DeVry University Journal of Scholarly Research

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A MESSAGE FROM THE PROVOST AND DEAN OF FACULTY

We are pleased to present the second edition of the DeVry University Journal of Scholarly Research. Scholarly activity is an important component of a faculty member's role at DeVry University. It is fitting that we now have a journal to showcase some of that work. We are especially pleased that this initiative was born out of discussions at our annual Faculty Symposium, an event that brings together a community of faculty to exchange ideas. Scholarship has always been on display at our annual symposiums, but our professors recognized the need to share some of their work with a larger audience. Thus, with the help of 60 faculty members, this journal came into being. Thanks to all of our authors and editors for your contribution to our 2014 editions. We look forward to many more editions in the future.
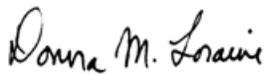
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A MESSAGE FROM THE EDITORS

The editorial board is delighted to share the enclosed examples of scholarship with you from across the Colleges of DeVry University. We have had what we consider to be a highly successful year that has involved developing our infrastructure, policies and procedures, culminating in the publication of 13 papers. We are very proud to have achieved the formal recognition of an International Standard Serial Number (ISSN), and with it our place in the Library of Congress catalog. One of the aims of the journal is to encourage collaboration and interdisciplinary research, amongst faculty, students and other DeVry University colleagues. Working on projects independently can be daunting, but finding research partners transforms the research experience and may lead to a highly unique blend of perspectives and skill sets. The unique characteristics of DeVry University have already, and should continue to be reflected in our research and publications.

We have a number of messages to convey to DeVry University faculty in support of future participation in the journal. First, we would like to encourage authors who have previously submitted articles to find some time to address the comments made by peer reviewers and plan on submitting in June or December of 2015. We welcome papers from Brasil, as this will add a very important international dimension to the journal. In addition, we would like to reiterate the importance of careful preparation of your paper prior to submission – please check the guidelines regarding length, organization and format. This will greatly accelerate the time it will take to get into print. Our journal welcomes all forms of scholarship and we will be particularly excited to receive innovative papers, as well as carefully crafted papers of social and practical relevance.

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DEVRY UNIVERSITY JOURNAL OF SCHOLARLY RESEARCH

JOURNAL INFORMATION

MANUSCRIPT SUBMISSIONS INFORMATION

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education research, or related subjects. Text and citations
should conform to APA style: *Publication Manual of the
American Psychological Association* (6th ed.). Because the
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manuscripts as part of its process of selecting articles for
publication, manuscripts should not bear the author's name
or identifying information.

Electronic submissions of manuscripts (MS Word)
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Dr. Deborah Helman: *dhelman@devry.edu*

EDITORS AND REVIEWERS

DeVry faculty who wish to apply for positions on the journal's
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PEER REVIEWERS FOR THIS ISSUE (CONT'D)

DEVRY UNIVERSITY INSTITUTIONAL REVIEW BOARD (IRB) GUIDELINES FOR RESEARCH

DeVry University established an Institutional Review Board (IRB) in March, 2012. The purpose of an IRB review is to assure, both in advance and by periodic review, that appropriate steps are taken to protect the rights and welfare of humans participating as subjects in a research study. IRBs attempt to ensure protection of subjects by reviewing research protocols and related materials. IRB protocol review assesses the ethics of the research and its methods, promotes fully informed and voluntary participation by prospective subjects capable of making such choices (or, if that is not possible, informed permission given by a suitable proxy), and seeks to maximize the safety of subjects.

Employees of DeVry University who want to conduct research must contact the IRB. The IRB has an application and guidelines that will be sent back to employees to fill out to get approval from the IRB to conduct research. For additional information, you can contact the DeVry University IRB through the following email address: *dvuirb@devry.edu*.

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Risky Business: Expanding the Research Agenda for Transaction Cost Economics in Strategic Alliances

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Abstract

Transaction cost economics has frequently been used to explain firms' behaviors in strategic alliances because it provides a way to address the issue of opportunism risk. However, there has been minimal effort in the literature to understand how organizations quantify the actual effects of opportunism. Additionally, the literature has not attempted to probe how firms balance the combined effect of transaction and opportunism costs against the synergistic potential of interfirm alliances. These gaps have caused scholars to overlook an important part of the partner selection process, which in turn prevents a deeper understanding of how firms form these alliances. This paper contributes to the literature on transaction costs and opportunism through the development of research questions that can facilitate future study in these areas.

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Keywords: strategic alliances, transaction cost economics, opportunism

Rather than describe the actions of markets, as is the case with neoclassical economics, *transaction cost economics* represents a new research perspective that focuses on the determination of costs and risks facing the firm on a per-transaction basis (Williamson, 1985). A key consideration in transaction cost economics is opportunistic behavior, which has been described as "self-interest seeking with guile" (Williamson, 1985, p. 47). Because individuals are only capable of limited knowledge, or bounded rationality (Simon, 1961), it is not possible for them to know and anticipate *ex ante* all contingencies in their dealings with other parties. This introduces the risk of opportunism whereby one party attempts to prey on the vulnerability of another (Parkhe, 1993). In the transaction cost view, the risks created by opportunism necessitate costly moves and measures to mitigate the impact of these risks on the firm (Hansen, Hoskisson, & Barney, 2008). Hence, minimizing these risks becomes the primary concern of the organization.

A related focus of the new institutional economics is the way in which organizations create governance structures to respond to various types of risks. Transactions that involve commodity goods are best handled by markets, which find equilibrium based on price, whereas transactions involving specialized goods or requiring specialized know-how are best internalized by the firm (Williamson, 1985). However, there is also an intermediate, hybrid form that can be managed by a range of alternative governance structures utilizing components of contractual law, joint ownership, and joint management. Strategic alliances, "collaborative organizational arrangements that use resources and/or governance structures from more than one existing organization" (Inkpen, 2001,

p. 409), are an example of such a hybrid form. As a result, there has been significant and ongoing interest in the strategic alliance literature from the transaction cost perspective (Judge & Dooley, 2006).

The collaborative nature of strategic alliances conflicts with the dark prospect of opportunism. Even if one holds that opportunism is a result of "frailty of motive" instead of Machiavellian "pre-emptive opportunism" (Williamson, 1993b, p. 97), there is often uncertainty as to what one party expects the other to do (Inkpen, 2001; Ulset, 2008). It is therefore important to understand how the costs associated with opportunistic behavior play into the actions of strategic alliance partners.

Purpose

The primary purpose of this paper is to consider how organizations might assess the components of opportunism within a transaction cost framework. Because much of the literature surrounding opportunism in transaction cost economics has been conceptual, there is no clear mathematical basis to evaluate the various elements influencing opportunism. This paper contributes to the literature by proposing a number of questions for future research on the effects of opportunism on alliances.

This paper is organized into four sections corresponding to the key elements discussed in this study: (a) the theoretical background for the risks highlighted by transaction cost economics, (b) how opportunism risk can be calculated, (c) the upside of collaboration, and (d) implications.

Theoretical Background

To properly frame the implications of risk on strategic alliances, it is necessary to discuss the development in the literature for the following areas: (a) transaction cost economics, (b) opportunism, (c) contractual governance, and (d) hierarchical governance.

Transaction Cost Economics

The underlying premise for transaction cost economics is the belief that most exchanges are properly handled by the market. Because it utilizes the equilibrium-finding mechanism of price, the market is the default mode, and the transaction becomes the basic unit of analysis (Williamson, 1993c, 1996). A transaction cost occurs when goods or services are transferred to a different entity.

Alternative forms of organizational structure are necessary in situations where this friction creates excessive transaction costs. A make-or-buy analysis is often used to explain the continuum of organizational structures that are available to the organization (Barringer & Harrison, 2000). Because it will be more efficient to buy "nonspecific" products and to make "idiosyncratic" products (Williamson, 1985), exchange conditions governing nonspecific products are fulfilled by price, which is best handled by the market. On the other hand, idiosyncratic products typically have specific requirements in the form of know-how or unique assets that are best internalized by the firm. A hybrid model represents in-between situations that have characteristics of both markets and internalization. Contractual structures are effective for hybrid situations that are more market-like, whereas more hierarchically-oriented structures, such as equity joint ventures, are appropriate for situations requiring internalization (Williamson, 1985). Strategic alliances are an example of a hybrid structure. Interfirm agreements introduce a number of incremental constraints that are not perfectly handled by either extreme of market or firm. Such agreements, therefore, expand the make/buy decision into a make/buy/partner consideration (Barringer & Harrison, 2000).

Transaction costs associated with these models can vary. The labor associated with the contractual and management process would form the basis for these costs (de Jong & Woolthuis, 2009; Dobler, Burt, & Lee, 1990; Ebers & Oertemans, 2013). Similarly, the amount of time spent preparing for and negotiating contracts serves as an observable indicator of dependent time (Anderson & Narus, 1990).

Opportunism

The greatest concern for parties entering relationships with other organizations is the threat of opportunism. Williamson (1993b) maintained that the assumption of opportunism had long been suppressed by economists, only to emerge as theories of adverse selection, moral hazard and shirking entered their models. He famously described opportunism as "self-interest seeking with guile" (1985, p. 47). However, this was later amended to frame opportunism according to three types: blatant, or Machiavellian behavior; subtle, or self-interest seeking with guile; and natural, or "tilting the system at the margin" (1993c, p. 115).

The greatest peril of opportunism appears to lie in the subtle form, which can by definition be difficult to recognize and predict, corresponding to "the frailty of motive 'which requires a certain degree of circumspection and distrust' in the transaction cost economics scheme of things" (Williamson, 1993b, p. 97). Frailty of motive, though less direct than Machiavellian "pre-emptive opportunism" (1993b, p. 97), can be difficult to determine in an alliance

relationship. It can exist in the actions of a partner who merely withholds information or attempts to substitute substandard resources for those anticipated (Judge & Dooley, 2006).

Opportunism is a continual concern for parties entering agreements because individuals have limited rationality (Simon, 1961). Such bounded rationality is treated as a "constraining theoretical assumption" (Judge & Dooley, 2006, p. 26) in transaction cost economics. Parties in an agreement cannot fully predict the future, especially in terms of outcomes and risks. Because it is difficult to know who is going to operate opportunistically, selection and search costs will be increased (Williamson, 1985). As a result, significant effort and cost must be expended to structure an agreement to protect the parties.

Contractual Governance

Alliance relationships that can be managed by contract (i.e., those which are considered closest to market exchanges) allegedly entail less risk than those requiring hierarchical structures. These types of relationships can be negotiated relatively quickly and with minimum investment, though they tend to be problematic for alliances requiring determination of property rights, relying on the transfer of knowledge between firms or needing high levels of management effort (Gulati, 1995). Such contractual agreements can incur significant transaction costs in negotiation, contract structuring, and the creation of monitoring and reporting systems.

Various ways have been proposed to manage the risk of opportunism in contractual relationships: pooling contracts (Sampson, 2004b), division of labor (Pangarkar & Klein, 2001), and reduction in assets or diversification (Nooteboom, Berger & Noorderhaven, 1997).

Hierarchical Governance

Agreements that require more robust structures, such as equity joint ventures, allegedly have more risk of opportunism. Such situations often involve potential knowledge leakage (Oxley, 1999; Oxley & Sampson, 2004; Sampson, 2004b), delineation of intellectual property rights (Oxley, 1999; Sampson, 2004a), measurement of individual partner contribution (Santoro & McGill, 2005), and collaborative research and development situations for which all the issues of concern cannot be specified *ex ante* (Pangarkar & Klein, 2001). The investment of alliance-specific resources and the implementation of a formal governance structure are the two most effective ways to address such risks (Isidor, Steinmetz, Schwens, & Kabst, 2014).

The first, alliance-specific investments are credible commitments (Williamson, 1996) that are unique to the relationship and are often non-redeployable (Williamson, 1993a). Such commitments motivate a partner to act in good faith lest it run the risk of losing the use of these resources (Teece, 1992). The second, hierarchical governance structures represent an economic deterrent to opportunistic behavior because they introduce a shared management and oversight structure by which both parties (in a dyadic alliance) protect their interests and maintain some level of monitoring over the other party. In these arrangements, such as in an equity joint venture, the hierarchical form offers properties such as (a) residual claimant status to earnings and asset liquidation; (b) contracts for the duration of the firm's life; and (c) a board of directors with a decision-review relationship to management (Williamson, 2002). From an economic perspective, hierarchical forms of governance are only appropriate where the benefits of enhanced coordination outweigh the costs of setup and bureaucracy (Sampson, 2004a). Similarly, the costs involved with altering an alliance, such as fees, reorganization charges, and opportunity costs can outweigh efficiency gains projected for the alliance itself (Reuer & Arino, 2002).

There are obvious direct costs associated with both asset specificity and hierarchical governance. Resource investment costs will be those associated with the assets or individuals committed to the relationship (Williamson, 1985), whereas governance structure costs will consist of the cost of incremental controls, negotiation and set up costs, and bureaucratic costs (Sampson, 2004a). Nevertheless, empirical studies have generally supported the relationship between the use of asset-specific investment and hierarchical agreements (e.g., Artz & Brush, 2000; Isidor et al., 2014; Murray, 2001; Oxley, 1999; Reuer & Arino, 2002; Sampson, 2004a, 2004b; Santoro & McGill, 2005; Young-Ybarra & Wiersma, 1999).

Calculating the Risk of Opportunism

Transaction cost economics reflects the principle of finding the most cost-efficient manner in which to process a transaction (Williamson, 1985). As such, it devotes significant attention to the identification of the costs that would be incurred in a strategic alliance agreement. These costs, even though they represent future costs of management or renegotiation, can be conceptualized with relative completeness and, given the proper operating parameters, could be calculated by an organization with a relative degree of accuracy. On the other hand, the risk of opportunism is represented in the literature as something of an amorphous concept.

Previous studies have highlighted areas affected by opportunism, such as technology leakage (Oxley, 1999; Oxley & Sampson, 2004; Sampson, 2004a) and hold-out behavior (Reuer & Arino, 2002). However, the actual costs of opportunism remain unresolved in current literature. In fact, some argue against opportunism. Hill (1990) maintained that opportunism in the transaction cost rationale is overstated because competitive markets will naturally select out organizations that behave in an opportunistic manner. Even in cases supported by specific asset investments, which could provide a level of acceptance for opportunistic behavior, over time markets will become less opportunistic. Similarly, Ring and Van de Ven (1992) suggest that the negative reputations created by opportunistic firms would work to eliminate them from consideration by other parties.

Nevertheless, in order to better understand the impact of opportunism in strategic alliances, it can be useful to develop a method for calculating it. As a starting point, Williamson and Craswell (1993) have suggested that such risks can have both favorable and unfavorable outcomes. This can be stated as: $V = q\,G + (1 - q)\,B$, where V equals overall value, G equals good outcomes, B equals bad outcomes and q is the probability of the good outcome.

If risk can be positive as this formula allows, then there can be cases that clash with a fundamental premise of transaction cost economics: the risk of opportunism causes the need for costly contractual or governance measures. Following that logic, it would be appropriate to conclude that the *risk* of an opportunity could be so favorable that negative controls in the way of reduced governance might be warranted to reduce transaction costs.

