University-Industry Alliances for Curricular Development: A Buyer-Supplier Relationship Model

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Mary J. Meixell, Ph.D.
Quinnipiac University, Hamden, CT
mary.meixell@quinnipiac.edu

ABSTRACT
University education is enhanced through collaboration with industry; yet accomplishing this aim is a challenge for both faculty and managers. This research addresses the mismatch problem by developing a model derived from the buyer-supplier relationship literature, and investigates mechanisms for enhancing employer involvement in the university curriculum development process.

KEYWORDS: Curriculum development, University-industry collaboration, Buyer-supplier relationships

INTRODUCTION
University education is enhanced through collaboration with employers; yet accomplishing this aim is a challenge for both faculty and business managers. Universities and corporate employers work in separate worlds that struggle to interrelate. From a curriculum development perspective, employers aim for recent graduates to have skills and knowledge that allow for no ramp-up time for their new employees. Universities certainly would like their graduates to find good career opportunities that they could not have achieved without a college education, but see the aim of university education as more than training for an entry level position in industry.

This mismatch in perspective often results in a gap between university curricula and employer expectations. The Chronicle of Higher Education recently reported that although employers continue to prefer college graduates for entry level positions, they do expect that new hires are able to be productive and capable from the first day on the job (Fischer 2013). Employers said that newly hired graduates are capable technically, yet they are often not satisfied with their basic workplace proficiencies (e.g. adaptability, communication), decision making skills, and the ability to solve complex problems on the job.

These concerns have motivated universities to examine their programs to determine what, if any, improvements are warranted. Certainly, program improvement initiatives are not new to academia; an examination of curriculum and pedagogical research in the business school literature shows that a great deal of attention has been devoted to this subject in recent years. A search of the Proquest ABI/Inform database reveals over 4500 scholarly articles when the terms “business” and “curriculum/pedagogy” and “college/university” are used as search terms. Some of this research addresses major revisions to well-known programs like the Masters of Business Administration (Weinstein and Barrett 2007; Paucar-Caceres 2008; Jain and Stopford 2011; Lyons 2012; Hesselbarth and Schaltegger 2013), and the Bachelors of Science in Accounting (Herring III and Williams 2000; Sullivan 2010; Willits 2010; Carmona 2013; Chabrak and Craig 2013), among other programs. Some of this curriculum-related literature addresses contemporary and pedagogical topics, such as retention of statistical analysis in the business curriculum (Parker, Pettijohn and Keilor 1999; Budé, Imbos, van de Wiel and Berger 2011),
ethical training for students (Hatton 1996; Sullivan 2010; Acevedo 2013), and sustainability in the curriculum (Nicholson and DeMoss 2009; Audebrand 2010; Orecchini, Valitutti and Vitali 2011; Persons 2012; Hesselbarth and Schaltegger 2013).

Other topics in this curriculum research relate to proficiencies and competencies more closely aligned with the COHE study, such as business writing (Carnes, Jennings, Vice and Wiedmaier 2001; Cox, Bobrowski and Spector 2004), foreign language proficiency (Chiru, Ciuchete, Lefter and Paduretu 2012) and cultural diversity and global awareness (Crawley and Crawley 2009; Witte 2010; Jain and Stopford 2011). Some of this research is process-related, including measurements for assessing how well graduates perform (Teijeiro, Rungo and Freire 2013). Another important topic in this research addresses integration across individual courses within the business curriculum (Berry 2009; Natale and Sora 2010). There is less research in this particular body of knowledge, however, on developing problem solving skills, as in (Siller, Balmori and Vargas 2006) and decision making skills, as in (Chiru et al. 2012), both of which are called out as a shortfall in the COHE survey.

This literature says relatively little, however, about methodologies that may be used by administrators and faculty when undertaking curriculum development. In practice, colleges often look to their accrediting bodies for guidance on process which typically does at least encourage external input, and often from employers. In practice, universities often ask an advisory board for their input (who may not have curriculum experience), or will rely on a panel of faculty experts (who may not have industry experience), or may simply explore peer university programs. Methodology-wise, some operations management faculty have drawn in practices from the quality management domain, specifically the House of Quality (HOQ) and Quality Function Deployment (QFD) from the product development literature (Aytac and Deniz 2005; Denton, Franke and Surendra 2005; