1.850	-16.280	34.570
SURP	0.010	0.025	0.155	0.000	6.737
FinDistress	-1.540	-1.561	1.371	-5.538	10.503
Avg%New	0.411	0.421	0.127	0.100	1.000
AvgNumest	13	14.543	8.548	1	48
Split	0	0.110	0.313	0	1
chSTR	-0.010	0.032	0.630	-3.557	3.875
chCON	-0.020	0.036	0.748	-4.026	3.840

Table 2
Pearson Correlation Coefficients for Variables Used in H1 Analysis
(Two-tailed p-values)

Panel A: Pearson Correlation Coefficients for H1, Model 1a,b

	saSTR	*saCON*	*LnMVEbeg*	*Loss*	*StdROE5*	*EL*	*SURP*	*FinDistress*	*Avg%New*	*AvgNumest*	*Split*
LnAvgAFE	0.04389	0.15988	-0.29823	0.3753	0.14631	-0.29519	0.19523	0.23649	0.45294	-0.16093	0.1437
saSTR		0.02921	0.05298	0.00797	0.00419	-0.0371	0.00642	0.01757	0.07787	0.06309	-0.0289
saCON			0.06925	0.11063	0.05552	-0.05243	0.03784	0.20358	0.11726	0.05747	-0.0616
LnMVEbeg				-0.19461	-0.18152	0.30693	-0.0383	0.0498	-0.0346	0.69346	0.1067
Loss					0.27735	-0.47246	0.15144	0.28218	0.17485	-0.1128	-0.0929
StdROE5						-0.2302	0.04415	-0.00056	0.15058	-0.10461	-0.0368
EL							-0.16105	-0.08298	-0.14572	0.20562	0.0015
SURP								0.15862	0.06825	-0.0372	-0.0260
FinDistress									0.02531	0.01983	-0.1271
Avg%New										-0.06004	-0.0143
AvgNumest											0.0901

aThe number of observations used in panel A is equal to 6,531. bAll correlations greater than .025 in absolute value are significant at less than the .05 level.

Panel B: Pearson Correlation Coefficients for H1, Model 2c,d

	saSTR	*saCON*	*LnMVEbeg*	*Loss*	*StdROE5*	*EL*	*SURP*	*FinDistress*	*Avg%New*	*AvgNumest*	*Split*	*chSTR*	*chCON*
LnAvgAFE	0.0534	0.1718	-0.295	0.355	0.1388	-0.2643	0.1966	0.2198	0.4561	-0.1594	0.1749	0.0026	0.0353
saSTR		0.0309	0.0408	0.0332	0.0146	-0.0616	0.0209	0.0255	0.0912	0.0447	-0.0217	0.3536	0.0272
saCON			0.0731	0.127	0.0524	-0.0695	0.047	0.2168	0.1261	0.0508	-0.0585	0.0575	0.4065
LnMVEbeg				-0.1829	-0.1532	0.2793	-0.0606	0.0343	-0.0027	0.6832	0.1024	0.0287	0.0289
Loss					0.2792	-0.4347	0.1552	0.2497	0.1773	-0.0921	-0.0878	0.0217	0.0386
StdROE5						-0.2263	0.0347	-0.0262	0.1688	-0.0686	-0.0496	0.0058	-0.0113
EL							-0.1107	-0.0499	-0.1329	0.1603	-0.0049	-0.0305	-0.0465
SURP								0.1181	0.0797	-0.0334	-0.0285	0.0004	0.005
FinDistress									0.0227	-0.0008	-0.118	0.0051	0.0191
Avg%New										-0.0369	-0.0173	0.0344	0.0406
AvgNumest											0.0912	-0.0045	0.011
Split												-0.0306	-0.0049
chSTR													0.1089

cThe number of observations used in panel A is equal to 5,341. dAll correlations greater than .027 in absolute value are significant at less than the .05 level.

Table 3
Regression Results for H1

Panel A: Regression results for H1, Model 1

Number of obs. =	6,531
F-Statistic =	151.8
Prob > F =	<0.001
Adjusted R^2 =	0.451

Variable	Expected Sign	Parameter Estimate	Std. Err. (Robust)	t-statistic	P>|t|
Intercept	?	-4.873	0.099	-49.45	<0.001
saSTR	?	0.031	0.012	2.52	0.012
saCON	?	0.117	0.014	8.62	<0.001
LnMVEbeg	-	-0.316	0.013	-23.89	<0.001
StdROE5	+	-0.395	0.159	-2.48	0.013
Loss	+	0.913	0.058	15.79	<0.001
EL	?	-0.025	0.009	-2.81	0.005
FinDistress	+	0.171	0.011	14.93	<0.001
Surp	+	0.720	0.157	4.60	<0.001
Avg%New	-	4.258	0.114	37.20	<0.001
AvgNumest	-	0.017	0.002	8.03	<0.001
Split	+	0.972	0.040	24.00	<0.001

Panel B: Regression results for H1, Model 2 (includes change in CSR variables)

Number of obs. =	5,341
F-Statistic =	264.6
Prob > F =	<0.001
R-squared =	0.458

Variable	Expected Sign	Parameter Estimate	Std. Err. (Robust)	t-statistic	P>|t|
Intercept	?	-4.824	0.111	-43.40	<0.001
saSTR	?	0.025	0.014	1.78	0.076
saCON	?	0.140	0.016	8.77	<0.001
LnMVEbeg	-	-0.324	0.015	-21.72	<0.001
StdROE5	+	-0.446	0.192	-2.33	0.020
Loss	+	0.908	0.066	13.72	<0.001
EL	?	-0.022	0.009	-2.32	0.021
FinDistress	+	0.172	0.012	14.43	<0.001
Surp	+	0.857	0.209	4.10	<0.001
Avg%New	-	4.365	0.124	35.12	<0.001
AvgNumest	-	0.014	0.002	6.28	<0.001
Split	+	1.093	0.043	25.33	<0.001
chSTR	?	-0.018	0.024	-0.77	0.440
chCON	?	-0.043	0.021	-2.06	0.039

Table 4
Derivation of Sample & Descriptive Statistics for Sample Used in H2 Analysis

Panel A: Derivation of the sample

Firm-year observations in KLD STATS, 1991-2005	17,752
Firm-year observations not included because:	
Missing *MVE* data to calculate *saSTR, saCON,* and *LnMVE*	(1,435)
No match in I/B/E/S	(3,636)
Observations with less than 5 months of *AFE* in a given firm-year	(1,418)
Missing data to calculate beginning *MVE*	(675)
Missing data to calculate *Surp*	(2,133)
Missing data to calculate *FinDistress*	(1,343)
Missing data to calculate *StdROE5*	(598)
Firm-year observations used in testing H2, Model 1	6,514
Missing prior year CSR data to measure change in CSR	(1,178)
Firm-year observations used in testing H2, Model 2	5,336

Panel B: Descriptive statistics for sample used in estimated H2, Model 1

Variable	Median	Mean	Std. Dev	Minimum	Maximum
AvgDisp	0.002	0.004	0.015	0.000	0.913
LnAvgDisp	-6.270	-6.214	1.083	-10.041	-0.091
saSTR	-0.232	0.021	0.989	-2.050	7.432
saCON	-0.232	-0.021	0.962	-2.144	4.545
LnMVEbeg	7.657	7.726	1.515	1.282	13.054
Loss	0	0.083	0.276	0	1
StdROE5	0.026	0.050	0.089	0.001	2.341
EL	1.480	1.643	1.828	-16.280	34.570
SURP	0.011	0.027	0.189	0.000	9.860
FinDistress	-1.580	-1.591	1.437	-5.538	18.028
Avg%New	0.414	0.423	0.126	0.100	1.174
AvgNumest	12	13.982	8.553	3	48
Split	0	0.112	0.315	0	1

Panel C: Descriptive statistics for sample used in estimated H2, Model 2

Variable	Median	Mean	Std. Dev	Minimum	Maximum
AvgDisp	0.002	0.004	0.015	0.000	0.913
LnAvgDisp	-6.312	-6.264	1.062	-10.041	-0.091
saSTR	-0.163	0.061	1.012	-1.984	7.432
saCON	-0.169	0.005	0.976	-1.990	4.518
LnMVEbeg	7.875	7.931	1.475	1.282	13.054
Loss	0	0.070	0.256	0	1
StdROE5	0.025	0.045	0.075	0.001	2.341
EL	1.550	1.747	1.850	-16.280	34.570
SURP	0.010	0.025	0.156	0.000	6.737
FinDistress	-1.540	-1.563	1.371	-5.538	10.503
Avg%New	0.411	0.421	0.127	0.100	1.174
AvgNumest	13	14.588	8.512	3	48
Split	0	0.110	0.313	0	1
chSTR	-0.011	0.033	0.630	-3.557	3.875
chCON	-0.020	0.035	0.749	-4.026	3.840

Table 5, Panels A and B, shows the Pearson product moment correlations between variables used in H2 analysis. In both panels, the dispersion measure (*LnAvgDisp*) is negatively correlated with both size and analyst following; there is less dispersion among monthly analysts' forecasts for firms that are larger and are followed by more analysts. The relationship between *LnAvgDisp* and other control variables including *Loss*, *StdROE5, Surp,* and *FinDistress,* show significant correlations in the direction expected, based on prior research. The correlation between *LnAvgDisp* and *Split*, of .19 (p-value <.0001) supports the use of *Split* as a control variable.

Regression results for H2 are shown in Table 6. In Panel A, the parameter estimate for *saSTR* is equal to .020 with t-statistic equal to 2.10 (p-value equal to .036) This indicates a firm with a level of CSR strengths one standard deviation greater than its peers, on average, has increased average dispersion of 2%, all else being equal. The parameter estimate for *saCON* is equal to .134 with t-statistic equal to 12.01 (p-value less than .001), indicating a firm with a level of CSR concerns one standard deviation greater than its peers, on average, has increased average dispersion of 13.4%, all else being equal. These results provide empirical evidence of an association between CSR and dispersion in analysts' forecast, supporting H2. Similar to the interpretation in H1 analysis, results presented in Table 6 are consistent with the argument that firms that are less socially responsible, in terms of CSR concerns, are associated with greater uncertainty, less predictable earnings, and consequently, greater dispersion in analysts' forecasts. Results also indicate a possible association between a firm's level of CSR, in terms of strengths, and dispersion. Empirical evidence is less persuasive than the CSR concern argument, but is consistent with some increased uncertainty and difficulty predicting earnings for more socially responsible firms when CSR is measured as a function of CSR strengths.