The lack of a universally quantifiable basis for the risk of opportunism therefore raises the question of what form of economic calculus the firm uses to evaluate risk in terms of potential transaction costs. Because organizations are expected to react to the risk of opportunism with the appropriate level of transaction costs, it follows that they determine those risks. However, there may be no rational basis on which to calculate these costs if the risks of opportunism are speculative. Moreover, there is a greater propensity for the alliance to unravel if one partner suspects the other of opportunistic intent (Judge & Dooley, 2006).

Because it would be reasonable to expect organizations to operate in an efficient manner when structuring alliances, firms must identify and calculate the costs of opportunism in a precise enough way to determine their alliance governance form. This leads to the first research question necessary to build a more comprehensive basis for theory on opportunism costs

in strategic alliances: (*1a*) Can firms anticipating an alliance calculate the potential costs of opportunism from dealing with a particular partner? (*1b*) What mechanisms do firms use to calculate the potential costs of opportunism from dealing with a particular partner?

Simple economics would suggest that it is in the interest of the organization to incur transaction costs to mitigate the impact of the risk of opportunism, as long as those costs are not larger than the negative impact caused by the opportunism. In mathematical terms, the ideal relationship of costs to opportunism could be represented by this formula: $TC <= OC$, where TC refers to the appropriate transaction costs and OC is the opportunism cost.

However, it is unclear how a firm determines appropriate cost levels to avoid misalignment. An organization may seek to form joint development alliances with one of two separate companies (low-risk Partner A and high-risk Partner B). The operative question is whether the organization can determine an optimum governance arrangement for each relationship. Transaction cost theory would suggest that a less elaborate governance structure would be needed to manage the relationship with Partner A than the alliance with Partner B. However, because opportunism is a hypothetical quality, the organization may not ascertain which of the two partners actually represents the greater potential for opportunism. Misaligned governance occurs in low hazard alliances, causing costs of bureaucracy to exceed the cost of opportunism (Sampson, 2004a). Furthermore, it is reasonable to assume that the firm may be unable to determine the extent of damage that could be caused by either partner.

As a result, it is unclear whether the firm can make a reasonable estimate of the prospective transaction costs of either arrangement, consequently leaving itself open to mismatched governance structure and requirements. In fact, when transaction cost economics concepts were explained to executives directly involved in their organizations' strategic alliances, none indicated that transaction costs had implicitly guided the way they structured their relationships (Faulkner, 1995). It is, therefore, necessary to understand precisely the perceived effect of opportunism on the determination of governance mode.

Based on the preceding analysis, the following research questions emerge: (*2a*) How do firms calculate the opportunism costs of dealing with that partner? (*2b*) How do firms calculate the appropriate level of transaction costs attributable to governance, etc. necessary to mitigate opportunism costs?

The Upside of Collaboration

Although transaction and opportunism costs are fixtures of strategic alliances, these costs can be offset by the benefits of the collaboration. In this section, that tradeoff, as well as a proposed calculation for the trade off of cost and benefit, is discussed.

Cost vs. Benefit

As was stated above, a core belief of transaction cost economics is that the transaction is the fundamental unit of analysis (Williamson, 1985, 1993c, 1996). However, this inherent focus on economizing has been challenged in the strategic alliance literature, particularly concerning the singular preoccupation with costs.

One limitation of this preoccupation is that the benefits of the alliance are not taken into account in the economizing equation. Alliances enable firms to gain access to resources and markets in order to preempt competition and exchange competencies (Nooteboom et al., 1997); minimization of cost is not their only benefit. Collaboration provides access to otherwise unavailable resources (Murray, 2001; Powell, Koput, & Smith-Doerr, 1996), such that the need for resources might be strong enough to justify an organization forming an alliance, even if it will cause high transaction costs (Combs & Ketchen, 1999).

Two examples will serve to illustrate the dilemma. In the first example, an organization contemplating two separate relationships with two different firms might anticipate the same level of transaction costs under each scenario. Under transaction cost economics theory, the firm should therefore be indifferent to the two alternatives and should consider them to be inter-changeable. However, if one organization's alliance offers a benefit that is significantly greater than that of the other, the organization should assess the value of the two situations differently. This is consistent with the concept that value is specified as "excess over the next best alternative partner" (Nooteboom et al., 1997, p. 317). However, the unclear prospect of opportunism confounds the firm's ability to properly evaluate these two alternatives. If, for example, a partner's form of opportunism were to provide fewer resources than promised in its agreement, it could still be advisable for the focal organization to compensate by providing these resources itself (Judge & Dooley, 2006). Not to do so would potentially undercut the benefits the alliance would provide. However, the cost-oriented nature of the transaction cost perspective might inadvertently cause the focal organization to avoid the partnership due to the estimation of increased costs.

In a second example, an organization might consider an alliance with a proposed partner that would provide access through its own distribution channels to a desired market. In this scenario the amount of specific investment (and consequently, anticipated transaction costs) required of the focal firm could be minimal. However, if that organization concluded that the specific risk of opportunism with the partner were that the partner would fail to make good on market development efforts into a new sales territory, the result could be a missed opportunity and forfeited revenue stream. Under this scenario, there might be no workable opportunity for the focal firm to compensate for the partner's deliberate failure to perform since it would be impossible to develop an effective sales channel of its own in the desired time frame. The potential lost benefits could be disproportionately large in relation to the significantly smaller cost elements. Transaction cost economists might argue that the preferred course of action for the organization would be to get the partner to invest non-redeployable assets as commitments that would ensure its continuing involvement in the agreement. However, the most relevant investments, the development of its existing channel, have already been made and are already providing suitable rents to the partner organization. As a result, the partner firm faces no incentive to perform.

A second limitation lies in the firm's inability to measure the unique advantages offered by the strategic alliance. Transaction cost theory does not incorporate the notion of the "value perspective" (White & Lui, 2005). It is therefore difficult to compare alliances to other structural forms given that the benefits of alliances (e.g., learning from the partner, resource pooling and reduced environmental uncertainty) are unique to alliances and hence are a "function" of the costs instead of being "independent" of the costs. In such situations, the transaction cost perspective does not facilitate our ability to correctly assess the impact of the transaction, since it is only evaluating the cost portion of the cost-benefit equation.

A third limitation stems from the fact that alliances do not always occur as mere transactions in a vacuum, but instead often reflect long term relationships or relationships that encompass multiple individual alliances. Empirical studies of alliances from a transaction cost perspective have assumed that each alliance is independent and that the transaction costs associated with it are to be treated singularly (Gulati,

1995). But such studies ignore repeated alliances or the impact of prior interactions in how organizations chose their governance structure (Ring & Van De Ven, 1992; Zajac & Olsen, 1993). Since the transaction cost calculus does not differentiate between one-time situations and those that represent long term or multiple arrangements, the transaction cost perspective does not appear to offer a consistently generalizable view across all alliances.

Calculation of Cost vs. Benefit

It has been proposed that strategic alliances are formed with the expectation of a net positive value of outcomes (Parkhe, 1993). Though little incentive exists when costs can neutralize those outcomes, cooperation implies that there is positive value resulting from the interdependence. Consequently, it is appropriate to assess the implications of opportunism risk against these benefits, rather than merely from a perspective of pure costs. Alliances often produce unique forms of value, so the real basis for comparison should be benefit-to-cost ratios rather than pure costs (White & Lui, 2005). Ideally, the overall benefits would exceed overall costs, so overall benefits expected by the organization should be the result of the positive value created by the alliance, less risk of opportunism and transaction costs. Mathematically, this could be expressed in the following formula: $B = PV - (OC + TC)$, where B refers to overall benefits, PV refers to positive value created, OC equals opportunism cost and TC represents transaction costs.

Based on the preceding analysis the following research questions emerge: (*3a*) How do firms calculate the positive value created by an alliance? (*3b*) What mechanisms do firms use to compare the calculated positive value created by the alliance to calculated opportunism and transaction costs?

Discussion

It is clear in the literature that the effects of opportunism can be mitigated and even neutralized. However, with its focus on costs and risk, it is evident that the transaction cost perspective only looks at the cost side of the cost-benefit equation for strategic alliances (White & Lui, 2005). Because strategic alliances represent a unique source of value to the organization, the singular focus on cost alone overlooks this value. The potential for upside effects is not addressed in the risk-centric model of transaction cost economics. Risk is clearly a real possibility in any transaction, but so is the benefit that set the initial premise for the alliance. This was shown in the recent case example of a pharmaceutical alliance between Solvay and Quintiles (Kaplan, Norton, & Rugelsjoen, 2010). Although the parties to such an alliance would

normally try to mitigate their risk through reliance on a service level agreement, which is a form of contractual safeguard, they ultimately found that a process designed to foster collaboration actually addressed concerns over opportunism while simultaneously bringing better than expected results.

Implications for Practice and Research

The research questions proposed in this paper frame areas that future studies might investigate, with the overarching question being how the organization assesses these factors. These questions have both applied and theoretical implications. The applied implications could potentially inform managers on how to better scan for opportunism cues in a partner. For instance, it is understood that trust contributes to alliance success, but it's not currently clear how firms assess a partner's trustworthiness (Schilke & Cook, 2013). These research questions would shed light on ways in which organization leaders could anticipate relationships that hold excessive downstream opportunism risk.

The theoretical implications might cause us to re-contextualize the adequacy of the transaction cost perspective as an overarching model. Even though Williamson acknowledged that scholars should evaluate transaction costs in conjunction with other factors, he continues to emphasize that economic activity is significantly shaped by transaction cost considerations (Williamson, 1985). Perhaps it is appropriate to take Williamson's former suggestion to heart and begin to probe ways in which other theories of strategy, economics and behavior synthesize in order to determine how firms act in the face of unknowns such as opportunism.

The research questions presented in this paper represent an attempt to form a basis for the evaluation of the various theoretical factors that comprise and influence the consequences of opportunism. The intention of these questions is to encourage greater investigation into the behaviors of organizations in response to opportunism. Although it is fully expected that many of the viewpoints espoused by the transaction cost perspective will continue to have applicability, it is also anticipated that new theoretical insights and relationships would likely emerge.

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Quasi-Experimental Investigation of the Extended Job Characteristics Model

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Abstract

The job characteristics model (JCM) is a prominent theory in organizational behavior. The JCM was extended by including personality elements. Studies with this model have reported inconsistent results, specifically in the interaction effect between worker conscientiousness and task autonomy to work performance. Results of this study illustrate a negative significant interaction effect between high and low levels of autonomy and high and low levels of conscientiousness to student satisfaction ($Z = -2.270$ and $p < .05$). Inconsistent results in prior studies may now be resolved by this negative interaction effect. Researchers had reported that worker conscientiousness and task autonomy each had positive relationships with performance. Inconsistent results with a combination of both variables to predict job performance may now be explained. This negative interaction effect will be of interest to job redesign practitioners and researchers in organizational behavior. This study helped strengthen the efficacy of the extended JCM.

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The job characteristics model (JCM) has been a prominent and popular theory in organizational psychology for over 40 years (e.g., Behson, 2010; Casey, Hilton, & Robbins, 2012; Juhdi, Hamid, & Siddiq, 2010; Piccolo, Greenbaum, den Hartog, &Folger, 2010). In their original model, Hackman and Oldham (1976) explained that work performance is enhanced by changes to characteristics of the job environment. Recently, researchers (e.g., Indartono & Chen, 2010; Juhdi, et al., 2010) have extended the JCM by including personality elements as additional interactive independent variables. Unfortunately, the findings across these extended JCM studies have been inconsistent. For example, Grant (2008) reported a significant negative interaction effect between the job characteristic task significance and the dispositional element worker conscientiousness; however, Piccolo et al. (2010) and Stumpp, Hülsheger, Muck, and Maier (2009) were unable to find an interaction effect for the job characteristic autonomy and personality attributes to job performance. Piccolo et al. (2010) stated the need for an objective source for levels of the job characteristic task autonomy.

An opportunity was found in the field of higher education that offered a source for level of task autonomy. This source was uncovered in the implementation of a currently popular method for course delivery, blended learning. Tightly scripted, blended learning implementations can provide a source for a low autonomy task environment, when compared with traditional course delivery (i.e., an environment that tends to have high levels of autonomy when instructors do not have sufficient creative license in course engineering) (Napier, Dekhane, & Smith, 2011). Blended learning refers to courses in which varying portions of the coursework are completed online, asynchronously (Lin, 2012). In some cases, the online portion of blended learning

course material is scripted, reducing the autonomy of instructors (Leveson, 2004). A utilization of student satisfaction data taken from low-autonomy, scripted blended learning courses, and from traditional delivery courses, provides the potential for exploring the inconsistency in JCM extended model studies by reducing the problem of common methods variance.

Purpose and Research Questions

The purpose of this study was to investigate a possible interaction effect between two independent variables: level of autonomy and instructor conscientiousness to student satisfaction as measured by the Net Promoter Score (NPS). This study evaluated the interaction effect between autonomy and instructor conscientiousness on student satisfaction as measured by NPS.

The following are the research questions:

Q1. *What is the relationship, if any, between student satisfaction, as measured by NPS, and high and low levels of instructor autonomy?*

Q2. *What is the relationship, if any, between student satisfaction, as measured by NPS, and instructor conscientiousness levels, as measured by the conscientiousness subscale of the Big Five Inventory (BFI)?*

Q3. *What is the interaction effect, if any, between level of instructor conscientiousness and level of instructor autonomy on student satisfaction, as measured by the NPS?*

The following null (H0) and alternative (Ha) hypotheses were tested for main effects and an interaction effect between instructor conscientiousness and level of autonomy on student satisfaction:

H1o. There is no relationship between student satisfaction, as measured by NPS, and high and low levels of instructor autonomy.

H1a. There is a statistically significant relationship between student satisfaction, as measured by NPS, and high and low levels of instructor autonomy.

H2o. There is no relationship between student satisfaction, as measured by NPS, and instructor conscientiousness levels, as measured by the conscientiousness subscale of the BFI.

H2a. There is a statistically significant relationship between student satisfaction, as measured by NPS, and instructor conscientiousness levels, as measured by the conscientiousness subscale of the BFI.

H3o. There is no interaction effect between level of instructor conscientiousness and level of instructor autonomy on student satisfaction, as measured by the NPS.

H3a. There is a statistically significant interaction effect between level of instructor conscientiousness and level of instructor autonomy on student satisfaction, as measured by the NPS.

Definition of Terms

Autonomy

Autonomy is a JCM job characteristic that refers to the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling work and in determining the procedures to be used in carrying it out (Piccolo et al., 2010).

Blended Learning

Blended learning refers to the delivery of course material using both face-to-face and on-line asynchronous methods, especially using web-based systems (Verkroost, Meijerink, Lintsen, & Veen, 2008). In this study, a form of blended learning, implemented at an institution of higher education in the Western United States, was utilized. These courses are constructed of scripted lectures, tests, and exercises. Instructors are required to enroll in (and pass) a blended-learning training module to become certified to teach blended-learning classes.