The inclusion of change in CSR measures reduces the number of usable observations to estimate the model from 6,514 to 5,336. As shown in Table 6, Panel B, the *saSTR* parameter estimate, t-statistic, and p-value, using robust standard errors are equal to .020, 1.85, and .065, respec-

Table 5
Pearson Correlation Coefficients for Variables in H2 Analysis

Panel A: Pearson Correlations Coefficients for H2, Model 1a,b

	saSTR	saCON	LnMVEbeg	Loss	StdROE5	EL	SURP	FinDistress	Avg%New	AvgNumest	Split
LnAvgDisp	0.04179	0.21677	-0.34618	0.45016	0.17504	-0.26518	0.20677	0.36045	0.30971	-0.10072	-0.2131
saSTR		0.02998	0.05168	0.0082	0.00495	-0.03749	0.00644	0.01976	0.07643	0.06128	-0.0287
saCON		1	0.06933	0.10982	0.05584	-0.04977	0.03688	0.20187	0.1166	0.05826	-0.0611
LnMVEbeg				-0.19293	-0.1806	0.30679	-0.03842	0.05151	-0.03491	0.69157	0.1054
Loss					0.27539	-0.47111	0.15079	0.27989	0.17536	-0.11012	-0.0925
StdROE5						-0.22967	0.04439	-0.00324	0.15183	-0.10209	-0.0367
EL							-0.16019	-0.07993	-0.1452	0.20398	0.0013
SURP								0.15814	0.06825	-0.03648	-0.0258
FinDistress									0.02524	0.02145	-0.1269
Avg%New										-0.05893	-0.0123
AvgNumest											0.0886

aNumber of observations is equal to 6,514. bAll correlations greater than .025 in magnitude are significant at less than .05 level.

Panel B: Pearson Correlations Coefficients for H2, Model 2c,d

	saSTR	saCON	LnMVE-beg	Loss	StdROE5	EL	SURP	FinDis-tress	Avg%New	AvgNumest	Split	chSTR	chCON
LnAvgDisp	0.048	0.234	-0.359	0.433	0.178	-0.236	0.212	0.345	0.313	-0.106	-0.189	-0.002	0.014
saSTR		0.031	0.040	0.032	0.015	-0.061	0.021	0.027	0.089	0.044	-0.021	0.356	0.029
saCON			0.073	0.129	0.053	-0.068	0.047	0.216	0.125	0.050	-0.058	0.057	0.406
LnMVEbeg				-0.182	-0.154	0.279	-0.061	0.034	-0.003	0.682	0.101	0.028	0.029
Loss					0.280	-0.435	0.155	0.252	0.178	-0.091	-0.088	0.022	0.039
StdROE5						-0.226	0.035	-0.026	0.171	-0.068	-0.050	0.006	-0.011
EL							-0.111	-0.050	-0.132	0.160	-0.005	-0.031	-0.046
SURP								0.118	0.080	-0.033	-0.028	0.001	0.005
FinDistress									0.023	-0.002	-0.118	0.006	0.019
Avg%New										-0.036	-0.015	0.035	0.040
AvgNumest											0.090	-0.006	0.010
Split												-0.031	-0.004
chSTR													0.110

cNumber of observations is equal to 5,336. dAll correlations greater than .027 in magnitude are significant at less than .05 level.

Table 6
Regression Results for H2

Panel A: Regression results for H2, Model 1

Number of obs. = 6,514
F-Statistic = 425.9
Prob > F = <0.001
Adjusted R^2 = 0.484

Variable	Expected Sign	Parameter Estimate	Std. Err. (Robust)	t-statistic	P>|t|
Intercept	?	-4.600	0.079	-57.98	<0.001
saSTR	?	0.020	0.010	2.10	0.036
saCON	?	0.134	0.011	12.01	<0.001
LnMVEbeg	-	-0.356	0.011	-33.23	<0.001
StdROE5	+	0.012	0.114	0.10	0.919
Loss	+	0.957	0.044	22.00	<0.001
EL	?	0.014	0.007	1.98	<0.001
FinDistress	+	0.190	0.011	17.74	<0.001
Surp	+	0.580	0.110	5.26	<0.001
Avg%New	+	2.061	0.086	24.01	<0.001
AvgNumest	-	0.036	0.002	21.47	<0.001
Split	+	-0.404	0.032	-12.70	<0.001

Panel B: Regression results for H2, Model 2 (includes change in CSR variables)

Number of obs. = 5,336
F-Statistic = 309.5
Prob > F = <0.001
Adjusted R^2 = 0.485

Variable	Expected Sign	Parameter Estimate	Std. Err. (Robust)	t-statistic	P>|t|
Intercept	?	-4.497	0.088	-51.30	<0.001
saSTR	?	0.020	0.011	1.85	0.065
saCON	?	0.175	0.013	13.57	<0.001
LnMVEbeg	-	-0.369	0.012	-31.47	<0.001
StdROE5	+	0.097	0.151	0.64	0.522
Loss	+	0.936	0.050	18.81	<0.001
EL	?	0.016	0.007	2.22	0.027
FinDistress	+	0.189	0.010	19.09	<0.001
Surp	+	0.674	0.144	4.68	<0.001
Avg%New	+	2.094	0.091	22.95	<0.001
AvgNumest	-	0.034	0.002	19.28	<0.001
Split	+	-0.327	0.035	-9.37	<0.001
chSTR	?	-0.022	0.018	-1.19	0.233
chCON	?	-0.086	0.016	-5.45	<0.001

tively, indicating marginal significance. The estimated coefficient on *saCON*, however, is statistically significant (p-value less than .001). Results indicate that a firm with CSR concern levels one standard deviation higher than its peers, on average, will have 17.5% higher dispersion of analysts' forecasts, on average, all else being equal. The parameter estimate for *chCON* is -.086, with t-statistic and p-value equal to -5.45 and <.001, respectively. Results indicate an increase of CSR concerns of one standard deviation during a fiscal year, on average, is associated with a decrease in average dispersion of 8.6%, all else being equal. As with H1, a likely explanation is that firms experiencing greater changes in CSR concerns have also had more exposure in the media, more public information available to analysts, resulting in less dispersion in analysts' forecasts.

CONCLUSION

The purpose of this research was to examine the relationship between corporate social responsibility (CSR) and earnings predictability. The theoretical framework suggested firms that are more socially responsible avoid or mitigate impacts to financial performance arising from negative events and/or private—social conflicts. In addition, theory suggests CSR may provide competitive advantage through intangible assets creation and operational efficiency. In an accounting context, the first theoretical benefit would seem to enhance earnings predictability. More socially responsible firms avoid or incur less expense and avoid lost revenues associated with private-social conflicts. Alternatively, less socially responsible risk revenue disruptions and/or increased future expenses as some private-social conflicts erupt and manifest in ways that require corporate action. There is uncertainty, however, on whether private-social conflicts will surface; there is also uncertainty on how and when these issues would affect net income. This is a key argument suggesting more socially responsible firms are positively associated with earnings predictability. When CSR is measured in terms of concerns, relative to industry peers, the evidence supports this argument. However firms with changes in CSR concerns appear to be more predictable in terms of analysts forecasts.

The benefits of intangible asset creation and efficiency gains have less clear implications on earnings predictability. To the extent that the CSR strengths measure is operationalizing this aspect of CSR, the evidence suggests decreased earnings predictability. These CSR benefits potentially increase uncertainty, as it may be difficult to predict when the benefits of intangible assets will be realized in accounting earnings.

Panel A shows the derivation of the final sample used in H1 analysis. Panel B shows descriptive statistics for all variables used in estimating Model 1 for H1 analysis. The number of observations is equal to 6,531. Panel C shows descriptive statistics for all variables used in estimating Model 2 for H1 analysis. The number of observations is equal to 5,341. Summary statistics shown include median, mean, standard deviation, minimum value, and maximum value for each variable.

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The Waning of Information Risk in the U.S. Treasury Inflation-Protected Bond Market

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ABSTRACT

Prior research by Chu, Pittman, and Yu (2005) documents the information risk found in the US Treasury Inflation-Protected Securities (TIPS) market for the period of 1999–2001. I find that information risk is rapidly waning in the TIPS market when analyzing the 1999–2007 period. The time series dynamics between the TIPS market and the nominal Treasury market more recently resemble those of more established inflation-indexed bond markets such as those found in the United Kingdom and Canada. This result is important for both bond investors and government issuers. Investors may now be able to participate in a more developed and efficient TIPS pricing market. The lack of information risk can lower the borrowing cost for the US government when issuing TIPS bonds.

1 Part of this work was performed while the author was at the College of Business Administration of the California State University, Sacramento.

INTRODUCTION

The US Treasury first issued TIPS bonds in 1997. During the first few years of trading, the yields on TIPS were perceived by many to be too high based on inflation expectations and nominal Treasury pricing. While some of this yield premium was attributed to a liquidity premium on TIPS, Chu, Pittman, and Yu (2005) document that for the period of April 8, 1999, to September 7, 2001, the TIPS security suffered from information risk and thus demanded a premium to compensate the uninformed investor. O'Hara (2003) explains how an investor will demand a premium for a perceived lack of information. Chu, Pittman, and Yu use time series econometric techniques to illustrate how for their period of study, the yield on a TIPS security primarily depends on the information in the nominal Treasury market. They find a long-run cointegrated relationship between the two securities that adjusts the TIPS yield. They also find a short-run Granger causality from the nominal Treasury yield to the TIPS yield.

In this study, I reexamine the US TIPS market with a more recent dataset. Using daily observations from January 4, 1999 to February 28, 2007, the time series characteristics of the TIPS yield are analyzed along with the nominal Treasury yield. Alongside this analysis, I compare the US market to some more developed inflation-indexed bond markets such as those of the United Kingdom, Canada, and Australia. I find that the information risk of the TIPS market is decreasing. The time series characteristics of U.S. TIPS more recently resemble the more established markets of the UK and Canada.

DATA DESCRIPTION

Major characteristics of the inflation-indexed bonds of the nations of the US, the UK, Australia, and Canada are illustrated in Exhibit 1.[1] The US TIPS market is the newest of the four while the UK Inflation-indexed Gilt market is the oldest and most developed. Inflation-indexed debt makes up more than 25% of the UK marketable debt market. Semi-annual coupon payments and monthly inflation index updating are a commonality between the US, UK, and Canada inflation-indexed bond markets. I will later illustrate that these three markets have the most in common from the time series analysis results of real rates versus nominal rates. The Australian market differs with its quarterly coupon payments and quarterly inflation index updating. One notable difference between the UK mar-

1 Various other nations issue inflation-indexed debt yet the bonds of these four countries are constructed from a similar design. The markets for these four securities are also quite large compared to other inflation-indexed government bond markets.

ket and the rest is the implication of taxes. The tax system in the UK only taxes the coupons on inflation-indexed bonds as income. In the US, Australia, and Canada, the coupons and the periodic principal increase from indexation are both taxed as income.