Conscientiousness

Conscientiousness is a JCM personality characteristic that refers to individuals who are disciplined, dependable, organized, goal oriented, persistent, law abiding, and honest (Grant, 2008).

NPS

The net promoter score (NPS) is an indicator of customer loyalty. It consists of one question: On a scale of 0-10, how likely is it that you would recommend (the company, product, or service) to a friend or colleague (East, Romaniuk, & Lomax, 2011)?

Background and Conceptual Framework

Hackman and Oldham (1976) built upon a study by Turner and Lawrence (1965) who listed a number of job attributes that were identified as having a positive effect on worker motivation. Some of these job attributes (e.g., job variety and autonomy) appeared to have a positive relationship with internal worker motivation. Based upon these concepts, Hackman and Oldham developed the original JCM.

The JCM specified five core job characteristics or dimensions that elicit positive worker motivation: (*a*) skill variety, which refers to the number of skills, tasks, and proficiencies a particular job requires; (*b*) task identity, which refers to the wholeness of a particular task that creates an output or service from start to delivery; (*c*) task significance, which represents the amount of impact a task has on others within or external to the enterprise; (*d*) task autonomy, which represents the amount of discretion workers have in determining tasks, methods, and procedures used to perform work requirements; (*e*) task feedback, which refers to the degree of direct and precise information provided to a worker about the quality of their outputs and services.

The basic JCM posits that these five job characteristics generate positive motivation in workers who manifest improved work behavior. To facilitate an understanding of relationships between the three major parts of the JCM, please refer to *Figure 1*.

Figure 1: Basic JCM Structure

Five Job Characteristics	Positive Relationship →	Personal and Work Outcomes

Skill variety — High internal work motivation

Task identity

Task significance — High-quality work performance

Task autonomy — High satisfaction with work
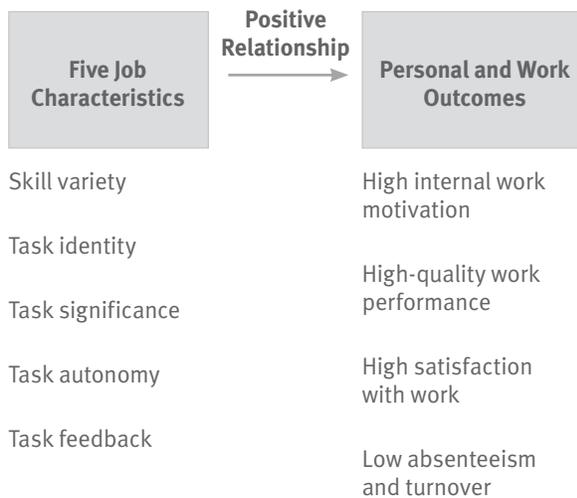
Task feedback — Low absenteeism and turnover

Figure 1. Structure of the basic JCM. Adapted from the job characteristics model in Psychology Applied to Work, by P. M. Muchinsky, 2003, p. 400. Copyright 2003 by Wadsworth

During the first 10 years of its use, hundreds of JCM job redesign studies had been published (Fried & Ferris, 1987). Although most reported significant positive relationships between job characteristics and worker performance, others did not. To support efficacy of the JCM, a number of meta-analysis projects were undertaken. The most robust in terms of the number of studies used and methods employed was by Fried and Ferris (1987), who included 200 studies in their analysis. Fried and Ferris reported that unlike prior meta-analytical studies that consisted of

narrative reviews, their study included an analysis of correlational data and reported a significant construct validity of the JCM ($p < .01$). In other words, across the included studies, a significant number reported findings that supported JCM predictions. In those studies that did not, Fried and Ferris claimed the lack of reported successful predictions was due to unsuccessful job redesign implementations. Over 20 years later, a meta-analytic study that utilized structural equation modeling on studies reported robust JCM predictions in job redesign projects (Behson, 2010). Of interest is that the majority of JCM studies used parts, but not all, of the model.

Method and Design

Study subjects consisted of 74 volunteer instructors who had taught graduate and undergraduate courses in blended as well as traditional course delivery methods (approval for the data gathering was obtained from the Provost). The 74 volunteers, a convenience sample, represented over 80% of instructors attending a private sector university faculty development event in the spring of 2012. The number of volunteers provided an acceptable sample size based upon an a priori test of hierarchical multiple regression, with two independent variables and one dependent variable. A power analysis utilizing *G*Power* (2009), based on an effect size of *1.00*, α *error probability of 0.05*, *power of .95*, $F(2, 31) = 2.15$, reported a requirement of 33 subjects.

After agreeing to join the subject pool, participants were provided a two-week period to complete an online version of the conscientiousness subscale of the BFI. Student satisfaction course scores were gathered from archival NPS reports of traditional and blended courses. Traditional course content was open to the discretion of the instructor. Curriculum guides were provided, but texts, lectures, quizzes, exercises, midterms and final exams were constructed by instructors. Blended courses included in the archival NPS data were from the initial blended learning implementation. These courses contained scripted materials needed to teach and assess students. Instructors were asked not to edit the material until they became fluent with the material and new teaching method. For this study, traditional course archived NPS scores were considered as representative of a high autonomy task environment while NPS scores from the initial blended learning courses were considered as low task autonomy scores. Access to this database was approved by the Dean of Academic Affairs. A program dean, with database access, generated reports and provided printed files of the output. Due to confidentiality issues, electronic files of the data were not generated.

Materials for this study included the database archive printed reports and the BFI scores for the 74 volunteers. John, Robins, and Pervin (2008) reported their BFI conscientiousness subscale test-retest reliability at .82. John et al. used a pair-wise convergent validity method to compare their BFI to two prominent personality inventories that included a conscientiousness subscale, the Trait Descriptive Adjectives (TDA), and the NEO Personality Inventory (NEOPI). John et al. reported pair-wise convergent validities in a range from .94 BFI-TDA to .96 BFI-NEOPI.

Archived NPS scores were obtained from hard-copy reports created from the academic database used in generating the course delivery type by instructor identifier. The NPS single question survey had been provided to students electronically at the end of each class. NPS scores ranged from −43 to 100 for each student's score per course.

Three variables were used in this study. Level of autonomy, an independent variable, was represented by two objective levels: low for blended learning and high for traditional course delivery. Conscientiousness, the second independent variable, was represented by instructor self-ratings. Student satisfaction, the dependent variable, was represented by NPS data. Validated and established survey instruments were utilized for one independent variable and the dependent variable. The other independent variable was an objective measure of task autonomy based on course delivery method. *Table 1* illustrates the variables in this study:

SPSS version 20 for Windows-based computers was employed for data analysis and reporting (IBM SPSS, 2011). The updated data set was run through SPSS (version 20) using a *2 X 2 ANOVA* analysis of data. The *2 X 2 ANOVA* fit the data and research questions well. Green and Salkind (2008) recommended the *2 X 2 ANOVA* for studies that have subjects with three scores, two factors, and a dependent variable. Subjects in this study had scores on two independent variable factors each divided into two or more variables — (a) level of conscientiousness, low 0 lower quartile of the BFI conscientiousness subscale and high 1 upper quartile of BFI; (b) objective measure for autonomy, 0 low level of autonomy for blended course delivery and 1 for traditional course delivery—and one dependent variable: student satisfaction as measured by NPS. The 2 X 2 ANOVA provided the main effects of each independent variable upon the dependent variable, as well as the interaction effect of both independent variables on the dependent variable. If main effects were discovered, follow-up tests of pair-wise comparisons would have been executed. These outputs provided the best source of information for testing the research questions.

Table 1: Variables Type and Source

Variable	Variable Type	Variable Source	Scoring Method
Instructor Conscientiousness	Categorical	Survey	Likert-type scale ranging from 1 (*very inaccurate*) to 5 (*very accurate*) two levels low for lower quartile and high for upper quartile scores
Autonomy	Categorical	Course delivery method	High 1 for traditional and low 0 for blended learning course delivery
Student Satisfaction as Measured by NPS	Ratio	Archival data	Likert-type scale ranging from 0 (*not at all likely*) to 10 (*extremely likely*) NPS is calculated by subtracting scores 0–6, from scores 9 and 10. Scores 7 and 8 are not included

Results

Statistical analyses were conducted. An alpha significance level of .05 was used for all research questions. There were 74 completed surveys. Conscientiousness scores ranged from a low of 27 to a high of 45. The mean score was 40.9. The bottom quartile of conscientiousness scores ($n = 37$) included scores no higher than 39, and the top quartile ($n = 38$) included scores with values of 45. Student satisfaction as measured by NPS ($n = 148$) ranged from −43 to 100, with a mean of 65.9 ($SD = 35.9$). This information is reported in *Table 2*.

Table 2: Descriptive Statistics for Conscientiousness and Student Satisfaction as Measured by NPS

Variables	N	M	(SD)	Min	Max
Conscientiousness (all participants)	148	40.9	(4.3)	27	45
Conscientiousness (top and bottom quartiles)	75	40.2	(6.6)	27	45
Student Satisfaction as Measured by NPS	148	65.9	(35.9)	0−15	100

Mean scores were computed for student satisfaction as measured by NPS at all levels of the categorical predictor variables (low vs. high autonomy, low vs. high conscientiousness). The minimum and maximum scores for each of the variables are reported (see *Table 3*).

Table 3: Mean Scores for Student Satisfaction as Measured by NPS by Level of Autonomy and Conscientiousness

Autonomy	Conscientiousness	N	M	SD
Low	Low	18	85.2	30.6
	High	19	58.3	42.0
	Total	37	71.4	38.9
High	Low	19	54.6	27.9
	High	18	79.1	34.2
	Total	37	66.5	33.1
Total	Low	37	69.5	32.8
	High	37	68.4	39.3
	Total	74	69.0	35.9

Tests for effects between variables statistics for the *2 X 2 ANOVA* are presented in *Table 4*. A significant interaction effect was reported $p < .01$ between autonomy and conscientiousness.

Table 4: Tests of Between-Subjects Effects Dependent Variable: Student Satisfaction as Measured by NPS

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	12648.297[a]	3	4216.099	3.613	.017	.134
Intercept	355189.099	1	355189.099	304.374	.000	.813
Autonlvl	448.481	1	448.481	.384	.537	.005
Conslvl	28.481	1	28.481	.024	.876	.000
Autonlvl *conslvl	12177.099	1	12177.099	10.435	.002	.130
Error	81686.582	70	1166.951	1166.951		
Total	446235.000	74				
Corrected Total	94334.878	73				

Note: R Squared = .134 (Adjusted R Squared = .097), autonlvl = level of autonomy, conslvl = level of conscientiousness R Squared = .134 (Adjusted R Squared = .097)

Distribution of student satisfaction as measured by NPS values appeared to be notably non-normal (see *Table 5* and *Figure 2*). When dependent variable scores are not normally distributed and their distribution is heavily skewed, the power of a *2 X 2 ANOVA* is considerably reduced (Green & Salkind, 2007). A skew value of <.05 is considered extreme (Templeton, 2011). Before the research questions could have been addressed, this statistical problem, skew value of −1.07, required resolution.

To address the non-normally distributed, highly negative skewed dependent variable, student satisfaction as measured by NPS, the Two-Step Transformation for continuous variables to normal distribution was employed (Templeton, 2011). Templeton (2011) recommended a visual test of the results of his Two-Step Transformation for normalization. If the visual test rendered the resultant distribution not sufficiently normal, a non-parametric test is recommended.

Figure 2: NPS scores
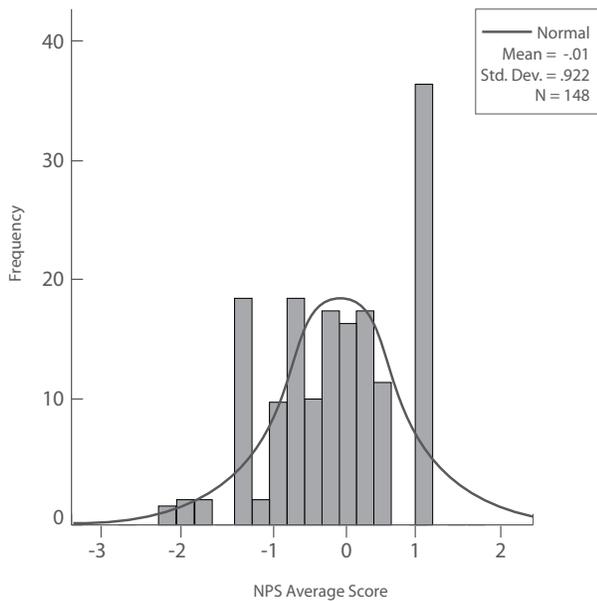
Figure 2: Histogram of average NPS scores

Because of the visually non-normal distribution of the transformed dependent variable scores, a non-parametric test was employed to respond to the research questions. When a non-parametric test is required to address research into interaction effects, a Mann-Whitney U test is recommended (Green & Salkind, 2008). A Mann-Whitney U test was executed using the non-transformed dependent variable, student satisfaction, as measured by NPS.

Results from the Mann-Whitey U test are illustrated for each research question. Subsequent to each result, the research question and related findings are presented. Results of each test are discussed in terms of the null and alternate hypotheses.

Table 5: Mann-Whitney U Test Statistics Autonomy Level to Student Satisfaction as Measured by NPS

Measure	NPS Average Score
Mann-Whitney U	2634.500
Wilcoxon W	5560.500
Z	-.392
Asymp. Sig. (2-tailed)	.695

Note: Grouping Variable: Autonomy Level 0 = Low 1 = High

For research question one, the null hypothesis was not rejected, and there was no support for the alternate hypothesis. Instructor autonomy had no significant relationship with student satisfaction as measured by NPS. The distribution of student satisfaction as measured by NPS was not significantly different in levels of autonomy Z = -.392 and p = .695 (see *Table 5*).

Table 6: Test Statistics Mann-Whitney U Test Level of Conscientiousness to Student Satisfaction as Measured by NPS

Measure	NPS Average Score
Mann-Whitney U	649.500
Wilcoxon W	1352.500
Z	-.383
Asymp. Sig. (2-tailed)	.702

Note: Grouping Variable: Conscientiousness Level 0 = Low, Level 1 = High

For research question two, the null hypothesis was not rejected, and there was no support for the alternate hypothesis. Instructor conscientiousness had no significant relationship with student satisfaction as measured by NPS. The distribution of student satisfaction as measured by NPS scores was not significantly different in levels of conscientiousness Z = -.383 and p = .702 (see *Table 6*).

Table 7: Test Statistics Mann-Whitney U Test Interaction of Autonomy Level with Conscientiousness Level to Student Satisfaction as Measured by NPS

Measure	NPS Average Score
Mann-Whitney U	543.000
Wilcoxon W	4729.000
Z	-2.270
Asymp. Sig. (2-tailed)	.023

Note: Grouping Variable: autnL_H X consL_H

For research question three, the null hypothesis was rejected, and the alternate hypothesis was supported. A significant interaction effect was reported between high and low levels of autonomy and high and low levels of conscientiousness to student satisfaction as measured by NPS Z = -2.270 and p < .05 (see *Table 7*).