Daily observations of 10-year maturity inflation-indexed and nominal government bond yields were obtained from Global Financial Data for the US, the UK, Australia, and Canada. Due to data availability, the statistical analysis in this study was performed on coupon bond yields instead of implied zero-coupon bond yields such as those used in other studies such as the one by Chu, Pittman, and Yu (2005). While zero-coupon yields are important in term structure studies, I argue that for a fixed maturity time series study between real and nominal bonds, the difference between coupon bond yields and zero coupon bonds yields is negligible. Additionally, the actual traded coupon bond yields of the inflation-indexed and nominal government bonds are more influential to market participants. As a robustness test, throughout the paper when possible, coupon bond yield results for the same period as the Chu, Pittman, and Yu (2005) study, April 8, 1999 to September 7, 2001, were compared to zero-coupon bond yield results. In each instance, results come out to be quite similar for coupon bond yields as they do for zero-coupon bonds yields.

Summary statistics for the data are displayed in Exhibit 2. As shown, the US and Canada produce similar interest rate markets; The respective averages and standard deviations of their 10-year real rates and 10-year nominal rates bear a strong resemblance. The average real rate in the UK is much less than the ones in the other three countries because of the more favorable tax treatment of inflation-indexed bonds in the UK. Both the UK and Australia interest rate markets are much less volatile than the ones in the US and Canada.

METHODOLOGY AND RESULTS

Stationarity and Cointegration Analysis:

Similar to the methodology of Chu, Pittman, and Yu (2005), this study attempts to analyze the relationship between the inflation-indexed government bond market and the nominal government bond market. First, each data series is transformed to mean and variance stationarity. Second, cointegration tests are performed to establish any long-run relationships between the real interest rate and the nominal rate. Third, Granger causality tests are used to establish any short-run relationships between the real rate and the nominal rate. Finally, vector autoregression techniques are used to observe the long-run relationships in conjunction with the short-run relationships in the interest rate markets.

The 10-year nominal rate and real rate for each country both require a transformation via first differencing in order to convert the variance to stationary. Mean stationarity is examined with the augmented Dickey-Fuller [1979] (ADF) unit root test. Exhibit 3 displays the results of the ADF test for the interest rate data. All four nominal rates and real rates exhibit a unit root in the untransformed series. Transforming the data for each by taking the first

EXHIBIT 1
Inflation-indexed Bond Comparison.
Bond characteristics other than market values came from Deacon, Derry, and Mirfendereski (2004)

	US[1]	UK[2]	Australia[3]	Canada[4]
First Issuance Year	1997	1981	1985	1991
Market Value (local currency, billions)	524.0	136.0	6.020	4.978
As Percent of Marketable Debt	10.06%	27.65%	10.86%	1.36%
Coupon Frequency	Semi-annual	Semi-annual	Quarterly	Semi-annual
Price Index Publication Frequency	Monthly	Monthly	Quarterly	Monthly
Indexation Lag	3 months	8 months	2 - 3 months[5]	3 months
Coupons Taxed as Income	Yes	Yes	Yes	Yes
Principal Increase Taxed as Income	Yes	No	Yes	Yes

1. From the US Treasury website, Market Value as of 9/30/2008
2. From the UK Debt Management Office website, Market Values as of 12/31/2007
3. From the Australian Office of Financial Management website, Market Values as of 6/30/2008
4. From the Bank of Canada website, Market Values as of 12/31/2007
5. The formula is based on the average percentage change in the CPI over the two quarters ending two quarters prior to the coupon payment according to Deacon, Derry, and Mirfendereski (2004).

EXHIBIT 2
Summary Statistics for the Interest Rate Data over the Period of January 4, 1999 to February 28, 2007 (N = 2010 Daily Observations)

	US	UK	Australia	Canada
Real 10-year Rate Mean	2.78%	2.01%	3.18%	2.96%
Standard Deviation	0.882	0.335	0.470	0.865
Maximum	4.41	2.74	3.87	4.23
Minimum	1.36	1.17	1.90	1.44
Nominal 10-year Rate Mean	4.83	4.84	5.73	4.98
Standard Deviation	0.744	0.395	0.447	0.684
Maximum	6.79	5.96	7.27	6.60
Minimum	3.13	3.90	4.59	3.73

EXHIBIT 3
Augmented Dickey-Fuller (ADF) Unit Root Test Results over the Period of January 4, 1999 to February 28, 2007. The critical values used are available in Davidson and MacKinnon (1993)

Test Statistics	US	UK	Australia	Canada
Real 10-year Rate	-1.23	-1.87	-0.92	-0.48
First Difference	-11.72	-12.24	-12.96	-11.21
Nominal 10-year Rate	-1.72	-2.74	-2.76	-1.13
First Difference	-11.57	-11.98	-12.91	-12.00
5% Critical Value	-2.86	-2.86	-2.86	-2.86
1% Critical Value	-3.43	-3.43	-3.43	-3.43

difference creates eight data series with mean stationarity according to the ADF tests.

Since all series exhibit unit roots, cointegration between the nominal and real rates within each country is a possibility. Johansen's (1988, 1991) trace test is a commonly used method for examining cointegration. Exhibit 3 displays the results of the Johansen trace test for each country. The hypothesis of no cointegration is rejected for all four countries. The hypothesis of a rank one integration is not rejected with the data from the US, Australia, and Canada. Thus it is concluded that the nominal rate and real rate data series from those three countries each have a cointegrating relationship, and that the two interest rate series generally move together in those countries over the long run. The cointegration test is inconclusive for the UK interest rate data. This will be further explored with the vector error correction model in section 4.3.

Granger Causality Tests:

Complementing the long-run cointegration analysis of the Johansen test, Granger (1969) causality tests can be used to determine if there is any short-term influence of one interest rate series to the other. In order to perform the Granger causality test, a vector autoregression (VAR) model is developed that incorporates both the lags of the dependent variable and the lags of the independent variable, as follows:

here n is the nominal rate, r is the real rate, $\Delta n_t = (n_t - n_{t-1})$, and $\Delta r_t = (r_t - r_{t-1})$. The optimal number of lags, k, is determined for each country by the process of minimizing the Akaike information criterion. The Granger test is a test of

$$\Delta n_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta n_{t-i} + \sum_{i=1}^{k} \gamma_i \Delta r_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta r_t = \hat{\alpha} + \sum_{i=1}^{k} \hat{\beta}_i \Delta r_{t-i} + \sum_{i=1}^{k} \hat{\gamma}_i \Delta n_{t-i} + \varepsilon_t \quad (2)$$

the joint hypothesis that $\gamma_1 = \gamma_2 = \gamma_3 = \ldots = 0$ in Equation 1 (or $\hat{\gamma}_1 = \hat{\gamma}_2 = \hat{\gamma}_3 = \ldots = 0$ for the real rate regression in Equation 2). The results of these tests are shown in Exhibit 5.

For the US data, the nominal rate significantly Granger causes the real rate at the 1% level (p = 0.00) and the real rate significantly Granger causes the nominal rate at the 10% level (p = 0.06). This means that short-term movements in each market influence the short-term movements in the other market. This evidence differs from that of Chu, Pittman, and Yu (2005). For the period of April 8, 1999 to September 7, 2001, they find that while

EXHIBIT 4
Cointegration Test Results over the Period of January 4, 1999 to February 28, 2007
Johansen Trace Test results are for the Real 10-year Rate and Nominal 10-year Rate
Critical values used are available in Osterwald-Lenum (1992)

	US	UK	Australia	Canada
Hypothesis: r = 0				
Likelihood Ratio	13.5864	14.2264	13.0032	16.5195
5% Critical Value	12.53	12.53	12.53	12.53
Hypothesis: r = 1				
Likelihood Ratio	1.5013	4.6699	0.9471	0.1761
5% Critical Value	3.84	3.84	3.84	3.84

EXHIBIT 5
Granger Causality Wald Test Results for the Real 10-year Rate and the Nominal 10-year Rate over the Period of January 4, 1999 to February 28, 2007

	US	UK	Australia	Canada
Optimal length of lag	3	2	1	1
Null Hypothesis: *"Real Rate does not Granger cause Nominal Rate"*				
Test Statistic	7.29	16.46	0.98	6.98
p-value	0.0631	0.0003	0.3223	0.0082
Null Hypothesis: *"Nominal Rate does not Granger cause Real Rate"*				
Test Statistic	32.28	8.18	9.94	8.31
p-value	<0.0001	0.0167	0.0016	0.0039

the nominal series does Granger cause the real rate series (p = 0.00), the real rate series does not Granger cause the nominal rate series (p = 0.89). I argue that the result for the January 4, 1999 to February 28, 2007 period comes from the fact that the TIPS market has had more time to develop from 2001 to 2007. Trading in the TIPS market is now substantial enough to influence the nominal Treasury market just as the nominal Treasury market influences the TIPS market.

From the UK and Canada data, a similar result is observed as in the US. The real rate and the nominal rate significantly Ganger cause each other in both countries with p-values less than 2%. I argue that this is the result of having an inflation-indexed bond market that has had a number of years to develop (since 1981 for the UK and since 1991 for Canada). It appears that information risk in the inflation-indexed bond markets of these two countries is absent and that this type of risk is waning in the US TIPS market. The information risk in the US TIPS market documented by Chu, Pittman, and Yu (2005) appears to be a result of the new and underdeveloped U.S. TIPS market during that period. As the market for TIPS has grown and evolved, the information risk is shrinking.

As for the Australia data, the nominal rate significantly Granger causes the real rate (p = 0.00), but not the other way around (p = 0.32). One possible explanation for this effect in Australia is that the inflation index in that country gets updated only quarterly, while the other three countries update their respective inflation indexes monthly. With longer periods of inflation uncertainty and effectively larger bond cash flow uncertainty, the inflation-indexed bond market of Australia may expectedly be more disadvantaged by information risk that the other three markets.

Vector Error Correction Model

Due to the cointegration analysis result between the nominal rate and the real rate in the US, Australia, and Canada, a vector error correction model (VECM) was used to further examine the long-run relationship between the two interest rates in those countries. Cointegration in the UK data is so far inconclusive and is further explored with the VECM model. The VECM is specified as follows:

$$\Delta n_t = \alpha\delta_{t-1} + \sum_{i=1}^{k}\beta_i\Delta n_{t-i} + \sum_{i=1}^{k}\gamma_i\Delta r_{t-i} + \varepsilon_t \quad (3)$$

$$\Delta r_t = \hat{\alpha}\delta_{t-1} + \sum_{j=1}^{k}\hat{\beta}_j\Delta r_{t-j} + \sum_{j=1}^{k}\hat{\gamma}_j\Delta n_{t-j} + \varepsilon_t \quad (4)$$

$$\delta_t = n_t - \lambda r_t \quad (5)$$

In this model, δt is the divergence of the real rate and nominal rate from the cointegration relationship. The cointegration coefficient, λ, specifies the scale of the long-run relationship. The regression results are shown in Exhibit 6. For each regression, the test of the significance of the coefficient on δt-1 provides evidence of whether the data series is dependent on the long-run cointegration relationship.

From the US regression results in Exhibit 6, the significance of the coefficient on δt-1 provides evidence that the nominal rate series, not the real rate series, is dependent on the cointegration relationship for the period of January 4, 1999 to February 28, 2007. This evidence is counter to that of Chu, Pittman, and Yu (2005). For the period of April 8, 1999 to September 7, 2001, they find that the real rate series, not the nominal rate series, is dependent on the cointegration relationship. When examining the coefficients of the lagged variables in the nominal rate equation, the significance of the lag three real rate coefficient explains the Granger causality effect observed in Exhibit 5. It appears that a short term movement in the real rate causes a reaction in the nominal rate three days later on average. When examining the real rate regression results, all three lags of nominal rate coefficients are significant, which coincides with the Granger causality previously observed.

As for the UK and Canada regression results, outcomes are very similar. For both countries, the nominal rate series appears to significantly depend on the long-run cointegration relationship. Both countries display a significant one day lag real rate influence on the nominal rate. Also, both countries display a significant one day lag nominal rate influence on the real rate.

The Australia regression results again differ from the other three countries. Both the real rate series and the nominal rate series significantly depend on the cointegration relationship. When analyzing the significance of the lagged coefficients, it appears that the nominal rate influences the real rate, yet the real rate does not influence the nominal rate. This result is consistent with the Granger causality results in Exhibit 5.

EXHIBIT 6
Vector Error Correction Model (VECM) results for the Real 10-year Rate and the Nominal 10-year Rate over the Period of January 4, 1999 to February 28, 2007

$$\Delta n_t = \alpha\delta_{t-1} + \sum_{i=1}^{k}\beta_i\Delta n_{t-i} + \sum_{i=1}^{k}\gamma_i\Delta r_{t-i} + \varepsilon_t$$
$$\Delta r_t = \hat{\alpha}\delta_{t-1} + \sum_{j=1}^{k}\hat{\beta}_j\Delta r_{t-j} + \sum_{j=1}^{k}\hat{\gamma}_j\Delta n_{t-j} + \varepsilon_t$$
$$\delta_t = n_t - \lambda r_t$$

	US VECM(3)		UK VECM(2)		Australia VECM(1)		Canada VECM(1)	
	Nominal	**Real**	**Nominal**	**Real**	**Nominal**	**Real**	**Nominal**	**Real**
Δnt-1	0.02936	0.08634***	-0.01921	0.04509**	-0.03688	-0.05499***	0.07998***	0.02486***
Δnt-2	-0.00264	0.06393***	-0.01105	0.02927				
Δnt-3	-0.09089***	-0.03534*						
Δrt-1	-0.00944	-0.06974**	0.15778***	0.06189**	0.06504	0.11985***	-0.18403***	0.10079***
Δrt-2	-0.02972	-0.10605***	-0.05502	-0.02709				
Δrt-3	0.11190**	0.05965**						
λ	0.78868		0.21070		0.24188		0.75317	
δt-1	0.02263**	-0.00481	0.03538***	0.00324	0.06060***	0.02569***	0.03140***	-0.00236

*Indicates the test statistic is significant at the 10% level.
** Indicates the test statistic is significant at the 5% level.
***Indicates the test statistic is significant at the 1% level.

CONCLUSIONS

This study documents the long-run and short-run relationships between the inflation-indexed government bond and the nominal government bond markets in the US, the UK, Australia, and Canada for the period of January 4, 1999 to February 28, 2007. Contrary to prior evidence by Chu, Pittman, and Yu (2005), who examined the US market for the period of April 8, 1999 to September 7, 2001, this study finds that the information risk in the US TIPS market is waning. The time series characteristics of the US market more recently compare similarly to those of the older and more established inflation-index bond markets in the UK and Canada. As of January 17, 2014, the US Treasury website[2] quotes average daily turnover of TIPS at over $5 billion. With such substantial trading volume, US TIPS have apparently persisted in their development as a more liquid security.

This result is important for both investors and the issuer in the US TIPS market. In the first few years of TIPS trading, information risk made TIPS pricing inferior to nominal Treasury pricing. Price quotes for TIPS were primarily driven by lagged information in the nominal Treasury market. Now that the TIPS market has had more time to develop, its price quotes are determined by a more efficient market. A lack of information risk can lower the borrowing cost for the US government when issuing TIPS securities.

2 http://www.treasury.gov/resource-center/fin-mkts/Pages/tips.aspx

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Web Recruitment: Impact of Aesthetics and Playfulness on User's Initial Affective Reactions as it Relates to Applicant Attraction

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ABSTRACT

Acquiring pools of qualified job applicants can be a costly endeavor for organizations. Many companies have turned toward technology for assistance in attracting talent, thus the design of recruitment websites becomes an important consideration. While there are many aspects to website design, our focus is on a website's "façade," namely playfulness and aesthetics, and their impact on applicant attraction. We explore the relationships among organizations' recruitment website façades, initial affective reactions to the façades, and applicant attraction to that organization. Responses to a questionnaire completed by senior-level university students provide data for analysis. The results support our hypotheses that initial affective reactions mediate the relationship between both website playfulness and website aesthetics with applicant attraction. These findings reflect the importance of website design when the Internet is used as a recruitment channel.

INTRODUCTION

Using digital resources has significantly changed how job seekers research organizations and how organizations recruit potential applicants. Job postings (estimated at 4.7 million in 2010; Hagerty & Light, 2010) can be found through job search engine sites, job boards, niche job sites, social media, professional networking sites, and company websites. According to the results of a biennial survey on workplace trends (SHRM Workplace Forecast, 2011), 38% of its respondents, all human resources professionals, indicated that an increased use of Internet recruiting was of major strategic impact. Further, 46% reported they were currently increasing their investment in Internet recruiting. In addition, Pew Internet Surveys (2011) reports that 56% of job seekers use the Internet to look for employment. The benefits that web-based technology offers to organizations in their recruiting efforts include improving recruiting efficiency, increasing the quality and quantity of applicants, and communicating organizational brand identity (Johnson & Gueutal, 2011). However, organizations still need to be confident that a website approach reaches the people the organizations need to reach,

is viewed as credible, and captures the viewer's attention through the effective use of color and design (Breaugh, 2009).

Given the unlimited options for designing a website and the associated cost of that design, knowing the impact of the website on the potential applicant is important for understanding how recruiting is happening in today's digital age. Previous research (Cober, Brown, Levy, Cober, & Keeping, 2003; Thoms, Chinn, Goodrich, & Howard, 2004; Williamson, Lepak, & King, 2003) found that a website's ease of navigation and artistic features affect how a potential applicant stays engaged in the recruiting process. Karr (2000) found that at least one-quarter of all college students will not continue in the recruitment process if a company's website is poorly designed. Hoffman and Novak (1996) found that potential applicants will leave a website when they become frustrated with use. Given the benefits and potential strategic impact of using the Internet for recruiting processes, it is important to identify how specific aspects of a website affect the potential applicant's job search process. Cober, Brown, Keeping, and Levy (2004), citing Tractinsky, Katz and Ikar (2000), state that the website "façade," or what users first experience, is "what cues users about the inside" (Tractinsky, et al., p. 140), and can be related to an applicant's initial affective reactions. These reactions can then be linked to how interested the applicant remains in applying for the intended position. Our research tests the relationship between applicants' affective reactions and the specific website façade elements of playfulness and aesthetics as proposed in the Cober et al. (2004) model.

LITERATURE REVIEW

This section describes the variables of interest in our study and a selection of the existing research impacting our model development. As mentioned, Cober et al. (2004) present a model to guide future research surrounding the use of organizational websites for recruitment. They propose that job seekers are initially affected by the façade of a website. These affective reactions, coupled with system features, influence perceptions of usability and ultimately predict applicant attraction when accounting for moderating and mediating influences.

Website Façade: Playfulness and Aesthetics

The word 'facade' stems from the French and typically refers to the front of a building. In architecture, the facade of a building is the most important from a design point of view as it sets the tone for the rest of the building. The transference of this definition to the technological community becomes apparent as the look of a webpage or screen design suggests what the viewer might expect and feel. The website façade is a critical element in capturing an applicant's interest because an applicant forms impressions of images very quickly. Results of one study suggest that impressions are made in the first 50 milliseconds of viewing and these snap decisions about the quality of a webpage have a lasting impact on their opinions (Lindgaard, Fernandes, Dudek, & Brown, 2006). This lasting effect of a first impression, a kind of "halo effect," can influence a user's reactions to the site. The authors propose that the halo effect happens because cognitive bias suggests people enjoy being right, so continuing to use a website that gave a good first impression helps to prove to the individual that he or she made a good initial decision.

Research in human computer interaction has initially focused on effectiveness and efficiency of interactions; however, a shift in focus has been made to the whole user experience, which includes emotions and visual aesthetics. The aesthetics of a website are its design elements. The greater the unity of these elements, the more aesthetically pleasing the website is to the viewer. Moshagen and Thielsch (2010) provide a discussion of early research on aesthetics. Their review of literature notes Birkhoff (1933), von Ehrenfels (1890), and Eyesenck (1941) suggesting that aesthetics of an object depends on two factors, namely simplicity and complexity, but these studies disagreed regarding the relationship between these factors (Moshagen & Thielsch, 2010). Berlyne's (1971) psychological theory of aesthetics resolves the contrast in these early studies by proposing that aesthetic appraisal is determined by the arousal potential of an object. Thus, this theory suggests that complexity can both increase and decrease aesthetic appraisal (Moshagen & Thielsch, 2010).