Figure 3: Autonomy and Conscientiousness Interaction
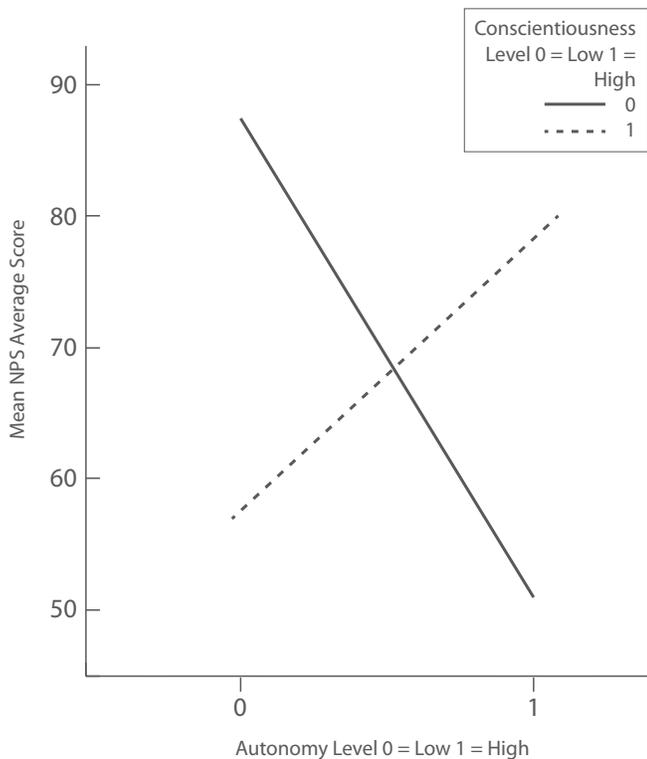
Figure 3. Multiple-line graph of interaction between autonomy and conscientiousness level and NPS.

To investigate the significant interaction effect between the two independent variables, autonomy and instructor conscientiousness, a multiple-line graph was generated (see *Figure 3*). The multiple-line graph provided a visual comparison of the two independent variables, autonomy and conscientiousness, to the dependent variable, student satisfaction as measured by NPS. The multiple-line graph illustrated that instructors low in conscientiousness perform better in low autonomy work environments, while instructors high in conscientiousness perform better in high autonomy work environments.

Discussion

Results showed a negative significant interaction effect between high and low levels of autonomy and high and low levels of conscientiousness to instructor performance Z = -2.270 and p < .05. Inconsistent results in prior studies may now be resolved by this negative interaction effect. Researchers had reported worker conscientiousness and task autonomy each had positive relationships with performance. Inconsistent results when applying a combination of both variables to predict job performance may now be explained (see *Figure 4*).

Figure 4: Significant Conscientiousness and Autonomy to NPS Interaction.
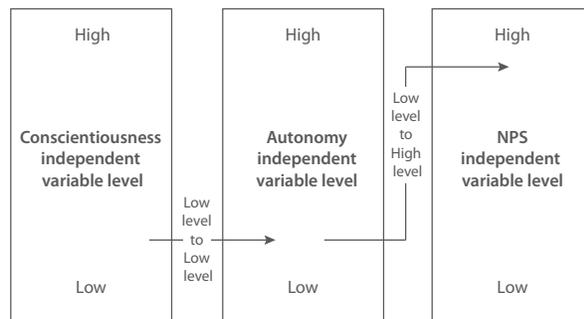
Figure 4. Significant interaction between conscientiousness and autonomy to NPS.

The unexpected non-significant interaction effect reported by Piccolo et al. (2010) were likely due to uncontrolled levels of conscientiousness in their subject populations. A similar negative interaction effect was reported by Grant (2008).

Limitations

This study may have been more robust if a psychometrically supported student survey of instructor performance had been used rather than the somewhat indirect measure, student satisfaction, as measured by NPS. The researcher originally used student survey information in a similar study and found significant interaction effects and was able to reject the null hypothesis for all research questions. Originally, the researcher was advised that the student survey had support from psychometric testing. However, it was discovered that the student survey had not been investigated for reliability or validity. For that reason, the NPS was employed in this study since archived information was available. A request to complete a psychometric evaluation of the student survey has been made and, recently, approved; once resources are obtained, a follow-up study, similar to the original, will be attempted.

It would benefit this area of research to use objective measures of work performance and worker conscientiousness rather than subjective survey measures. It would also be of interest to find a different objective measure of task autonomy as well. The blended learning environment used in this study has already evolved into a higher level of task autonomy. At the start of blended learning implementation, instructors were advised to not modify scripted online material until they became proficient it its use. Presently, instructors are able to modify portions of the course websites as well as include more of their own course material. For this reason, it was both fortunate and prudent to have used archival data, taken from the start of the blended learning implementation.

Conclusion

Discovery of a significant negative interaction effect between conscientiousness and task autonomy to performance is of importance to job redesign professionals, organization behavior professionals, and others interested in enhancing worker performance. The increase of task autonomy, by itself, does not, as a whole, predict individual worker performance. To increase prediction, worker conscientious levels should also be measured and considered in job design and redesign projects.

The extended JCM provides fertile ground for organizational behavior research after 40 successful years. As stated by Oldham and Hackman (2010), ongoing research into dispositional elements of workers and social aspects of the job environment will enable the JCM to continue its prominence in organizational behavior research. This study provided a positive step in this direction.

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The Four Es Model for Increasing the Number of Women in Computer Science

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Abstract

There is a shortage of women in computer science. An approach is needed to increase women and girls' interest in computer programming. To identify the best framework for both K-12 and higher education institutions to use to influence girls' view of Computer Science (CS), a thematic analysis of over 30 research papers and resources from the National Center for Women and Information Technology (NCWIT) website was conducted. Summarizing the different successful approaches taken by various researchers in increasing the number of girls and women studying CS and categorizing the approaches based on similar themes revealed that there are four common methods used to encourage girls to pursue CS. The Four Es model — *Expose, Encourage, Engage* and *Empower* — is derived from this analysis. The model can be used by institutions as a framework to increase women and girls' interest in studying and pursuing computer science careers.

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Keywords: STEM, girls, women, computer science, computing, gender

The decline of female engineers and computer scientists is a nationwide problem. Women account for a very small percentage of the people in the mathematical and computer science (CS) career fields (National Girls Collaborative Project [NGCP], 2011). According to the US Department of Labor, women make up 46.5% of the workforce but only 25% of the mathematical and CS jobs (as cited in NGCP, 2011). More than 60% of the 1.5 million students who reported not having computer coursework or experience were girls (National Center for Women and Information Technology [NCWIT], 2012a). Although more than half of high school Advanced Placement (AP) exam takers were female in 2011, only 19% of the students who took AP Computer Science were female (NCWIT, 2012a). Although women earn the majority of the degrees at the associate's, bachelor's, master's and doctoral level, women have consistently earned only 12-18% of CS bachelor's degrees from 2004-2013 (College Entrance Examination Board, 2004; Frieze & Quesenberry, 2013; Marklein & Marinova, 2012; Stross, 2008; Zweben, 2013). Among those women who graduate with a CS degree, 15% never take positions in the field and 20% leave the field after entering; at mid-career, 56% of women in the technology sector left, double the rate of men (Gammal & Simard, 2013).

Over three billion dollars have been used in total to improve Science, Technology, Engineering and Math (STEM) education, including computer science and computing (O'Leary, 2013). Organizations such as the National Girls Collaborative Project and Code.org list many non-profits targeted to advancing girls' interest in CS. Fidan (2011), Kurtzleben (2013), Tett (2013) and Toglia (2013) suggest that,

despite the money and the effort, women are still underrepresented in computer science and other STEM fields.

If this problem is not addressed, it hinders women's future earning potential in a technological world. In addition to hindering earning potential, without female participation in the CS industry, there is not enough diversity to generate new ideas (Drobnis, 2010). Studies have shown that those who are exposed to diverse information generate better ideas (Khanna, 2013). Diverse teams have been shown to outperform even the best individual expert (Khanna, 2013). Diversity and insight are needed in the computing industry to promote innovation, better products and business success.

Purpose

Addressing the problem of the lack of women in CS must start at our educational institutions. It is clear that higher education and K-12 institutes need to formulate and develop a framework to help change women's negative perception of CS and to help encourage and retain women with a CS major in hopes of producing more women in computing. The purpose of this report is to research and analyze methods used by researchers and universities to encourage and retain female students in their computer science programs and to compile a framework for others to follow based on that analysis.

Method

To help develop a framework for institutions to follow to recruit and retain women computer scientists, a thematic analysis of research on methods to attracting women to CS was conducted. The key steps in analyzing data in a thematic analysis involves the following: reading the data from the study, jotting down notes while reading (coding or open coding), then grouping the notes through analytical coding, categorizing the data, and sorting the data into themes (Merriam, 2009).

To complete the first step in thematic analysis, reading the data, search was carried out using Google Scholar, ERIC and ProQuest using the search terms "women in computer science" and "girls and computer science." After relevant articles were found, the reference list of each article was checked for additional studies. Articles located were included in this review if the study presented empirical data on improving girls' and women's view of computer science and how to increase women and girls in CS. In addition to the articles, related articles under the resources and tools link provided by the National Center for Women and Information Technology (NCWIT) website were read

and analyzed. In total, 31 research articles published between 1994 and 2013 were read along with 14 reports found on the NCWIT website.

The second step in thematic analysis involved creating an annotated bibliography for all of the sources read and taking notes on the successful methods used by researchers to improve perspectives and to recruit girls to CS. The third step, analytical coding, involved listing the approaches used by researchers to introduce girls to CS based on the type of approach and approach specifics. The type of approach used by each researcher was derived based on keywords identified in their research; keywords such as *encouraging, engaging, recruiting, collaborative learning, exploring, extrinsic motivation, early support, rebranding,* and *curriculum change* were identified as repeated by many researchers. Once keywords were identified, the approach specifics were listed under each keyword category. For the last step in thematic analysis, sorting the data into themes, each of the keywords identified through research were categorized into broader themes. The approach specifics were then listed under these new, more broadly-derived themes. Finally, the themes resulted in the identification of the four Es model, which is the resulting framework model derived from this literature analysis.

Results for Approaches

The results of analytic coding show various keywords for approach categories and approach specifics. The studies are arranged below based on each of these keywords: (a) encouraging, (b) engaging and extrinsic motivation, (c) recruiting, (d) exploring, (e) early support, and (f) rebranding and curriculum change.

Encouraging

Under the keyword encouraging, seven out of the various studies analyzed successfully increased women in computer science programs through providing mentors, providing counseling and guidance, having upper class women in the program provide support to freshmen women, and empowering women to believe they can succeed and make a difference in the world (Kaufman, 2013; Kurtzleben, 2013; Lin, 2013; Mbera, 2013; Tett, 2013; Thilmany, 2011; Toglia, 2013).

Engaging and Extrinsic Motivation

Under the keyword engaging and extrinsic motivation, 19 studies successfully introduced programming to girls and changed their negative perception of computing through fun activities. Some of the activities included hands-on exercises, teaching programming through designing and creating

one's own game, using real-world and motivating assignments, and relating coursework to societal issues (Koester, 2013; Kurtzleben, 2013; Lin, 2013; Mbera, 2013; NCWIT, 2011a; Rowan-Kenyon, Swan & Creager, 2012; Tett, 2013; Thilmany, 2011; Toglia, 2013). Other activities included teaching programming concepts without the use of computers, holding workshops in an all-girl classroom, providing free curricula, using LEGO bricks to teach programming, and using software such as Storytelling Alice, MOOSE Crossing, StarLogo TNG, ScriptEase, Globaloria, AgentSheets and Scratch (Drobnis, 2010; Hayes & Games, 2008; Kelleher & Pausch, 2007; NCWIT, 2007b; NCWIT, 2012b; NCWIT, 2008a; NCWIT, 2008b; NCWIT, 2005b; Peckhman, 2013; Thilmany, 2011).

Recruiting
Under the keyword recruiting, six studies approached increasing the number of undergraduate women in CS through targeted recruiting. These studies showed success when women in high schools and high school afterschool programs and clubs were targeted and actively recruited into CS programs (Kurtzleben, 2013; Lin, 2013; Mbera, 2013; Tett, 2013; Thilmany, 2011; Toglia, 2013).

Exploring
Under the keyword exploring, one study suggested looking at the décor in the classroom and keeping it neutral to make female students feel welcomed (NCWIT, 2011a). Under the keyword collaborative learning, three studies point to the success of a collaborative learning curriculum in increasing women's interest in CS. Collaborative learning includes programming through group work, pair programming assignments, and peer-led team learning (Koester, 2013; NCWIT, 2005c; Rowan-Kenyon, Swan & Creager, 2012).

Early Support
Under the keyword early support, fourteen studies found that early exposure to computing helped increase the number of women in the CS industry. These researchers suggest that early exposure is necessary in order to grow women's interest in CS. Some of the suggestions of these findings include encouraging girls to tinker at a young age, supporting girls in experience, skill and confidence, exposing girls to play computer and video games early on, and shifting their view of computer science and mathematics as being masculine (Agosto, 2002; Busch, 1995; Cherney, 2008; Cohoon & Tillberg, 2005; Damour, 2009; Denner, Werner, Bean & Campe, 2005; Gorriz & Medina, 2000; Inkpen, Upitis, Klawe, Lawry,

Anderson, Ndunda, Sedighian, Leroux & Hsu, 1994; Kurtzleben, 2013; Li, 2008; Mbera, 2013; Tett, 2013; Thilmany, 2011; Toglia, 2013).

Rebranding and Curriculum Change
Under the keyword rebranding and curriculum change, six studies suggested curriculum change to increase the number of women in the CS industry. Georgia Tech Media Computing, Carnegie Mellon University and Harvey Mudd College changed admissions requirements and introduced curriculum that taught computing in an exciting way (De Palma, 2001; Kaufman, 2013; Lagesen, 2007; Lin, 2013; NCWIT, 2005a, Sackrowitz & Parelius, 1996).

Results for Themes
Categorizing each of the approaches into related themes resulted in four broad themes that will be discussed further below:
- *Expose:* studies suggesting early exposure to computing and exposure through recruiting;
- *Encourage:* studies that suggest early encouragement and encouragement in college;
- *Engage:* studies that suggest engagement through activities, games, curriculum and collaborative learning; and
- *Empower:* studies that suggest empowering through shifting the mindset of young women and providing support and continued support.

The four themes reveal that there are four categories of methods that educational institutions can apply to increase the number of women studying CS. Ideally, the model's methods should be applied sequentially, beginning with expose, then encourage, engage and empower.

Figure 1. The Four Es Model

Figure 1. The four Es model illustrates the four broad themes identified by this thematic analysis.

Expose
Whether at college age or earlier, girls should be exposed to programming via various events and computer activities. At the K-12 level, girls should be exposed to computing via playing computer games or educational software; some recommendations are AgentSheets, Storytelling Alice, Globaloria, ScriptEase, Scratch and LEGO bricks. Universities need to actively recruit girls to their computer science

programs by reaching out to K-12 teachers, students, and high school groups such as the yearbook group or the honor society.