A myriad of studies of website visual aesthetics have been conducted. Besides complexity and simplicity, these studies have included text, fonts, proportions, images, icons, color, variety, animations, variety, and many more surrogates for aesthetics. Several of these have focused on the viewer's response to particular aspects of aesthetics. For example, a study by Deng and Poole (2012) suggests significant influences of webpage complexity and order on customer's preferences for webpages and a moderating effect of customer's shopping motivational orientation on his or her preference for webpage complexity. A study by Wang, Minor, and Wei (2011) investigated online consumers' cognitive, affective, and conative responses to web aesthetics. Their findings resulted in dissimilar patterns when two dimensions of web aesthetics, aesthetic formality and aesthetic appeal, were investigated. Perceived aesthetic formality was found to have a positive influence on satisfaction, while perceived aesthetic appeal had a negative influence on satisfaction when consumers pursued purchase task. These two studies alone exemplify the various pieces of aesthetics in screen design and how the pieces can impact the viewers' reactions.

The term "playfulness" suggests full of fun and frolicsome. This attribute, too, is found in screen designs and has been shown to influence the viewer's response to webpages. Identified by Moon and Kim (2001) as an extension of the Technology Acceptance Model ("TAM"), the playfulness of a website relates to how entertaining the viewer believes it to be; more specifically, the authors define perceived playfulness as the extent to which the individual "perceives that his or her attention is focused on the interaction with the [technology], is curious during the interaction, and finds the interaction intrinsically enjoyable or interesting" (p. 219). Cober et al. provide as an example the Disney website, which the authors describe as "flashy and fun to watch" (2004, p. 628). Moon and Kim (2001) offer the prescient advice that playfulness would join the TAM's ease of use and usefulness as an important issue, it will play an important role in increasing usability, and that interface design must consider both the intrinsic and extrinsic motivations of the viewer. Webster and Martocchio (1992) provide results of their investigation on microcomputer playfulness, which describes an individual's tendency to interact spontaneously, inventively, and imaginatively with microcomputers. They found that microcomputer playfulness relates positively to mood, involvement, and satisfaction.

Initial Affective Reactions

Affective reactions have been studied in relation to numerous constructs over the years (Watson, 2000; Madden, Allen & Twible, 1988; Brief & Weiss, 2002). Positive and negative affect fall along two independent continua. Positive affect can include reactions such as enthusiasm, excitement, interest, and activity. Negative affect reactions can include distress, guilt, irritability, hostility, and shame. Following the consumer literature, Cober et al (2004) postulated that website façade, specifically playfulness and aesthetics, would elicit positive rather than negative emotions and that emotional reaction is ultimately related to how interested the individual is in engaging in the recruitment process with the organization.

Because affect is found to contain two separate, orthogonal dimensions, a person would not be expected to react both positively and negatively to the same website façade. Rather, an initial affective reaction would be one or the other. Following Cober et al. (2004) and Page and Herr (2002), positive affect is more likely to be the default emotion when experiencing a new item.

However, positive affect has not been significantly studied in the recruitment literature. Ashford and Saks (2002) found a relationship between the actual materials used to recruit a potential applicant and the continuing attitudes that applicant may hold if he or she becomes an employee. If, as Lingaard et al. (2006) state, viewers form impressions within 50 milliseconds of seeing a recruitment website, then identifying how an applicant's initial affective reactions are influenced by the website's façade may play a significant role in helping employers understand how to maximize the effectiveness of recruitment webpages and the resulting long-term attitudes of new hires.

Applicant Attraction

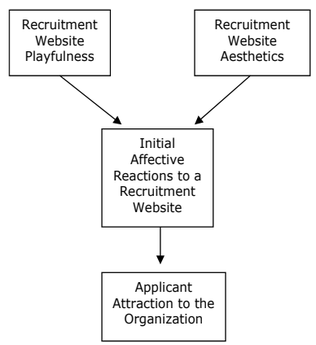
Various characteristics of a website have been linked to a person's interest in employment with a particular organization. For example, organizational image has been linked to web recruitment using person-job fit to explore the relationship (Allen, Mahto, & Otondo, 2007; Lynes & Marler, 2011). A significant positive relationship between website vividness and applicant attraction was found when an organization possessed a good reputation but provided a low amount of information (Williamson et al., 2010). Paths between website attitudes, organizational attitudes, and employment intention have been explored (Allen et al, 2007). In a multi-method study utilizing eye-tracking, verbal protocol analysis, and survey data, Allen, Biggane, Pitts, Otondo, and Scotter (2013) found that job-seekers focus verbal attention more on content than design, especially when information relates to an actual job opening. In addition, perception of communication features of a website helped explain applicant attitude toward the organization and intent to pursue employment and design helped explain applicant evaluation of the website.

In these studies, the mediating role of initial affective reactions was not considered. These studies examined only the direct effect of a website's façade on applicant attraction. However, Cober et al's (2004) model very clearly postulates that initial affective reactions mediate the relationship. Without examining the influence that affective reactions can have on a person's interest in a particular organization, we do not have a full understanding of the impact of website playfulness and aesthetics on why a person might choose to work for one organization over another.

MODEL DEVELOPMENT

Our study builds upon and extends the existing research by looking specifically at playfulness and aesthetics, the initial affective reaction to those website façade components, and the overall impact on applicant attraction to the organization. Therefore, based on the review of the literature and Cober et al's (2004) work in particular, we

FIGURE 1
MODEL



propose the following relationships between an organization's website façade and applicant attraction to that organization as mediated by initial affective reactions (Refer to Figure 1).

Given the Cober, et al. (2004) research propositions regarding web site playfulness and aesthetics and the Lingaard et al. (2006) finding that an applicant forms an impression almost immediately when viewing a website for the first time, we postulate that an applicant's reaction to a website's façade will more than likely be along the positive affect continuum rather than the negative affect continuum. We propose and test two hypotheses. Both hypotheses are stated in the alternative. The first identifies the relationship between a website's level of playfulness and the impact positive affect will have on the likelihood the viewer will be interested in employment. The second hypothesis identifies the relationship between a website's level of aesthetically pleasing attributes and the impact positive affect will have on the likelihood the viewer will be interested in employment.

H1: Initial Positive Affective Reactions mediate the relationship between the Playfulness of a company's Recruitment Website and Applicant Attraction.

H2: Initial Positive Affective Reactions mediate the relationship between the Aesthetics of a company's Recruitment Website and Applicant Attraction.

METHOD

Sample and Procedure

This study utilized a student population from a private, Catholic university located in the Southwest United States. Our sample consisted of 62 students in several senior level capstone classes over multiple semesters. Data was collected during class time. Even though the students were provided the opportunity to decline participation at no cost to them, all of the students chose to continue participation. No incentives were offered to the students. The participants were primarily traditional undergraduate (75.4%) and master's (14.8%) students majoring in a variety of business subjects. The average respondent was 23.5 years of age. Sixty-one percent were female and 16.4% were white while 83.6% were racial minorities. When asked about their current employment situation, 80.3% answered they were either not employed or only employed part-time (working less than 35 hours per week). Of those working, 82% answered that they have only worked in a full-time capacity for four years or less with 25% indicating that they intend to remain with their current employer for one year or less. Forty-nine percent of the participants stated that they would prefer another job to the one they currently hold and 75% stated that they thought it would be somewhat or extremely difficult to find another job. When asked if the participant is actively involved in the recruitment process, 73.3% answered yes. Therefore, these statistics indicate that the sample of students who participated in this study were appropriate to test our hypotheses since the majority of the participants had experience working and were currently engaged in a recruiting process.

Several different sources were used to identify a total of fifteen organizational websites for the study. Organizations were chosen based on recognition as a local or national leader in recruitment website design, identified through previous research of web recruitment, or were located in the same geographic area as the respondents. Each student was provided with a presentation containing links to 15 different company's recruitment websites. Students were instructed both orally and in writing to view each recruitment website in the order presented in the survey for approximately 20 seconds then complete the hardcopy questionnaire applicable to that particular company. Students did not navigate through the web pages, but focused solely on the recruitment page. The order of viewing was randomized to account for biases that might occur due to the previous page viewed. Since each student viewed each of the 15 websites, a total of 930 observations were possible.

Measures

Website Playfulness

We used the playfulness items identified by Webster and Martocchio (1992) in their construct development utilizing microcomputers. They utilized five independent studies involving more than 400 participants to develop a valid measure of microcomputer playfulness (Webster & Martocchio, 1992). Characteristics of playfulness included in their study were spontaneous, imaginative, flexible, creative, playful, original, and inventive. These seven items are the basis for the survey questions incorporated in our study. Students were asked to described the playfulness of each website by selecting the number which best described themselves when interacting with the website. The numbers were on a scale of 1 to 5 with 1 being Strongly Disagree and 5 being Strongly Agree. A rating of 3 is considered Neutral. A factor analysis established that all items fell on one factor with a total eigenvalue = 4.64. Cronbach's alpha for our scale = .915.

Website Aesthetics

Aesthetics represent the overall stylistic or innovative features of a website. It has many facets such as color, fonts, pictures, the use of whitespace, and unity and has been shown to be positively associated with organizational attractiveness (Cober et al, 2004). The literature provides several items that can potentially measure aesthetics. These include beauty, meaningfulness (Schenkman & Jonsson, 2000), icons, coherency, layout (Ismail & Kadir, 2004; Matthews, 1999), proportion, symmetry, simplicity, complexity, unity, equilibrium, regularity, economy, density, and rhythm (Ngo, 2004). We based our survey items for aesthetics on a combination of characteristics cited. Items measured in our study include proportion, meaningfulness, simplicity, beauty, symmetry, complexity, unity, and equilibrium. Respondents were asked to rate the web page for each of the items from 1 to 5 with 1 being Strongly Disagree and 5 being Strongly Agree. A rating of 3 is considered Neutral.

A factor analysis identified that our eight-item scale loaded on two factors. However, the second factor contained only two items. Based on previous statistical research that finds that factors with less than three items are generally unstable (Costello & Osbourne, 2005), we dropped the two items, simplicity and complexity, from further analysis. While we do not have a definitive reason for the two-factor outcome, we can speculate that student responses to the degree of simplicity and degree of complexity may have been based on the recruitment website content rather than the website's appearance. When these two items were eliminated, the single factor resulted in an eigenvalue of 4.002. Our six-item aesthetics scale results in a Cronbach's alpha of .882. Nunnally (1978) has indicated 0.7 to be an acceptable reliability coefficient; thus, the items are considered an adequate measure of this variable.

Control Variables

We controlled for demographic characteristics when exploring the relationship with a company's website façade and a student's interest in working for that company. Prior research suggests that gender and age are significant in predicting applicant attraction (Williamson et al, 2010). In addition to these two variables, we also tested for the influence of race.

Initial Affective Reactions

Initial affective reactions are measured by the 20-item Positive Affect-Negative Affect Scale ([PANAS]; Watson, Clark, & Tellegen, 1988). This scale measures a person's current mood and emotional response to a stimulus, which is, for our study, the organization's recruitment webpage. The scale includes items such as interested, excited, enthusiastic, and attentive to measure positive affect. Distressed, upset, irritable, and hostile measure negative affect. For our study, we measured positive affect with 10 items. Items in our study are measured on a 1 to 5 scale with 1 being very slightly or not at all to 5 being extremely. Participants are asked to rate their emotional response to the website immediately after viewing the organization's recruitment webpage and before they continued to the next organization's website. The ten items that form the positive affect scale had a Cronbach's alpha of .951.

Applicant Attraction

There are several instruments that measure aspects of job seeker's interest in employment with an organization. In order to measure the student's employment interest in the organization, we used the following five items from the organizational attractiveness scale by Turbon and Keon (1993):

1. I would exert a great deal of effort to work for this company
2. I am interested in pursuing my application with this company
3. I would like to work for this company
4. I would accept a job offer

Table 1
Descriptive Statistics

	Observations	Mean	Median	Maximum	Minimum	Standard Deviation
Playfulness	916	3.37	3.429	5	1	.944
Aesthetics	916	3.53	3.500	5	1	.747
Positive Affect	914	2.18	2.000	5	1	.995
Applicant Attraction	909	4.55	4.600	7	1	1.518

Note: The number of observations differs based on missing data.

5. I am no longer interested in this company except as a last resort

Students were asked to respond using a scale of 1 (Strongly Disagree) to 7 (Strongly Agree) with the last question reversed coded. The Cronbach's alpha for this scale is .936.

Table 1 provides the descriptive statistics regarding playfulness, aesthetics, positive affect, and applicant attraction.

Bias Analysis

Efforts were taken to reduce bias by randomizing the order in which students viewed recruitment websites for data collection. However, since each participant in our study evaluated more than one of the organization's recruiting webpages, our concern surrounded clustering at the student level for analysis (Williamson et al, 2010). For the 62 participants, each evaluated 15 companies resulting in 930 possible observations in our dataset. We tested for autocorrelation by evaluating the relationships between our independent variables and our dependent variable by website. This resulted in significant findings for all 15 websites despite the smaller number of observations (62) when using linear regression. Our results suggest that autocorrelation is not a concern in the analysis.

RESULTS

An exploration of the variance of playfulness and aesthetics within our chosen websites was conducted. In order to identify those websites that exhibited low or high playfulness measures, the seven items used to measure the playfulness construct were averaged. This provided a playfulness score for each respondent for each organization. This score was compared to a score of 3, which represents Neutral on the Likert scale used in the survey. This resulted in 12 of the 15 companies having a significant deviation from the Neutral measure for Playfulness at the .05 level. Nine of these companies reflect positive Playfulness while 3 are considered to be Unplayful. The overall average playfulness score for all websites combined was 3.32 with a standard deviation of 1.02. Table 2 reflects the mean differences in average playfulness of organizational websites:

Table 2
Variance in Playfulness of Websites

Organization	Mean Difference	t
Goldman Sachs	1.214	12.483*
Johnson & Johnson	.989	12.424*
General Electric	.716	7.481*
C.I.A.	.684	8.023*
Walt Disney	.594	5.710*
Kohl's	.579	5.231*
Verizon	.483	4.410*
IBM	.359	2.374*
BP America	.345	3.284*
Sprint	.194	1.593
Microsoft	.192	1.584
Valero	.038	.372
Deloitte & Touche	-.332	-3.012*
Google	-.622	-5.189*
Macy's	-.651	-4.358*

*Denotes websites which are significantly different than 3 at the .05 level.

Microsoft, Sprint and Valero were the three organizations that did not have a statistically significant difference from the neutral value of 3 on the Playfulness scale. Deloitte & Touche, Macy's, and Google webpages were scored below Neutral indicating these webpages lacked Playfulness. The remaining 9 organizations acquired scores suggesting the façade was Playful.

The same procedure followed for the Playfulness measure was used to determine if variations existed for Aesthetics in the 15 websites viewed. The items for this construct were also averaged to provide an aesthetics score for each respondent for each organization. This score was compared to a score of 3, which represents Neutral on the Likert scale used in the survey. Twelve of the fifteen websites had an Aesthetics score significantly greater than the Neutral value of 3. Two websites, Deloitte & Touche and Macy's, were not significantly different than our Neutral measure at the .05 level. Google was the one website which had a significant unfavorable Aesthetics rating by viewers. While Macy's also had an Unplayful score, it was not significantly different from neutral due to its wider confidence interval. The overall average aesthetics score for all websites combined was 3.48 with a standard deviation of .857. Table 3 displays the differences from neutral and the significance level.

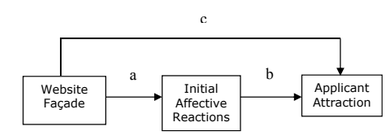
Our hypotheses propose both a direct and indirect effect of Playfulness, Aesthetics, and Initial Affective Reactions on the Applicant Attractiveness based on viewing a company's recruitment website. While structural equation modeling is often used to test complicated causal relationships amongst constructs, our proposed relationship can be determined with traditional linear regression analysis and a follow up test of significance.

Table 3
Variance in Aesthetics of Websites

Organization	Mean Difference	t
Johnson & Johnson	.882	9.906*
Goldman Sachs	.831	7.713*
General Electric	.803	10.489*
C.I.A.	.791	10.945*
Walt Disney	.715	8.114*
Verizon	.637	6.573*
BP America	.605	6.411*
Microsoft	.505	5.283*
Kohl's	.487	5.198*
IBM	.457	3.927*
Valero	.455	5.620*
Sprint	.336	3.169*
Deloitte & Touche	.185	1.783
Google	-.238	-2.229*
Macy's	-.290	-1.923

*Denotes websites which are significantly different than 3 at the .05 level.

Figure 2



In order to determine if mediation (indirect effects) exists, we examined the relationships of our constructs according to Figure 2.

In order to test the hypotheses, we use the methods proposed by Preacher and Hayes (2008) and the SPSS software. This approach utilizes bootstrap confidence intervals, which is preferred over other common approaches for identifying the indirect effects of the mediator variable. We used the default setting of 1000 bootstrap samples to correct for biases in the distribution of the indirect effect.

Table 4 provides details of our statistical analysis of the direct and indirect relationships of our variables under study. The results presented have been controlled for age, gender, and race.

The statistical tests result in support of both the first and second null hypotheses. Our analysis indicates that Playfulness and Aesthetics directly affects our dependent variable, Applicant Attractiveness (p =.000). However, our hypotheses suggest that initial affective reactions to these two facets of website façade provide an indirect effect on the applicant attraction construct. We proposed that positive affect would mediate this established direct relationship. Significant relationships between website façade factors and positive affect factors are evident. Both website Playfulness and Aesthetics were significantly related to positive affect measures. Results suggest Partial Mediation rather than Full Mediation of positive affect factors since both the façade variable and the emotion variable remain significant when used to predict Applicant Attraction to the organization.

Despite the result of an indirect effect of positive affect response, it is necessary to determine if this result is statistically significant. A Z-test was performed using the unstandardized beta of the indirect effect and the standard error of the indirect effect (Holmbeck, 2002). We were able to use the coefficient and standard error of the indirect beta from the results of bootstrapping provided by the SPSS add-in developed by Hays (2013). The Z-value for the indirect effect of positive emotions with playfulness is 10.304. The Z-value for the indirect effect of positive emotions with aesthetics is 10.213. These values indicate that the effect of the mediator is statistically significant.

Table 4
Results of Tests for Initial Affective Reactions as a Mediator Variable between Website Façade and Applicant Attraction

Path	IV	Mediator	DV	Coeff	se	t	P	Adj R2	Boot-strap se	Indirect Beta
a	Playfulness	Positive Affect		.5650	.0295	19.1629	.0000			
b		Positive Affect	Applicant Attraction	.6109	.0496	12.3079	.0000			
c	Playfulness		Applicant Attraction	.7628*	.0473	16.1270	.0000	.3351	.0335	.7628-.4176= .3452
ab	Playfulness	Positive Affect	Applicant Attraction	.4176**	.0520	8.0348	.0000			Partial Mediation
a	Aesthetics	Positive Affect		.6681	.0385	17.3612	.0000			
b		Positive Affect	Applicant Attraction	.6327	.0484	13.0852	.0000			
c	Aesthetics		Applicant Attraction	.9353*	.0607	15.4073	.0000	.3343	.0414	.9353-.5125= .4228
ab	Aesthetics	Positive Affect	Applicant Attraction	.5125**	.0643	7.9668	.0000			Partial Mediation

*Total Effect of IV on DV.
**Direct Effect of IV on DV.

DISCUSSION

The results of our study establish not only the impact a website's façade has on an applicant's attraction to an organization, but also the role that initial affective reactions, specifically positive affect, play in the process. We found that positive affect mediates the relationship between both a company's website's playfulness and its aesthetics with a viewer's interest in employment with that company.

The design and content of a recruitment website can influence a viewer's reaction to an organization, ultimately influencing their interest in employment. As part of a report to organizations regarding the use of human resource information systems, Johnson and Gueutal (2011) conducted an informal study with college students regarding organizational web presence, and found students viewed the firm "with a less technologically advanced and dynamic recruiting website as a less attractive employer, and as failing to be a leader in its industry (even though it was)" and believed that the website sent the message that the organization lacked innovation and quality (p. 8). Our research helps guide companies in their efforts to attract qualified applicant pools by addressing the playfulness and aesthetics of their recruitment webpage, so that companies can establish an inviting yet sophisticated web presence.

Aesthetic properties of a website which include proportion, meaningfulness, beauty, symmetry, unity, and equilibrium should be considered when designing the organization's recruitment website. Characteristics of playfulness, which include spontaneity, imaginativeness, flexibility, creativity, originality, and inventiveness, are also considerations that should not be overlooked in the facade design. These design details influence the positive affect of the viewers and ultimately impact applicant interest in the organization. This finding supports a portion of the theoretical framework proposed by Cober et al. (2004).

LIMITATIONS AND FUTURE RESEARCH

While our study did support the influence of façade on positive affect, we did not examine the role that negative affect may have on applicant attraction. Given that the initial reactions are immediate and normally individuals take more time to develop negative responses to new objects (Lingaard et al, 2006; Page & Herr, 2002), we were not able to investigate negative affect with our current design. However, future research under a more experimental or time-series method could investigate whether negative affect, if any, might be derived from viewing organizational recruitment websites.