K-12 or higher education institutes can hold workshops and other gender-inclusive activities and events to expose girls to the world of computer programming and to reveal to them what computer programmers do. Girls should know the different computer science careers they can pursue and the financial implications of working in the CS industry. Once the girls are exposed to programming, the next step is encouragement.

Encourage

K-12 and higher education institutes can encourage girls to pursue CS careers by changing the perception of computing as being a masculine activity through shifting the mindset of young women. Educators need to encourage girls to tinker, whether on computers or other devices. Because of the stereotypical views of CS, educators should encourage girls to be confident and build their skills in computing. Female mentors are hard to find due to the lack of women in CS, so educational institutes need to find and develop mentoring and counseling programs for students by either allowing upper-level female college students to mentor freshmen, by reaching out to other non-profit organizations that provide mentors, or by hiring female computer science educators. Female students should be encouraged through a gender-inclusive college curriculum. Some suggestions include changing the admissions requirement to "no prior programming skills necessary" and making introduction to computer science a mandatory class for all majors. Once female students are encouraged to pursue computer science and programming careers, they need to be engaged in their pursuit.

Engage

Educational software, computer games, collaborative learning, fun hands-on activities, revised curriculum and workshops should be used to engage girls to pursue CS and to continue with CS. In K-12 schools, teachers should use fun gaming activities to help engage girls in computer programming. At the university level, professors should use collaborative learning and fun hands-on activities to engage their students, especially activities such as peer-led-programming, programming activities that tie in real-world problems and relate coursework to societal issues. Other suggestions include using CS Unplugged, holding all-girl programming workshops, and using resources found on the NCWIT website.

Universities and middle/high schools should not just stop there, in order to retain the girls and to keep them engaged girls need empowerment.

Empower

Schools can empower their female students and retain their numbers by building their confidence, providing continued mentoring by peers/instructors, counseling and providing an inviting physical environment. At the K-12 level, adults and teachers need to be mindful of what they say and their actions; they should refrain from adding to the stereotypical view of mathematics and computer science being masculine. Educational institutes need to provide continued peer and institutional support to their CS students. Schools should provide readily available mentoring programs, guidance and counseling to their female students to help build confidence in their computing skills. Motivational programs can support female students' belief that their computing skills are just as good as those of their male counterparts. Institutes must provide a non-threatening, inviting and inclusive environment that allows the students to program and learn coding. Women need empowerment to program and learn coding. Women need empowerment to believe that they can make a difference in the world through computer science.

Conclusion

The *Expose, Encourage, Engage* and *Empower* model will surely help institutions to approach the crisis of disproportionate numbers of women studying CS. At the K-12 level, if faculty are successful in exposing girls to computer science at a young age through tinkering, gaming, encouraging, engaging and empowering, there is a chance that more girls will move on to major in computer science. At the higher education level, if more women are exposed, encouraged, engaged and empowered to continue with their studies and to maintain their confidence as they conclude their studies and enter the workforce, then more women might join the industry and therefore change the computer science workforce.

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Paths to Closer Academia-Industry Collaboration for Career-Oriented Education

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Abstract

Literature on academia-industry collaboration has largely focused on the discussion of benefits, success/failure factors, categories, issues of quality, and models. Little effort has been given to uncover best practices to enable a closer collaboration. The purpose of this paper is to identify feasible paths, from the perspective of faculty in technology programs, and to build a closer academia-industry collaboration for career-oriented education. This paper will discuss the available opportunities for collaboration between academia and industries to (a) shorten the gap between the classroom and the workplace; (b) provide different forms of job-related training opportunities, including internship, "on-site training," co-operative education, and mentorship; and (c) prepare students for technology-intensive careers. It also discusses issues and barriers that could hinder the collaboration, doable approaches towards a closer collaboration with an attempt to improve the quality of career-oriented education, and ways in which career-oriented degree programs can benefit from collaboration.

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Keywords: Academic-industry collaboration, on-site training, internship, co-operative education, career mentorship

The purpose of career-oriented education is to equip students with knowledge and skills to obtain an entry-level position in the industry. In order to accomplish this goal, many career-oriented curricula include internship, on-site training, or co-operative education (co-op) for students to apply skills learned in the classroom to job-related work experience and to expand their knowledge of on-the-job training. Not only can such experience provide students with opportunities to practice in the discipline of their choices, but it also allows them to develop job-specific skills, explore discipline-related career options, and network with potential employers.

It is not the norm for postsecondary institutes to require students to complete an internship, on-site training, or co-operative education (co-op) prior to graduation. A survey conducted by National Association of Colleges and Employers (NACE, 2013) found that 36.8% of college seniors graduating in 2013 had never taken at least one internship, co-op, or both. In the field of technology-related majors, for example, students may obtain credit for seminars, co-ops, and internships towards a bachelor's degree in Electrical and Computer Engineering; however, no internship or co-op is required in order to graduate.

According to a report on the employees' job readiness (Hemphill, Lillevik, & Perry, 2013), there is an immediate need to bridge the skill gap between work and education, especially in the manufacturing and technology-intensive industries. Such "disparities" provide an opportunity for collaboration between academia and the industry. Therefore, researchers have begun to investigate this issue, and efforts have been made to raise its awareness (Lameman et al., 2010; McGill, 2010; Piirainen, 2010; Swain, 2009). Little effort, however, has been made to bring together

academia offering career-oriented education programs and the executives and experts from the industry to draw up a collaborative framework.

The purpose of this paper is to identify feasible paths to build a closer academia-industry collaboration for career-oriented education. This paper contains three sections: (a) opportunities are available, so are issues and barriers; (b) breaking the ice; and (c) the quest for relevance. These sections are following by a conclusion that advocates closer academic-industry collaborations.

Opportunities Are Available; So Are Issues and Barriers

Swain (2009) classifies collaboration into two types: education-oriented and research-oriented. When collaborations were formed for the sake of education, the scope was largely limited to internships (Lameman et al., 2010). The intention is to provide learning opportunities outside the classroom to qualified students. The industry does not intend to modify the curricula, not to mention improving or influencing the quality of career-oriented education. Occasionally, research-related collaborations may occur; however, these partnerships are mainly formed for short-term technology development. They are seldom established to train future practitioners or to improve career-oriented education.

Organizations, such as the Institute of Electrical and Electronics Engineers (IEEE), Association for Computing Machinery (ACM), International Game Developers Association (IGDA), and Interactive Audio Special Interest Group (IASIG), have made efforts to develop curriculum guidelines to minimize gaps between academia and the industry. However, these organizations focus more on identifying core instructional topics with little effort on facilitating academia-industry collaboration.

Academia and the career-oriented industry have different priorities (Berman, 2000; Swain, 2009). Academia typically attempts to break new ground, whereas the industry is normally concerned with profits and return on investment (ROI). Nevertheless, academia and industry can find some common ground to motivate both sides. For example, Microsoft successfully guided and sponsored academia in developing a few algorithms that are now used in the coding of several popular games. The game industry also relied on published scholarly research on artificial intelligence (AI) to code the game of checkers, which has approximately 5 × 1020 possible positions (Schaeffer et al., 2008). Nevertheless, the currently available algorithms are not capable of solving all aspects of problems of chess games for a

higher level of entertainment. On this basis, academia can continue to take the lead in technology innovation and share the research results with the industry.

Hopson (2006) and Lameman et al. (2010) noted that academia and the industry need to establish trust and understanding to build a worthwhile collaboration. Industry partners need to understand that university faculty must fulfill responsibilities, such as the teaching load, publishing requirements, and continuous contribution to the field of study. Academia, in turn, needs to appreciate how profits and ROI may affect the outcome of research in industry. Both sides must understand and appreciate how their counterpart values the collaboration; otherwise, outcomes of academic research projects often fail to translate into noticeable impacts for the industry (Greitzer, Pertuze, Calder, & Lucas, 2010). The industry often evaluates how successful a collaboration is by its return on investment (ROI). On the academia side, success is often measured by how much knowledge and technology are acquired, and how they may contribute to future research grants.

Ficocelli (2006) introduces a model to establish such a collaboration from an educational perspective. Table 1 illustrates this model, and provides a list of doable strategies and approaches to establish collaboration. For example, the industry can help faculty by delivering guest lectures, and faculty members can provide leads on collaborative research proposals.

Table 1: Ficocelli's Model of Collaboration

Industry helping faculty	Faculty helping industry
(a) Delivering guest lectures	(a) Give honest evaluation of prospective employees (the students)
(b) Hiring of industry practitioners as part time faculty (visiting fellows)	
(c) Recruitment opportunities	(b) Provide help/ feedback on problems. Smaller companies are certainly more open than larger more established companies (read as … More internal policies)
(d) Site visits (tours)	
(e) Stuednt projects	
(f) Summer jobs/internships	
(g) Collaboration on course delivery – electronic discussion groups (inlcude students and industry)	
	(c) Organize student volunteers to support companies with play testing and focus groups
(h) Support contests (best modification, artwork, animation)	
(i) Sponsoring career-related clubs	(d) Provide leads on collaborative research proposals
(j) Mentoring	

Note: Adapted from Ficocelli (2006)

Support from participants on both sides, and a strong desire to meet the collaboration objectives, also affect the outcome of collaboration. Greitzer et al. (2010) observe that a majority of industry-university collaborations do not lead to positive outcomes because the participants have different interpretations of three core factors: cost, schedule, and technology. *Figure 1* illustrates the relationship of these three core factors. Collaborations are often formed to fulfill job-related obligations, and participants on either side do not expect to have valuable outcomes; therefore, the collaboration often becomes a formality, not a reality. The result is often the publication of research papers, or commentaries, that have no significant contribution to the industry.
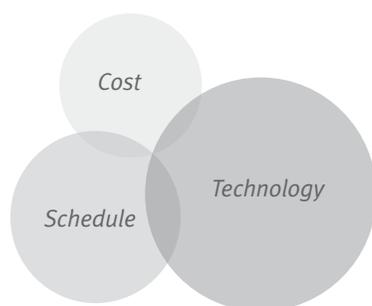
Figure 1: Success Factors

Figure 1: The size of each circle is a sample way to indicate weighting and priority of these factors. In this figure, technology has highest priority and weighting.

Greitzer et al. (2010) further identify seven key factors that can lead to the success of industry-university collaboration in the technical field from the perspective of the industry:

(a) Define project scope within the project selection process.

(b) Ensure that Project Managers (PMs) of collaboration have three core competencies: in-depth knowledge of technology, established network within company's functional and organizational units, and ability to coordinate between academia and industry.

(c) Illustrate the vision of how the collaboration can help the industry.

(d) Focus long-term investment on relationships.

(e) Build strong liaisons with academic collaborators.

(f) Encourage buy-in and support from company management.

(g) Insist that there is a champion within the company during the collaboration, and after, to nurture this relationship so that the research can be exploited.

Collaboration can be beneficial to both sides. Perkmann and Walsh (2007) find that companies can gain knowledge from universities, with respect to technology innovation, if the industry can advise the direction of the research. Swain (2009) echoes this perspective by saying that academia can develop knowledge and skills, and share its research results with the industry. Lameman et al. (2010) also suggest that partnerships between the industry and academia can provide a more career-oriented education and promote technology growth. As stated by Ficocelli (2006), "Being able to interact with game industry professionals not only motivates and excites students; it also provides them with exposure to real world issues and problems" (p. 7).

Unlike full-time faculty at many institutions, part-time instructors of career-oriented degree programs may be encouraged, but are not required, to conduct scholarly research. In reality, many schools rely largely on practitioners as adjunct faculty to deliver career-oriented education. Consequently, they have more opportunities to build an industry-sponsored education, and they should consider taking the lead to initialize the collaboration. Career-oriented schools can periodically invite professional experts from the industry to review and verify the compliance of instructional content to close expectation gaps. However, the value of adjunct faculty who are practitioners or veterans of the industry has been overlooked. With the experience and connections they have in the industry, having them teach a career-oriented course is already a form of collaboration. The collaboration can start from bringing real-world experience to the lecture and learning activities, and then expand to a departmental collaboration with a focus on imparting or acquiring job-specific knowledge and skills to prepare students for entry-level positions in the industry. As confirmed by McGill (2010), a close collaboration to this extent can ensure and improve the quality of career-oriented education.

According to Russell's (2012) report, finding qualified instructors for career-oriented curricula is a challenge, especially in disciplines where a master's degree is not generally available. Pulsipher (2010) also noticed that many practitioners do not have advanced degrees to qualify for teaching at the college level. Successful practitioners, with or without an advanced degree, probably can enjoy more competitive compensation in the industry, as shown in *Table 2*. The average annual salary of U.S. adjunct professors is $31,393, which is lower than what an entry-level information technology (IT) worker earns ($47,399) per year.

Table 2: Average Salary (IT Practitioners vs. College Professors)

Job Title	Average Salary	Job Title	Average Salary
CTO	$150,517	Professor	$85,672
IT Director	$100,860	Associate Professor	$70,002
IT Manager	$78,384	Assistant Professor	$60,375
Entry-level IT worker	$47,399	Adjunct Professor	$31, 393

Note: Adapted from PayScale.com (2014)

An education-oriented collaboration with an aim to share manpower in development of commercial applications can probably reduce the instructor shortage. For example, after completing a series of game-specific courses, the school can arrange for students to work with a team of game programmers at a local game studio to develop a commercial game in some way. The studio would be responsible for the teaching of job-specific skills, similar to the practical training model adapted by most vocational and technical colleges.

Breaking the Ice

Academia can conduct practical research needed by the industry to initiate the collaboration. Lameman et al. (2010) use "user-oriented research" as an example to depict how academic research can apply to the industry. "User information," or more precisely "player information," is now a vital component in web- or game-related development projects. Lameman et al. (2010) endorse that academia can collect, analyze, and then provide reliable data on "user information" through intensive user studies, which exhibits the value of academia-industry partnerships. In a progressive manner, collaboration can shift toward education in the various forms described in a later section of this paper.

In an effort to enhance the collaboration, the IGDA curriculum framework suggests postsecondary career-oriented programs to add industry-related components to their curricula as an initiative to invite collaboration from the industry (IGDA, 2008). The components are (a) recruit instructor with industry experience; (b) offer more courses that require team-based projects, such as a capstone course; (c) have dedicated labs and libraries for students to access hardware, software, tools, and published literature; (d) establish an advisory board consisting of local professionals, if available; (e) facilitate portfolio development for students to present their

work for employability; (f) actively seek internship opportunities with companies and community organizations; (g) encourage student-managed groups for developing job-related skills; and (h) set up a speaker program for practitioners and/or professionals to discuss technology trends.

In return, the industry can offer informal practices, such as industry-student mentorship. With the interaction and intervention, these industry professionals can become familiar with the academic side and then continue to serve on curriculum advisory boards. The collaborations can occur in four areas discussed below: (a) internships, (b) on-site training, (c) co-op education, and (d) mentorship.