Another limitation of this study is the sample of respondents. Data were collected from primarily traditional undergraduate students at only one university. Further support for positive affect as a mediator's role in a website's impact on applicant attraction may be found by expanding the characteristics of the sample. In addition to age, race, and gender as control variables, factors used in other studies of a similar nature include outcome expectancy, familiarity, and employer reputation.

CONCLUSIONS

The use of digital resources and company websites for the recruitment of qualified applicants is extensive. The design and content of these pages can directly impact the viewer's interest in applying for open positions. This study provides additional data for organizations wishing to expand their pool of job applicants via attention to playfulness and aesthetics. According to our findings and in support of other studies, companies should continue to maintain recruitment websites that are visually appealing to the job seeker. Webpages that are aesthetically pleasing and playful stimulate positive affect, which ultimately increases the job applicant's attraction to the organization.

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Potential Benefits and Barriers in Stream Mining Techniques over Varying Types of Data Streams

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ABSTRACT

Developing event-consciousness by social mining has become very vital due to the extraordinary growth of social-media applications. Mining hot topics from social-media streams has drawn a lot of attention recently. Both sentiment mining and stream mining research have experienced an explosive growth in awareness and demand as Web 2.0 technologies have paved the way for a surge of social media platforms that have significantly and rapidly increased the availability of user generated opinioned text. An enormous amount of data can pass through a data stream every second. Data stream mining is needed because there is no system that has an infinity capacity that can store the infinite data generated by a data stream. We consider various types of data streams and their producing processes. The current research on attempting to collect and interpret the data correctly and efficiently has been categorized. Also, future applications and directions have been identified.

INTRODUCTION

It is only until recently that technology has created something called data stream mining. A staggering amount of data can pass through a data stream every moment. Before losing this information it must be continually mined and evaluated in real time. Once a data element is removed from memory it cannot be retrieved and with a constant flow of information there is not enough memory to hold all of it. Since only selected information can be stored and evaluated, it is crucial to use the appropriate method to sort, collect, and interpret these data elements before they are lost and cannot be recovered.

There are four main types of data stream mining algorithm categories: Clustering, Classification, Frequency Counting, and Time Series Analysis. Clustering is a type of learning that is unsupervised and data is separated into a cluster of subsets that have their own distinct properties. Classification is a type of learning that is supervised and data is grouped into predetermined classes. Frequency Counting is used to find relationships between data. Time Series Analysis is when data is taken in order by time and any adjacent data points are considered dependent upon them. When the correct method is chosen and the correct data elements are found, then a company can identify situations to improve efficiency as well as identify opportunities to reduce cost and/or increase profits.

According to Chen (2008), there are endless applications for data stream mining. For instance, telegraph systems can be studied to better understand the nesting habits of birds by collecting data for temperature, humidity, and barometric pressure. An aurora defense system can be used to study the position of enemy equipment by collecting data from wireless networks. A monitoring system can be placed on hospital patients to collect data for their blood pressure, heart rate, and body heat to better prevent diseases. Online data can be collected so companies can better understand the purchasing habits of consumers and stock market streams can be studied as well as monitoring industrial equipment. There is a wide range of endless applications where data stream mining can be utilized.

CURRENT RESEARCH

Sliding Window Technology

There are many applications for mining frequent itemsets over data streams. It can be used to detect purchasing patterns in the retail industry, to identify patterns of items clicked on internet web pages, recorded telephone calls, and many more. Deypir and Sadreddini (2011) propose list based data stream mining (LDS), a better way to conserve memory and processing power while mining data streams by using sliding windows. A simple list is used for items in each window and then the most memory efficient list type is selected based on frequency for each item in that list. When a change occurs, the window content is adjusted to save memory. The new method utilizes a vertical layout based on three list types and is continuously monitored and adjusted during stream mining to control its memory usage. Typically the number of converted lists is very low which results in faster run time and better memory usage. LDS has been found to be faster than the competition as long as the amount of incoming information is at low to moderate levels. Since LDS focuses on simplicity by having a low number of converted lists, as well as efficient maintenance, far less memory is required as well.

In some data stream applications, the information embedded in the data arriving in the most recent time period is of particular interest. Chen et al. (2012) propose a method for efficiently mining the frequent patterns in a varying-size sliding window of online data streams. To highlight recent frequent patterns in the data stream, a time decay model is used to differentiate the patterns of recently generated transactions from historical transactions. The derived concrete bounds of the decay factor can achieve either 100% recall or 100% precision. A summary data structure, named SWP-tree, is proposed for capturing the content of the transactions in the sliding window by scanning the stream only once. In order to speed up online processing of new transactions, the information of frequent patterns recorded in the SWP-tree is updated in an incrementally way. To make the mining operation efficient, the SWP-tree is periodically pruned by identifying insignificant patterns. Since the sliding window can change its size, the effect of window size is examined. The performance of the proposed technique is evaluated via simulation experiments. The results show that the proposed method is both efficient and scalable, and that it outperforms comparable algorithms.

Dai and Chen (2012) present an algorithm AFPCFI-DS for mining the frequent itemsets from data streams. The algorithm detects the frequent items using a FP-tree in each sliding window. In processing each new window the algorithm first changes the head table and then modifies the FP-tree according to the changed items in the head table. The algorithm also adopts local updating strategy to avoid the time-consuming operations of searching in the whole tree to add or delete transactions. Their experimental results show that the algorithm is more efficient and has lower time and memory complexity than the algorithms Moment and FPCFI-DS.

Nori, Deypir, and Sadreddini (2013) introduce a new algorithm for closed frequent itemset mining over data streams operating in the sliding window model. This algorithm has dramatically improved runtime and memory usage.

High Utility Itemsets

Li (2011) takes a contrary view to mining itemsets over data streams. He believes that other research proposals create far too many candidate itemsets and that MHUI-max (Mining High-Utility Itemsets based on LexTree-maxHTU) can mine these high-utility itemsets with far fewer candidates and create better results as opposed to sliding window technology. The author continues to argue that searching for patterns in itemsets alone does not give you a complete understanding of their utility in terms of cost and profit and "Utility can be seen as how useful or profitable an itemset is" (p.2). Merely counting the number of itemsets or finding patterns does not locate those items of high utility that would be of most interest to a company or researcher. Far too many items with little value would be included taking up time to sort through them and valuable space since memory is always a limited resource.

The results of the experiment did show that this approach does find high-utility itemsets at a faster rate and at the same time uses fewer candidates to do so resulting in faster computation time. They also compared MHUI-max to two other algorithms MHUI-TID and THUI-Mine and found that MHUI-max outperformed both of them. Again it is important to note that using the proper algorithm may depend on which data elements are sought. If high-utility data elements are less important in some cases it may be more beneficial to use a different algorithm.

Erra and Frola (2012) show how to employ Graphics Processing Units (GPUs) to provide an efficient and high performance solution for finding frequent items in data streams. The authors discuss several design alternatives and present an implementation that exploits the great capability of graphics processors in parallel sorting. The authors provide an exhaustive evaluation of performances, quality results and several design trade-offs. On an off-the-shelf GPU, the fastest of our implementations can process over 200 million items per second, which is better than the best known solution based on Field Programmable Gate Arrays (FPGAs) and CPUs. Moreover, in previous approaches, performances are directly related to the skewness of the input data distribution, while in their approach, the high throughput is independent from this factor.

Methods to Improve Industrial Efficiency

Alzghoul and Lofstand (2010) discuss improvement of product availability in industrial systems through the use of data stream mining. They attached sensors to a hydraulic motor system so they could monitor temperature, speed, and pressure. These devices enabled them to monitor any faults or system errors in real time as they occur. Although a database management system could not store and handle the endless data from a data stream, it can be used to manage and analyze the data gathered by data stream mining. They tested three different algorithms: Grid-based classifier, one-class support vector machines (OCSVM), and polygon-based classifier. Although all three methods resulted in over 95% classification accuracy, the OCSVM method showed the best results in terms of classification accuracy and execution time. But the training process for OCSVM is more expensive than the other two methods and if the other two methods are over 95% then they may be chosen over OCSVM if it is found to be too costly. The grid-based classifier is unique in that it can be used to determine the probability that a data point belongs with a certain class, but further development would be needed before this method will be effective. Further development of data stream mining for monitoring purposes can result in improved efficiency for machines by decreasing faults and achieving a better understanding of how and when they occur.

Enright, Madden, and Madden (2013) describe a methodology for encapsulating knowledge in the form of ordinary differential equations (ODEs) in dynamic Bayesian networks (DBNs). The resulting DBN framework can handle both data and model uncertainty in a principled manner, can be used for temporal data mining with noisy and missing data, and can be used to re-estimate model parameters automatically using data streams. The authors also apply their approach to a real-world example in critical care medicine. By incorporating knowledge in the form of an existing ODE model, they have built a DBN framework for efficiently predicting individualized patient responses using the available bedside and lab data.

Methods of Finding Frequent Patterns

Chen (2009) proposed the recent frequent pattern tree or RFP-tree. The stream is scanned only once and each transaction is stored into the pattern that it belongs to, known as the pattern tree. Scanning the data stream only once is of great importance because it makes this method much faster and more efficient. Also, a time decaying model is used to ensure results are correct and this method can be used to identify very long or short patterns of data. Five experiments were conducted on the effectiveness of RFP-tree for data stream mining online transactional data. The results of these experiments show that the average time was not affected by the size of the data stream which is very important since data streams can vary greatly in size at any given moment. Also, removing obsolete data was efficient and did not take too much time. Then RFP-tree was compared with three other algorithms (FP-stream, estDec, and DStree) and tested for time and cost of space. Memory usage and average run time was lower for RFP-tree than all other methods showing it is superior to them.

Geisler et al. (2012) present an evaluation framework for traffic information systems based on data streams. The authors apply traffic simulation software to emulate the generation of traffic data by mobile probes. The framework is applied in two case studies, namely queue-end detection and traffic state estimation. The results show which parameters of the traffic information system significantly impact the accuracy of the predicted traffic information. This provides important findings for the design and implementation of traffic information systems using data from mobile probes.