Internships

Pulsipher (2010) notices that the industry seldom hires graduates straight out of college, unless they have a proven record of job-related experience. Parberry et al. (2010) also confirm that employers are attracted to students who have experience with job-related projects. Internship is an effective way for college students to obtain work-related experience.

During visits to neighboring game studios, many employers have clearly expressed to the author of this paper a willingness to hire interns, especially if the intern is willing to accept little or no monetary compensation. On the other hand, through sponsorships, Piirainen (2010) demonstrates how the sponsoring game company can obtain marketable game ideas from educational institutions. Piirainen (2010) requires each team of his students to subcontract with a game studio as their sponsor and produce a simple, but marketable, game. The completed games are sold digitally on the Internet. This approach not only facilitates the hiring of talented graduates, but also allows studios to obtain game ideas that can be commercialized by the collaboration (Swain, 2009).

Although practitioners may be involved in developing new technology, their research usually focuses on application rather than on the formation of theory. Practitioners' research usually is aimed at improving job productivity, or obtaining competitive advantage. They focus more on the development or innovation of practical knowledge and skills; therefore, they frequently develop new techniques that are not attracted to academia. Despite the fact that the game industry often demands the skills to create codes, for example, of those of widely admired games, such as Starcraft II, Red Dead Redemption, Heavy Rain, Call of Duty, or Angry Birds, it may not be possible for schools to teach programming skills at such a highly

specialized level. Students, however, may be given opportunities to learn such technologies through meaningful collaborations.

On-Site Training

A vocational and technical college is a school focusing on preparing students to enter a specific workforce upon completion of the program. Although "apprenticeships" are not commonly utilized in the United States, a form of "on-site training" (or directed studies) is generally required to fulfill the graduation requirements. For example, nursing programs must include "on-site training" in a hospital. The term "on-site training" in this paper refers to a training conducted in an external professional facility, such as a software company, while the students are attending school full time. Students will receive supervised practical training in their field of study. Unlike traditional internships, an "on-site training" is a required component of the curriculum; which allows students to earn academic credits that appear on their transcripts and are counted towards the degree (Christman, 2012). Schools offering dedicated technology degrees should consider establishing an "on-site training" program with neighboring companies.

Prior to the "on-site training," students must meet specific criteria, such as GPA, class rank (junior or senior), and have completed a set of fundamental courses in the major. The industry partner would be responsible for providing entry-level projects with scope and size that can be completed within a reasonable time frame for practical learning. The purpose is to familiarize students with the real-world work environment, and the training may serve as a precursor to professional employment. Having a practitioner as a mentor, such as the one in an apprenticeship, will encourage students to develop strong work habits, just as an employee would have. For a career-oriented curriculum, "on-site training" is a practical option to engage students in the development of career-centered knowledge and skills. Students benefit from this form of collaboration by having a real job experience and earning credit toward a degree.

Co-Operative Education

A co-operative (co-op) education is a structured learning experience that requires students to leave school for a period of time to work in a designated facility to obtain practical work experience related to their academic major and career goals. Participating students must be in good academic standing, and have completed a set of required coursework.

Students who successfully complete the full co-op program will receive academic credits and compensations.

Co-op programs are often offered by traditional four-year universities, such as Rochester Institute of Technology, Florida Institute of Technology, Georgia Institute of Technology, Drexel University, Northeastern University, and others. It is worth noticing that faculty members at traditional universities are under the pressure to conduct scholarly research and publish. Taking the publishing requirement into consideration, faculty can take the lead in establishing collaboration relationships with companies in their neighboring communities by supplying additional manpower. For example, faculty can recommend qualified students to work in the company's facility to (a) find possible solutions to a research problem, (b) perform specific tasks of on-going projects, or (c) provide entry-level service such as tech-support, for example, repairing a telecommunications system, or building a data-driven website. In the meantime, faculty may publish papers, develop instructional materials for future students, or acquire practical knowledge and skills to fulfill their job requirements as both teacher and researcher. Both academia and the industry can benefit from the collaboration once the solution is developed. As suggested by Swain (2009), this type of research-oriented and education-oriented collaboration is valuable to both academia and industry.

The only questionable issue is how to maintain a balance between the "company secrets" on the industry side and the "interest of publication" on the academia side. Many universities employ an Institutional Review Board (IRB) designed to support faculty so that their research will comply with laws, regulations, contracts, and policies. Another example is the use of a "non-disclosure agreement" (NDA) as discussed by Kumar (2006). Students who receive support from game studios to build games to fulfill the requirement of a "Capstone" course are often required to sign a NDA with the sponsor. This is a common practice currently seen in many schools.

Mentorship

The industry can identify qualified mentors to work with faculty to guide students' research in the direction the industry wants. Faculty can resume their roles in teaching theoretical topics and publishing the research results, while the industry mentors help to align the instructional content and student assignments with measurable contribution to the industry. The industry partners can provide expertise

through mentorship and supervise the development of talents of involved students to build pools of job-ready employees.

This type of collaboration can also help to close the academic instructional gap. Many career-oriented programs neglect the need to balance theoretical knowledge and practical skills. Industry professionals can identify useful topics to be discussed in a job-related course. Their input can help align the over-weighted discussion of theories to more practical topics. When the level of collaboration is raised to the review of curriculum, it can possibly shift a theory-based curriculum more towards a career-oriented one in order to prepare graduates with readily applicable skills for the industry.

In the case of game programming, a well-aligned collaboration effort may help to keep academic studies in a balance between theory and practice. Several of the greatest breakthroughs in theories, such as applying the Backtracking algorithm to 3D simulation as a path-finding algorithm, came from academic research of Computer Science (CS) scholars. They are theoretically worthwhile, but the results may not be applicable to the game industry. The main disadvantage of these theoretical algorithms is that they take a very long time to complete, which can make gameplay become slow and intolerable. The game industry is risk averse. Most small and medium-sized game studios are opposed to taking financial risks, or only willing to take small risks. They often review the breakthroughs developed at the academic sites. However, part of such a review is to verify which breakthrough is useful to the game programming industry. Zhang and Wu (2011) are CS scholars who improved upon the standard A* algorithm. The standard form of A* algorithm is one of the most widely used path-finding algorithms of artificial intelligence, and is used in the game industry. The work of Zhang and Wu (2011) effectively eliminates the detour problem often seen in the search process. As Swain (2009) advocates, having input from the game industry can make such development mutually valuable to academia and the game industry.

The Quest for Relevance

With the quest for relevance goal, instruction content designers need to be more active in their search for industry-relevant instructional content with input from the industry. Schools do not have to limit their sources within academia profession. Instructors teaching career-oriented courses should look beyond the current instructional materials and incorporate job-related content recommended by the industry for classroom use. For example, keynote technologies employed by game companies are announced each

year in the Game Developer Conference (GDC), which is a useful source to identify the current needs of developers in the game industry. Instructors can actively seek useful and industry-relevant materials and invite practitioners or industry experts as guest speakers to discuss the insights and trends of technology.

Conversely, the industry can identify their needs of technology and invite academia to collaboratively develop solutions. For example, the following critical issues listed by Bostan (2009) are commonly seen in the role playing games (RPGs):

(a) Responsiveness: The ability of to minimize the response time a user's input.

(b) Stability: The absence of jitter and oscillation movements in the position of objects.

(c) Robustness: The ability to tolerate variations caused by environmental conditions.

(d) Calibration: The user can implement I/O devices based on individual physical characteristics to improve ergonomics.

(e) Customization: The user can make modification based on their preferences for a more personalized and satisfactory system configuration.

These issues are seemingly hardware-dependent. Both academia and the game industry can collaboratively revolutionize the technologies. Game instructors can discuss these issues in the classroom, and encourage students to brainstorm solutions. Research-oriented faculty can take the lead in developing solutions and transfer the innovated technologies to interested game studios.

Frequently, the instructional contents of job-related courses are designed with limited collaboration and support of the industry, resulting in misalignment with the needs of the industry. With this premise, collaboration must have clear and achievable objective with an attempt to reduce this disparity.

Both faculty and students should frequently attend professional conferences and industry-led workshops to gain insights on the latest technologies. Instructors can assign research papers to students, review papers of technology, or papers of case study based on these new innovations to engage students in active learning; therefore, they can be informed about the technology trends.

Academia ought to appreciate how these innovations enable students to learn readily applicable skills and how they can engage the creativity with the learning of such novel game technologies. It is important for

students to be informed of these achievements as they can also attempt to develop new know-hows applicable to other areas of technology.

It is inspiring to have a speaker program that includes inviting practitioners and/or game professionals to discuss the technology trends (IGDA, 2008). Career-oriented schools need to invite guest speakers to discuss their experiences and how they relate to new technologies in the industry. If physically hosting a guest speaker is not an option, a feasible option is to host a web-based seminar or webinar offered through a variety of tools available on the Internet.

In the case of game programming, instructors of an upper-level or advanced job-related course can consider discussing some of the new, open source, royalty-free technologies and encourage students to develop game codes leading them in the direction of innovating these technologies. Catto's Box2D engine, for example, lends itself to the development of a more robust algorithm for improved performance of the widely used Bounding Volume Hierarchies for collision detection as described by Vogiannou, Moustakas, Tzovaras, and Strintzis (2010). Academia can support the development of Box2D for JavaScript. JavaScript is an open source scripting language which can be used to teach basic game programming (Wu, 2009). Currently, this version of Box2D does not have an efficient lazy-loading system, and this deficiency causes slowness of the execution of JavaScript code that calls the Box2D libraries.

Conclusion

Paths to closer academia-industry collaboration for career-oriented education include internships, on-site trainings, co-operative educations, and mentorships. Informal collaboration; such as research partnerships, guest speaker programs, and advice on instructional content as well as assistance, review, and verification of curriculum development are also feasible initiatives. This is because the most important success factor is the motivation for both academia and industry to break the ice in the quest for relevance.

Establishing collaborative relationships with the industry is a time-consuming and challenging task for some institutions to achieve. However, it has proven to be a useful approach to engage students in the development of career-centered knowledge and skills. Obtaining input from industry is one effective way to keep academic research grounded in reality. It is mutually beneficial for both sides of academia, and the industry, to establish collaboration if both sides are willing to reach a consensus and understand each other's needs.

Only when students have the opportunity to apply what they learn in class to the real world, while still pursuing degrees, will they be more competitive in gaining entry to the career of their choice. It is necessary for career-oriented education to take action to choose one or more of the paths discussed in this paper to build closer academic-industry collaborations.

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Revisiting Memoir as Historical Record: New Historicism and Cultural Studies in *This Boy's Life* and *Hunger of Memory*

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Abstract

This research explores the ways memoir provides a historical record when viewed through the lens of New Historicism and Cultural Studies. This paper reviews memoir within the Creative Nonfiction (CNF) genre; the theories of New Historicism and Cultural Studies, and their connection to Postmodernism; the notion of truth and the ways it has changed since the mid-nineteenth century; and the ways an author establishes trust with the reader. It examines the historical record provided by two memoirs: *This Boy's Life* by Tobias Wolff and *Hunger of Memory* by Richard Rodriguez. Wolff compares one boy's life to the general idea of what life was like for boys growing up in 1950s America. Rodriguez provides the history of a Mexican American boy's quest for education and the price of that education. Finally, this article discusses the need for the alternate history provided by memoir and other works of creative nonfiction.

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Keywords: creative nonfiction, memoir, New Historicism, Cultural Studies, Postmodernism, Tobias Wolff, Richard Rodriguez

Nearly 50 years ago, memoir found new acceptance within the Creative Nonfiction genre. Originally, these stories were eagerly received as a vehicle that gave a voice to women, minorities, and everyday people — those who did not have a voice before that time. Nearly 30 years ago, New Historicism redefined literature to include "popular, mass, and minority genres as well as elite canonical works" (Leitch, 2010a, p. 30), and it gave us new questions to put to this literature. These events helped validate memoir's historical value.

With New Historicism and Cultural Studies, we were able to mine these stories for what they could tell us about history and culture. However, many critics were suspicious of the author's ability and willingness to tell the truth. As educators, we are still asking the question: Is the author telling the truth? We must move beyond that attitude and revisit memoir. We need to assume the truth, recognizing its limitations, and ask instead: What is the value of this literature as a historical account? We need to determine how we can use memoir to teach our students about the ways writing and other arts are a product of the culture in which they were created.

Memoir, when viewed through the theoretical lens of New Historicism and Cultural Studies, provides a historical record, a unique view of history and culture during the time period covered in the text. I will illustrate the process using two works of creative nonfiction, both memoirs: *This Boy's Life: A Memoir* by Tobias Wolff, and *Hunger of Memory: The Education of Richard Rodriguez* by Richard Rodriguez. Although the application of New Historicism and Cultural Studies could glean historical facts from any writing, including fiction, it is more suited to the creative nonfiction (CNF) genre, especially memoir which, like

most creative nonfiction, is subjectively written and, therefore, focuses on the author's view of the world in which he lives.

The application of theory validates the text as a historical document and enhances the reader's or critic's knowledge of history by providing an alternate perspective to compare to both recorded history and others' perspectives. In order for the text to be validated, it has to be accepted as truth, a somewhat complicated process that will be addressed in this paper. It is difficult to see the connection without examining the theory, the CNF genre, and, as previously mentioned, the notion of truth, both societal and within creative nonfiction.

Theory: New Historicism and Cultural Studies

New Historicism and Cultural Studies asks the question: What social and cultural influences are present in a piece of writing? It is the study of "literary texts not as autonomous objects but as material artifacts made in interaction with specific social, cultural, and political forces" (Leitch, 2010a, p. 30). The critic looks for history in literature, expanded to include "popular, mass, and minority genres as well as elite canonical works" (Leitch, 2010a, p. 30). Literature now included "long-lost literary works by women, people of color, and queers. . . [history] written from the margins. . . . Such works often produce counterhistories set against weighty mainstream traditions and accounts. This is history with a critical edge" (Leitch, 2010a, p. 29).

Postmodernist theories, which preceded New Historicism and Cultural Studies, had as a common thread the rejection of what French philosopher and theorist Jean-Francois Lyotard (1986) called the grand narrative, or metanarrative. Instead it looked to "the plurality of ways in which humans choose to live" (p. 1463). Postmodernism reflected society's rejection of the grand narrative. It would be replaced by local accounts, what Postmodernists called *petite histoire*.

The new theory was validated by the academy. In a 1980 speech, then Modern Language Association (MLA) president Helen Vendler "concedes that 'a piece of literature yields different insights depending on the questions put to it'" (as cited in Graff, 1987, p. 255). Critic Ross Chambers supports Vendler's statement. He "argues that 'meaning is not inherent in discourse and its structures, but contextual, a function of the pragmatic situation in which the discourse occurs. . . . Narrative mediates human relationships and derives its meaning from them'" (as cited in Graff, 1987, pp. 256-57).

Historian Hayden White (1973) says that "there can be no proper history" (pp. xi, xii). He describes history as remaining "prey to the creation of mutually exclusive, though equally legitimate, interpretations of the same set of historical events" (p. 438). Memoir provides these "mutually exclusive" accounts. White (1978) says that literature cannot separate itself from the things that created it. Analyzing literature within its historical context allows for a more specific history: "The more we know about the past, the more difficult it is to generalize about it" (p. 1543). We see this specificity in memoir.