In line with Kavanaugh et al. (2012), social media and online services with user-generated content (e.g., Twitter, Facebook, Flickr, YouTube) have made a staggering amount of information (and misinformation) available. Government officials seek to leverage these resources to improve services and communication with citizens. Significant potential exists to identify issues in real time, so emergency managers can monitor and respond to issues concerning public safety. Yet, the sheer volume of social data streams generates substantial noise that must be filtered in order to detect meaningful patterns and trends. Important events can then be identified as spikes in activity, while event meaning and consequences can be deciphered by tracking changes in content and public sentiment. The authors present findings from an exploratory study they conducted between June and December 2010 with government officials in Arlington, VA (and the greater National Capitol Region around Washington, D.C.), with the broad goal of understanding social media use by government officials as well as community organizations, businesses, and the public at large. A key objective

was also to understand social media use specifically for managing crisis situations from the routine (e.g., traffic, weather crises) to the critical (e.g., earthquakes, floods).

A Comparison of Counting and Sampling Methods

Ng and Dash (2010) offer an interesting comparison between approximate counting and sampling methods for frequent pattern mining on data streams. Approximate counting is used because it is not possible to keep an exact count of every item that passes through a data stream. If an itemset is found to be frequent in a small portion of the data stream, then it is kept, if not it is discarded. The method used is called Lossy Counting Algorithm (LCA). This method has been found to be lacking in precision for small itemsets that require little memory. They propose a customized version of LCA or CLCA that can account for small itemsets with much higher precision while using less memory and processing time for large itemsets. It does keep exact information about the data stream from one point to another but all other information from the data stream is lost.

On the other hand you can use a sampling method and a frequent pattern mining algorithm to find frequent itemsets. This method has information from the entire data stream, not for every data element, but from samples taken throughout. There are two sampling algorithms used, simple random sampling (SRS) using algorithm Z (Algo-Z) also known as reservoir sampling and distance based sampling for data streams or DSS. Four different algorithms were tested for processing speed and accuracy, counting methods LCA, CLCA, and sampling methods Algo-Z, and DSS. They found that since LCA records every single transaction which does give perfect recall, it limits speed and accuracy. CLCA adjusts errors for varying itemsets which has shown to improve precision greatly. Algo-Z was then compared with DSS. DSS was far superior to Algo-Z when using smaller sample sizes, although DSS does take more time than Algo-Z. DSS was also found to outperform LCA and Algo-Z in terms of accuracy and LCA was superior to Algo-Z as well.

The Importance of Load Shedding

Chang and Kum (2009) discuss the importance of properly discarding unneeded data elements in data streams. These data elements must be discarded as the influx of data elements becomes greater than the system can manage. They maintain that other systems discard data elements regardless of the amount of data elements at any given time so when the speed of data elements is manageable, some are still discarded. They also discard them randomly rather than by importance so important data elements are discarded as well as unimportant data elements. The authors propose a system that will only discard data elements when the influx is too high for the system to manage so there is not any unnecessary loss of data elements. Also, the data elements that are discarded will be of least frequency instead of simply discarded randomly so they will not lose data elements that are more important to the research. A tree-structure was used to maintain the counts of tuples throughout the data stream and a frequency-based load shedding system is used for deciding which most frequent items are kept and which items are trimmed when required. This is a great improvement and demonstrates the importance of load shedding data elements properly.

Utilizing Stream Mining on PDA Devices

A very new application for data stream mining is the ability to perform this task in real time on a device that is even more constrained to memory and processing power, such as a PDA. Haghighi et al. (2009) believe that Ubiquitous Data Stream Mining (UDM), a context-aware approach, will work well with PDA's. Instead of focusing on individual parts of context, the authors take a broader view of it and use context modeling coupled with fuzzy logic to do so. Since resources are limited, it is important that the algorithm can adjust when needed to variations in data rates of the data stream. The authors use Algorithm Output Granularity (AOG). It works well with resource constrained devices such as PDA's because it adapts to size based on available memory. Besides adapting to resource constrained memory, contextual awareness is also of great importance.

They simulated "A real world scenario in the area of mobile healthcare for monitoring patients suffering from high blood pressure fluctuations" (p.8) over a five day time period. Their results show that these methods do effectively adjust to different real life contextual situations. The system adjusts to different situations in real time. When blood pressure situations went up, the system adjusted properly and it made the same adjustment for low blood pressure situations.

Database as a Service

Organizations want to concentrate on their own business and outsource the rest of their work. This approach is named "database as a service concept" and provides lots of benefits to data owner, but, at the same time, brings out some security problems. Çokpınar and Gündem (2012) propose a rule mining system that provides efficient and secure solution to positive and negative association rule computation on XML data streams in database as a service concept. The system is implemented and several experiments have been done with different synthetic data sets to show the performance and efficiency of the proposed system.

FUTURE DIRECTIONS

Compared to many technologies, stream mining is still in its infancy and there is still much to learn about which method is best to use and the endless situations in which stream mining can be applied. Just as a data stream is an endless flow of information, there seems to be an endless list of algorithms developed to best capture and study this information. Every data stream is different as to the type of information, speed of data flow, and variation of data flow. One algorithm may be of better use for one type of data stream while another algorithm may work better for another type of data stream.

Challenges to Data Stream Mining

The five basic challenges to mining from a data stream can be summed up as: variation in the arrival time of data elements, quality of mining results, memory capacity keeping up with huge amounts of data, limited resources, and being able to understand and visualize results quickly (Kholghi and Keyvanpour, 2011). Sometimes the amount of data elements can be either too overwhelming for the algorithm to handle or there can be so few data elements that the algorithm should be collecting more information but is not able to do so.

When data elements are coming in at an extremely high rate, the best solution may be to use an algorithm that takes a sample of the data that best describes all of the data coming in at that time. For quality of mining results the method of the algorithm could be set in a way that does not allow it to collect the information properly so it misses key data elements of interest. The type of algorithm used must be able to accurately capture the data elements that encompass the overall meaning of the data stream. If this is not done correctly then results will be misunderstood and the wrong decisions will be made based upon them.

In order for memory capacity to keep up with huge amounts of information, it can be handled in two different ways. One can either have a system that is able to store more information and also store it on separate drives, or have a system that can interpret the information quickly, discard what is not needed, and then interpret new information and relate it to what was previously stored, constantly updating new material and relating it to previous summaries. Since data streams are unending massive amounts of information, the latter makes far more sense and will play a key role in understanding data streams better in the future. Since there are obviously limited resources for memory and computational power, a system should be in place that is effective when too much information is coming in and then also effective when there is less information. For instance it may work well to have a counting system in place while information is slow and steady but then have a sample system take over if information increases and becomes unmanageable. If one system cannot switch from one method to another, then it may be necessary to have two separate systems run simultaneously.

Peer-to-Peer (P2P) Networks

As one of data intensive large-scale distributed systems, peer-to-peer (P2P) networks can be applied for social networking, etc. In such P2P environments, global data mining is very costly due to the high scale and the asynchronous nature, as well as continuous sequence of rapid transactions. Farzanyar, Kangavari, and Cercone (2013) create an efficient local algorithm, *P2P-FISM*, for discovering of the network-wide recent frequent itemsets.

Mobile Data Streams

As information is constantly being processed and interpreted, it is very important that the results can be clearly and quickly understood. When the best systems are in place for interpreting data streams, visualizing and understanding the results quickly and efficiently will be of huge interest in the future. There are many challenges in visualization of the analysis/data stream mining results on a mobile device. Gaber et al. (2013) propose a generic theory for visualization on small screens.

Mobile devices have become the most utilized new technology recently. They have increased everyone's ability to communicate quickly and effectively as well as access enormous amounts of information right in the palm of their hands. Research on using this tool for data stream mining has already begun and we believe the greatest strides will be in this area. The biggest challenges will be their mobility, limited connectivity, and limited resources and so far the granularity based approach has again proven to be effective (Gaber, 2012). We believe that future advances in mobile devices will greatly diminish these challenges and data stream mining will be very effective and common using them.

Online Behavior Change Detection

In accordance with Vallim et al. (2013), Player Modelling has received much attention from the game community in the recent years. Tracking a player's behavior along time and informing it are important to the business in order to adapt itself to better respond to this new behavior via Artificial Intelligence. The ability to build accurate models of player behavior can be useful in many aspects of a game. The authors propose an incremental clustering learning technique, attempting to automatically detect the moments in time when the player changes behavior.

Sensor Based Data Streams

Using sensor nodes to send data wirelessly is now becoming a possibility as advances have been made in sensor device capabilities and the power of computers to interpret the data. These wireless devices have limited resources so they need to be able to adapt to changes in patterns in the environment around them. A granularity based approach is promising and has proven effective in testing in this area (Gaber, 2012). Further advances in this area will be most helpful in the security, science, and industrial areas where data sensors can be best utilized.

Personalization

Personalization and customization have numerous definitions that are sometimes used interchangeably in the literature. Sunikka and Bragge (2012) combine a text-mining approach for profiling personalization and customization research with a traditional literature review in order to distinguish the main characteristics of these two research streams. Research profiling with search words personalization and customization is conducted using the Web of Science literature database. The elements typical to the personalization and customization research are identified. Personalization research has a strong focus on technology and the internet; in addition to which it emphasizes customers' needs and preferences as well as information collection for user modeling and recommender systems. Customization is an older research stream, and the main body of the research has focused on tangible products but has lately initiated research in service fields. Based on the insights gained from research profiling and literature review, the authors suggest a new classification of concepts linked to personalization.

CONCLUSION

It seems apparent that there is still much to be learned about data stream mining. Data streams can be found and collected from every aspect of life: financial, economic, industrial, biological, social, and many more. With all of these different sources of information, data can never be collected and interpreted in the exact same manner. Since there are huge differences in the type and amount of data elements at any given moment, there may never be one algorithm that best captures the information from all of them. The data stream must be studied, understood, and an algorithm may need to be modified and adjusted for every unique data stream in order to best capture and understand the information passing through it.

There are many different ways to collect data from data streams and the algorithms used as well. Sliding window technology can capture frequent itemsets that uses list based data stream mining (LDS). It utilizes a vertical layout based on three list types and is continuously monitored and adjusted during stream mining. It may be more beneficial to search for itemsets high in utility, rather than counting frequent itemsets. Although one method may be more efficient than another, it also may be far more time consuming and expensive to establish and run. It may be more beneficial to have predetermined categories for data to be collected rather than constantly comparing and organizing data and comparing it to historical summaries. There are times when one should use a counting method and times when a sampling method is superior. Research in handheld devices such as PDA's will be of great importance in the future as well.

With all of the different ways of collecting data, processing it, and interpreting it, coupled with huge differences in types and sizes of data streams, there will never be one method that is perfect for all of them. The key will be to understand all of the different types of data streams and to find the best system for each. After this is better understood, algorithms and techniques can be improved and customized for each type of data stream and more work can be placed on quickly and efficiently understanding the results.

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