Memoir in the Creative Nonfiction Genre

Although the focus of this paper is on memoir, the creative nonfiction genre distinction, which includes many types of writing, is relatively new — its beginnings have been identified as 1965 — and often misunderstood, even among academicians. Writer Barbara Lounsberry (1990) describes the types of work that make up creative nonfiction: "Compelling prose narratives are artful memoirs, autobiographies, biographies, histories, travelogues, essays, works of journalism, forms of nature and science writing, and ingenious combinations of these forms" (p. 11).

Memoirs have been written since the beginning of recorded history, but with the recognition of the CNF genre in the mid-twentieth century, memoir was considered different from autobiography, which chronicled a life. Memoir tells stories — a collection of memories — from the author's life based on the author's unique experiences and perceptions. Creative nonfiction defies definition because of its many forms — creative seems to be synonymous with fiction — but they have one thing in common: The author is intent on revealing the truth as he or she sees it and telling it in a creative way.

The Notion of Truth

Truth in memoir is vital, but what is the nature of truth? The concept of truth was redefined by philosopher Friedrich Nietzsche in his late-nineteenth century writing. In an introduction to Nietzsche's writings, Leitch (2010b) says that historically, "Western philosophy was committed to ascertaining the fixed and solid truth" (p. 760). Nietzsche's (1979) views suggest a search for truths — plural — rather than one Truth with a capital "T," saying that "we can [n] ever know anything except through the lens of human perception" (p. 80). We find this human perception in memoir.

White (1973) discusses Nietzsche's contribution to New Historicism and Cultural Studies: "Nietzsche marked a turning point [when] he rejected the . . . historical analysis historians had used since the 1830s and denied the reality of any such thing as a [single] historical process" (p. 331). The upheaval in society — against authority, against government, against established societal values, against religion — that accompanied Postmodernism rejected Truth and demanded truths from different voices.

In creative nonfiction the author convinces the reader of a desire and ability to tell the truth. In order for the memoir to be accepted as history, readers must believe that the author is telling a true story. Gerard (1996) examines limits to the writer's ability to tell the truth:

> No matter how clear-cut or simple the events we're trying to relate, the minute we open our mouth or take up our pen we are delivering fiction. We misremember. We inadvertently change what somebody actually said. . . . And what's left . . . can change the story of what happened. . . . We are limited. (p. 4)

The ability to relate the truth has shortcomings, and the presentation of fact will be colored by the writer's interpretation of it. In New Historicism and Cultural Studies, this perspective is a key element to providing one view of history. The creative nonfiction writer, then, assures the reader of a determination to tell the truth. The story will be as true as he or she can make it. Writers must be honest about their abilities and shortcomings.

There are several methods that the creative nonfiction author uses to create trust, from setting out the author's limitations as an introduction to the book (a contract with the reader), to a willingness to share intimate parts of the writer's life. One technique often used by authors of childhood memoir is to exclude the author's adult perspective. When writing about childhood, or any previous experiences, the writer must stick to what she knew at the time or identify her adult perspective, if and when it appears. There are many different versions of the truth. Zinsser (1987) discusses this phenomenon: "I was also struck by the fact that memory, one of the most powerful writers' tools, is one of the most unreliable." He says, about his reading of a memoir by another author: "How much of that drama was artifice? I only know that it felt true" (p. 25). It is the essence of truth that convinces the reader. The very thing that makes something feel true to a reader is often the reader's ability to recognize or identify in some way with the experience.

The discussion below begins with a brief review of each text; then a look at how the reader is assured of the author's intention to record his personal history and, more specifically, record it truthfully. Application of these inquiries will show the value of these texts as historical records.

Wolff's *This Boy's Life*

Tobias Wolff's *This Boy's Life: A Memoir* begins in 1955. Ten-year-old Toby and his mother Rosemary have left Florida. They are heading west to make their fortune in Utah's uranium fields. Toby's father has abandoned Toby, and he doesn't reappear until near the end of the book. Toby and his mother run into failure after failure as she goes from job to job and fends off one undesirable boyfriend after another. They end up in Seattle, where Rosemary marries Dwight, trying desperately to convince Toby (and herself) that Dwight is "not that bad" (Wolff, 1989, p. 64).

Dwight is a controlling man who drinks too much. With Toby's father far away, and his mother trying hard to deal with her own problems with Dwight, Toby learns to rely on himself. He becomes manipulative and deceptive in order to survive Dwight's reign of terror. Toby eventually escapes his life with his mother and Dwight, when Rosemary arranges for Toby to live with a friend's family and, later, with his father. As the book ends, the reader sees Toby with "a sense of relief and homecoming," going to the army (Wolff, 1989, p. 286).

Wolff makes several choices that show his intention to give an honest, subjective account. The first is a word to the reader:

> I would . . . like to thank Rosemary Hutchins [his mother] for [her] help and support. I have been corrected on some points, mostly of chronology. I've allowed some of these points to stand, because this is a book of memory, and memory has its own story to tell. But I have done my best to make it tell a truthful story. My first stepfather used to say that what I didn't know would fill a book. Well, here it is. (Wolff, 1989, inside cover)

In his own version of a reader-writer contract, Wolff communicates with the reader, listing his limitations as an assurance that he has told a truthful story.

In writing his memoir, Wolff recognizes the need to eliminate the adult perspective as much as possible. In an interview, Wolff says:

> [The adult perspective] gives too much solace to the reader. The boy doesn't know there's going to be [a] bridge [to adulthood]. The boy lives this life ignorant of what is going to happen to him later — as we all do. . . . It would compromise the integrity of his experience, to come in with a comforting adult voice. (Lyons & Oliver, 1990, p. 3)

The commitment to eliminate the adult perspective is not readily apparent to the reader, but it makes a difference in telling a more authentic story.

Wolff presents recognizable people and situations with which the reader can identify, yet his story is different from mainstream culture. One big difference, for example, is his parents' divorce. Only 11% of children in the 1950s had divorced parents (Wilcox, 2009). Another indicator of this difference is the title of his book. In an interview, Wolff was asked if the title alluded to *Boys' Life*, a popular magazine of the era. He responds: "Exactly. I meant to suggest an ironic discrepancy between the ideal boyhood portrayed in the magazine and my own experience" (Lyons & Oliver, 1990, p. 6). Many people who are familiar with this magazine, and others like it, will identify with Wolff's allusion to the magazine in his title. Due to Wolff's honest recollection of his life, readers can find comfort in knowing that someone else's life wasn't as idyllic as this and other magazines made it look. In sharing the intimate details of one's life, the writer of memoir is able to connect with the reader. Wolff's reader joins him in his recollection and gets to know his complex history.

The magazine *Boys' Life* portrayed an idyllic, if often unrealistic, lifestyle. The covers in 1960 featured boys having adventures in far-off lands, involved in patriotic activities or providing service, as part of a large family group, or standing next to a young lady and looking confused and a little shy (*Boys' Life* "Archives," 1960). The magazine advertised sports equipment and camping equipment that, presumably, would be used with these friends and family. It is easy to see how this magazine did not fit with what Wolff's life was like.

Stephanie Coontz, a historian who has written extensively about the American family, discusses the ways television, in particular, did not realistically portray a typical American lifestyle. Coontz (1999) cites shows like *Leave It to Beaver* which "did not reflect the real-life experience of most American families. While many moved into the middle class during the 1950s, poverty remained more widespread

than in the worst of our last three recessions" (para. 6). In addition, this show featured a nuclear family which included an older brother. In Wolff's case, his older brother lived with their father, who has consciously abandoned any responsibility toward Toby. This caused a further disparity between what life should be and what it was for a boy like Toby. There is little difference between a true and a false portrayal by the media. It was easier to accept the disparity than doubt its source.

Critics often question the veracity of the authors of memoir. In the following article, the author quotes Wolff as he talks about a writer's responsibility to reveal truth. In every good writer, there must be a "willingness to say that unspeakable thing which everyone else in the house is too coy, or too frightened, or too polite to say" (Davis, 1994, p. 31).

Wolff presents his readers with a compelling narrative. Readers may see reflections of their own lives, but the story is uniquely Wolff's. He lets his reader "live" the story with him. Wolff had a difficult childhood, which he survived largely due to his own cunning and the lessons he learned from his mother. The reader is left with a history of what life was like for one boy growing up in the 1950s and 1960s. When this story is compared to history presented by publications like *Boys' Life*, by television, and by other memoirs, it contributes to a plurality of narratives that yield an expanded view of history.

Rodriguez's *Hunger of Memory*

Richard Rodriguez's *Hunger of Memory: The Education of Richard Rodriguez* tells the story of Rodriguez's family background, his quest for education and the English language, and how living in the outside world left him alienated from his family and his culture. As Rodriguez's education progresses, he finds himself embarrassed by his parents, their broken English and their lack of education, and increasingly unable to identify with his family. By the time he completes his studies and earns a PhD, the separation is complete and irreversible.

In order to show the reader what he has lost, Rodriguez has to show the reader what he had. He reveals his culture — the safety and sense of family and extended family — and some of its disadvantages. For example, the Mexican American view on skin color — lighter is better — and the subtle prejudice he faces within his Mexican American community because he has dark skin.

In the mid-1970s, as a beneficiary of affirmative action Rodriguez is offered a job, based largely on his minority status, and he wrestles with the decision

to accept it or not. He turns down the prestigious teaching jobs that he did not earn on his own merit and leaves the field of education altogether. His account ends with his becoming a writer and, through his writing, further exploring the relationship between education and separation from one's native culture.

Rodriguez's story conveys a clear aura of truth. Rodriguez invites the reader to witness his journey of education and his alienation from his family and culture. Through his honesty, his refusal to hide from the reader, Rodriguez convinces the reader of his desire to examine the truth. His willingness to reveal himself gives him credibility in telling an authentic story that explores the author and his culture, although he faces critics from his own culture who doubt his veracity.

Vallejos (1983) does not think Rodriguez accurately portrays the Chicano man. Vallejos says that *Hunger of Memory* tells the story of Rodriguez's failure to complete a rite of passage that is common among Chicano men: separation, transition, and reintegration. Vallejos (1983) criticizes Rodriguez for not completing the rite-of-passage "by rediscovering the traditions preserved by [his] family and community... and depicting the richness of Chicano culture" (p. 14). This very criticism indicates that Rodriguez is telling only his own story. If Rodriguez had intended to write a story that followed the traditional rites-of-passage, he could have chosen fiction as the vehicle for his story. He chose, rather, to give an honest account of his life that does not fit into the expected patterns that minority men are said to follow. In fact, a large part of the story deals with Rodriguez's facing the alienation he feels because he did not complete such a rite-of-passage.

Rivera (1984) also criticizes Rodriguez's work: "Throughout the text. . . . Rodriguez implies . . . that authenticity can only come by being an exterior being in the English speaking world. . . . [But] it is possible to participate in many worlds . . . gaining perception and appreciation from all" (pp. 6, 7, 8). Perhaps for Rivera, it is possible to participate in many worlds, but Rodriguez tells us: "I write of one life only. My own. If my story is true, I trust it will resonate with significance for other lives" (Rodriguez, 1982, p. 7). These criticisms indicate that Rodriguez's genre has not been understood: A writer telling a true story does not have an obligation to tailor that story to the expectations of others, inside or outside of his culture, or to follow a cultural paradigm.

Another journalist who interviewed Rodriguez compares his own experiences with Rodriguez's:

Rodriguez and I [came]...from working class backgrounds: we grew up bicultural, came of age in the sixties, and benefited from post-civil rights opportunities, studying to the doctoral level. . . . His story of being caught between cultures could have come out of my own mouth if not for the way he chose to tell it, making of the distance between Anglo and Hispanic a rhetorical Atlantic that he crossed to reach Americanization. (Marzan, 2003, p. 46)

Richard Rodriguez perceived his experiences differently from the way others did, and there weren't many others to share his experience. Data available from 1974 (data on Hispanics was not available before then) shows that fewer than 10% of Hispanics completed four or more years of college (U.S. Census 2008, 2008).

The three critics cited above do more than validate Rodriguez's intention to tell his own story; they also verify the history Rodriguez gives us about his culture. This group of men all came of age in the 1950s and the1960s. Vallejos, Rivera, and Marzan do not find fault with Rodriguez's portrayal of the Mexican American lifestyle. There is an implicit agreement with his narrative of what it was like to grow up in this culture, even though they grew up in different parts of the country, and Rivera is Puerto Rican rather than Mexican American. In spite of their differences, they have much in common. Marzan (2003) even claims that their stories could be interchangeable except for their perception of the alienation he and Rodriguez each felt. Vallejos (1983) ends his analysis of Rodriguez's work and several other works of Chicano literature by highlighting this very point: "Novels . . . document the Chicano's marginal existence . . . [and] celebrate the ritual of Chicano living, which is firmly rooted in a longstanding tradition and nurtured within the Chicano family and community" (p. 15).

Rodriguez succeeds at not only revealing his culture, but providing an alternate perspective that is uniquely his own. When his story is compared to others, both in and outside of his culture, it rings true and offers what the author intended: a history.

Conclusion

Memoir yields history when examined through the lens of New Historicism and Cultural Studies. Both Wolff's and Rodriguez's memoirs are examples of this process: The authors established that they were telling a true story, both through their own words and through the words of their critics. Memoir gives these authors a voice, and it gives readers a history, one perspective. The value of these texts is seen when they are compared with other memoirs of their time

and with recorded history. As educators, we can use memoir to show our students the ways history evolves with each new account, how literature influences — and is influenced by — society. The social upheaval of the 1960s demanded a wider view of history, and it was told through stories. Those stories and the ones that continue to be written today contribute to a plurality of views that are part of our history.

History professor Kathryn Nasstrom offers a unique insight about the historical value of memoir. She is writing about people who lived through the Civil Rights Movement, but her insights can be applied to any memoir. Nasstrom (2008) encourages others to "tell their [own] stories before all we have left is history" (p. 326). She continues: "Autobiographies of the [civil rights] movement" are a "dialogue with history . . . but those produced in the last twenty years took shape in a particular cultural context" (p. 328). Nasstrom's words illustrate my point: The powers that influence recorded history do not give this alternate view. We need to hear history from authentic voices.

Nietzsche (1979) summed the process up when he said that we cannot "know anything except through the lens of human perception" (p. 80), but Nasstrom's (2008) point describes the importance of memoir: Without other accounts to challenge it, to question it, to compare it with, "all we have left is history" (p. 326).

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Communicating in Different Languages: Teaching Millennial and Generation Y Students in Online Environments

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Abstract

This paper explores the body of knowledge on generational learning and shows implications on how the generational differences between an educator and his or her students may affect learning outcomes. Attention is given to the online learning environment because the absence of face-to-face instruction further compounds the educator's ability to connect with students. The current student population consists of a mix of the Silent Generation, Boomers, Generation X, and Generation Y (Millennial) students. Although all considered adult learners, each group has varying needs and preferences regarding the approach to learning and what constitutes an optimal learning environment. Therefore, educators can be prepared to compensate effectively for the different learning styles characterized by the Learning Paradigm of the generations represented in the classroom. Previous literature and best practices have often focused on the Instruction Paradigm and this paper discusses the need for additional research into the Learning Paradigm to measure how integrated learning techniques affect learning outcomes for generations of learners — namely, the Millennial Learners.

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One of the challenges in online teaching in any academic environment is the lack of face-to-face (F2F) contact. The educator misses the stimulation of visual cues and body language that provides so much important feedback. Another challenge is that the students may come from a generation with different characteristics than the significant majority of the faculty. Although there are adaptations to the online teaching process that can partially compensate for the lack of F2F experience (Skype, instant messaging, world-wide telephonic contact, threaded discussions, multi-model presentations, etc.), which of the faculty is familiar with the generational differences that underpin the entire teaching and learning paradigms? To understand this dichotomy, it may be valuable to review the faculty and student populations and examine the unique characteristics of each generation. Then, it may be possible to coordinate better the Instruction Paradigm with the Learning Paradigm.

The Two Paradigms and Adult Learning Theory

Barr and Tagg (1995) identified two co-existing paradigms — the Instruction Paradigm and the Learning Paradigm. The Instruction Paradigm focuses on how to provide or deliver instruction — it is transferring knowledge from the instructor to the student in a linear fashion. The Instruction Paradigm conforms to the visible/formal features inherent to a paradigm; they include "processes, roles, tools, etc." (Kurkela, 2011, p. 15). The Learning Paradigm conforms to the invisible/informal features of a paradigm — "customs, values, taboos, stereotypes, traditions, etc." (Kurkela, 2011, p. 15). The Learning

Paradigm is mostly concerned with the production of learning. It closely examines the individual, collective, and environmental factors inherent to learning processes.

Knowles (1973) was among the first researchers to differentiate the manner individuals learn, beginning with childhood and into adulthood. Knowles wrote specifically about the following four assumptions based on how individuals mature: how the self-concept changes, the value of lived experience, an individual's preparedness to learn, and the orientation to learning. Andragogy, the adult learning theory, and subsequent iterations to the body of knowledge, are applicable to all adult learners.

With an understanding that adult learners are more task-oriented and goal-oriented (Kenner & Weinerman, 2011), educators must use instructional strategies that present content in a relevant manner. Having an overall acceptance that many adult learners are intrinsically motivated (Mirci & Hensley, 2010), the Instruction Paradigm has become a generic replication from university to university and classroom to classroom. The manner in which educators are teaching adult learners has barely evolved because of less research into the more relevant adult Learning Paradigm. The Learning Paradigm identifies generational differences as the set of mitigating variables to overall learning outcomes in a multi-generational classroom.

Generational differences are a well-researched subject. Groups of individuals are bound by shared experiences. The generational differences are traditionally explored using the context of organizational behavior and other psychological states affecting one's view of the world. The cohorts are connected by age, maturation, and/or other developmental factors and professional societies such as the Society of Human Resource Management (SHRM) have conducted surveys related to best practices for working with multiple generations (Costanza, Badger, Fraser, Severt, & Gade, 2012).

Generations Defined

Meade (1942; 1954) established the concept of using dates and timeframes to define generations of people. Halse and Mallinson's (2009) construct for defining generations is as follows:

> [T]he state of the world at a particular time in history leads to certain commonalities in the global environment and in the experiences people have in this context, particularly in early life and adolescence, which affects their attitudes, expectations, and values as adults. (p. 1)

Attitudes toward and expectations of learning are inherent to the generation in which one belongs. Igaray and Maccracken (2011) referred to generations as "cultural lenses" (p. 11). Although the birth years may vary by a year or two dependent on the demographer and some overlapping characteristics, there are distinctive values and preferences from generation to generation.

The relevant generations for this discussion involve the Silent Generation (to a much lesser degree), the Boomer Generation, Generation X, and the complex Generation Y/Millennial Generation. Although some sociologists and anthropologists differ slightly on the very specific generational delineators, the following explanation is a reasonable overview of the guidelines, values, and characteristics of each group.

The Silent Generation accounts for individuals born between 1923 and 1942. Because of age, there has been a migration away from the workplace. They have more traditional values (Timmerman, 2007). The characteristics of this population include seeking achievement, status, and power. This generation is very patriotic; they trust the American government possibly because they came of age during World War II (Trinity University, 2010).

Boomers, also referred to as Baby Boomers, consist of individuals born between 1943 and 1962. The literature on this generation is divided between those born in the earlier years and the latter years. The change is due to the subsequent economic downturn and changes in the nuclear family — mother working outside the home and the sexual revolution (Timmerman, 2007). As a whole, this generation values change, competition, success, and teamwork. As employees, they tend to be individualistic and perfectionists.

Generation X, individuals born between 1963 and 1983, value entrepreneurship and are loyal, independent, and creative. They are highly adaptive and value quality of work life. Generations X individuals tend to work hard to have more time to balance work and life responsibilities while Baby Boomers work hard for promotion; Generation X individuals tend have a more negative view of the economy due, in part, to having to compete with Boomers for jobs upon graduation (Minifie, Middlebrook, & Otto, 2011). Timmerman (2007) referred to this generation as the "ultimate pragmatists" (p. 27).

Generation Y, often called Millennials, were born in 1984 and thereafter. This generation thrives in environments that allow autonomy and where there is

positive reinforcement. Their social values are similar to their parents but their worldview is quite different (Timmerman, 2007). They value technology as a tool for multi-tasking (Thaler, 2013).

Purpose

It is important to understand how the values and worldviews of the generations translate inside a classroom environment. It is of equal importance to understand how the generational difference between the educator and the students affects learning. The following sections are discussed below: (a) generational learning, (b) generational teaching, and then followed by (c) implications for teaching and learning.

Generational Learning

Schullerly (2013) acknowledged the challenges of working with multiple generations in the same environment as employer to employee and educator to student. The most common opportunities for teaching and learning style conflict and misunderstandings come from generational differences. Many faculty and staff are exclusively Boomer and Generation X members. The students are disproportionately Generation Y members. In this scenario, educators must address how they are optimizing the integration of the teaching and learning processes within multi-generational classrooms.

The Generation Y/Millennial learning group is the most racially diverse and technologically inclined generation in North American history (Kruisselbrink-Flatt, 2013). There has been some research in working with the Millennial Learners regarding how best to manage and lead these individuals and appeal to their unique, specific generational characteristics. Having Millennial Learners work in teams and incorporate the use of technology (i.e. computers, cell phones) into the classroom are practices that are reinforced by Stapleton, Wen, Starrett, and Kilburn's (2007) research into how Generation Y/Millennials are captivated by new technology. Their dissatisfaction in the online environment has been attributed to the instructor's not meeting expectations of more collaborative work.

To address their characteristics of the Millennial Learners in the education environment, Kandlbinder (2010) explained how Millennial Learners tend to be positive, confident, and self-focused. He suggested the use of teaching strategies to enhance the Learning Paradigm. Those strategies included showing students how course content makes a positive impact on the world, the use of multiple activities inside the classroom environment (online or face-to-face)

specifically addressing a Millennial Learner's ability to multi-task, and offering rewards and recognition. This generation's attraction to video games is associated with clearly defined goals and incremental rewards (Crappell, 2012).

Per Stapleton et al. (2007), Millennial Learners have high expectations of the technology for the online component of their courses. The learning system must be available all of the time and it must operate effectively. Although hesitant to initiate communication, this generation of students expects constant, meaningful communication with the instructor and collaboration with other students. Because they did not grow up under the traditional confines of an 8am–5pm world, they have trouble with schedules and due dates that force them to operate within certain boundaries.

Thaler (2013) observed that Millennial Learners, being accustomed to using quick Internet search engines, "expect the research process to be fast, painless, and relatively free of complications" (p. 271). As such, these learners are oriented toward the process of inductive discovery and observing (Wessels & Steenkamp, 2009). Whereas Generation X students are more self-directed and self-reliant, Millennial Learners prefer collaboration (Bowen, et al., 2011; Minifie et al., 2011). To Millennial Learners, learning is a social activity (Stapleton et al., 2007).

To enhance the effectiveness of learning outcomes in the Learning Paradigm, faculty members must adapt their instructional styles to be more compatible with the Millennial's learning styles. Thus, to apply this Learning Paradigm, where the focus is more on student learning than faculty instruction, there have to be some adaptations to account for learning style differences. Educators must learn how the current college students learn and which teaching methodologies will be most effective.

Generational Teaching

An important area for analysis is learning how faculty from different generations can adapt their instructional styles to encourage the most effective learning by multiple generations of students — mostly Millennial Learners. Educators divide the teaching process into two paradigms — the Teaching Paradigm and the Learning Paradigm. The traditional teaching or Instruction Paradigm consists mostly of one-directional lectures accompanied by tests that only assess the level in which learners memorize concepts. Barr and Tagg (1995) indicated that educators are liberated from difficult constraints when they shift to the Learning Paradigm, which allows them to adapt a multitude of practices to effect learning at

the individual level. However, it is still unclear as to whether faculty, who have started using active learning techniques, are using techniques that are conducive to learning for the current generation of students (Minifie et al., 2011).

In the online academic environment, it is also important to understand whether any unique adaptations apply to the online teaching environment. Howles and Jeong (2009) expressed the problem as being the educators' inability to observe students' responses and interactions using different instructional approaches. The challenge to both novice and experienced educators is identifying the techniques that create positive learning outcomes. The students achieve the learning objectives in a manner in which they retain the information. Learners, being multi-modal, can learn from content presented in different formats (Howles & Jeong, 2009). They further discussed cognitive and personality-based learning styles, which they view as particularly relevant to online learning methodologies. Their conclusion offers a more constructive approach centering on the manner in which different learning styles impact the learning processes relative to specific tasks. Learning styles are inherent to the students' generation, which further suggests the need for educators to be perceptive to the generation(s) represented in their classrooms.

The learning style theories have substantive value, and teaching methodologies could be even more effective when they emphasize instruction that reflects the unique individual characteristics associated with generational differences. Thaler (2013) acknowledged the single greatest challenge is for an educator to provide individualized attention to students. However, when an educator adopts multiple practices to accommodate the different learning styles represented in the classroom, the need for individual attention is lessened.

Specifically, in the online learning environment, it may be more complex to attempt to assess the distinct learning styles using standard characterizations. The faculty members who can structure the learning paradigm to include content that recognizes the generational preferences or attributes have a better chance of meeting the overall college's objective and students' learning objectives. Reflective learners deliver more online responses and engage in more dialogue than active learners. As active learners, Millennials require engagement in higher-order, collaborative, and cognitive activities (Bowen et al., 2011). Educators must then translate this need into meaningful, online learning activities and have a sufficient tool or rubric to measure the outcomes of these activities.

Howles and Jeong (2009) suggest that discussion board prompts be structured in a way that plays to the strengths and preferences of both active and reflective learners. Educators can use a structured posting profile requiring a specific numbers of substantive online inputs that are derived from some form of offline activity. With Millennial Learners' aversion to research and having a tendency toward "scan and click" processes (Thaler, 2013, p. 269), discussion boards and short quizzes are best in assessing the level of effort put forth by the students. For online teaching, faculty expectations from discussions must adjust to the manner in which each generation learns. This requires not only an analysis of the content of students' discussions, but also the process by which they reach their conclusions.

Faculty members process information in a sequential fashion whereas Generation Y students process information in what appears to be a networked pattern that creates concept maps (Matulich, Papp, & Haytko, 2008). Millennial Learners perform better when faculty present instructions for an assignment that resemble a visual map (Thaler, 2013). This is another example showing how faculty, being of a different generation from the majority of students, must adapt.

Implications for Teaching and Learning

This paper identifies several of the pedagogical practices inherent to teaching adult learners. Not all practices are applicable in each learning environment (online and onsite) but individual reflection, experimentation, and assessment of these practices could introduce strategies for individual instructors. In addition, there are opportunities to stimulate successful online learning by applying the appropriate best practices for each situation. It is possible for individual instructors to develop or adapt the appropriate model or framework that best fits the curriculum, teaching style, student learning styles to match generation and/or personality preferences. All of these can lead to more robust student outcomes and satisfaction. The following list offers some suggestions to assist educators with adapting to the online learning environment with Millennial Learners:

- Establishing appropriate time-management techniques is essential for the instructor. The expectation from Millennial Learners is rapid feedback from the instructor. The short response time is an expectation of these students because of the constant connectivity they enjoy with peers. This expectation requires more structured assessment and responses by the instructor. This entire process requires well-defined contribution deadlines and scheduled feedback. Thus, a faculty challenge is to set aside time daily to review the course shell and

course activities. Increased proactive interfaces with Millennial Learners allows the instructor to quickly encourage students who may not be responding with the breadth and/or depth of responses required for the course.

- Because of the asynchronous learning style, there can often be conflict when either the student or the instructor has other responsibilities that inhibit scheduled course participation. To prevent this issue, it is important for Millennial Learners and instructors to provide advanced notice of schedule conflicts and agree on a course of action.

- The instructor must be proficient in the etiquette used in online discussion, while still being very specific with instructions, assessments, and requirements. Millennial Learners tend to have shorter attention spans. They value conciseness. To preclude spending enormous time trying to "personalize" each response, the instructor may find appropriate sets of responses that meet student needs and expectations and establish a library of these comments for use when they apply.

- There has to be consistent use of the LMS as the primary communication network as opposed to external email or telephone calls. Although it is advisable to have an alternative method to communicate in case of emergencies, Millennial Learners need structure and consistency. The course content, including announcements, should be required to be presented at a safe and secure site to protect both the students and the instructor. Communication time parameters, content prohibitions and standard format instructions all facilitate clear online communications.

- The instructor has to be equally adept at using the technology of the online learning platform and is willing to experiment with advanced technology applications to enhance the learning experience. Millennial Learners view the integrative technologies not only as quick access tools to information but as an extension of the Learning Paradigm. They are more receptive to using a variety of applications as a basis for guided learning.

Conclusion

Educators who recognize the generational learning preferences of Boomers, Generation X, and Millennial Learners use those differences to establish a foundation for a more effective learning platform. Educators, by continuously adapting their teaching styles to reflect the Learning Paradigm, will transcend the above-referenced suggested practices into more rigorous teaching methodologies suitable for the current generation of adult student learners. Recognizing the differences students perceive in the online environment will require instructor adaptations throughout the course to ensure different students achieve the desired results respective to their unique approach to online learning. When adapting to the Millennial Learners' learning styles, educators enhance the faculty-student relationship, transforming it into a positive collaboration — just what the Millennial Learners desire.

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For the third issue of the journal, we continue to solicit scholarly articles (3000 to 5000 words) that have not been published elsewhere but are "working papers."

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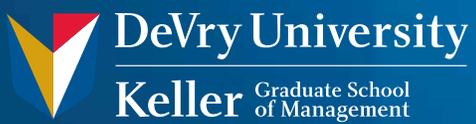
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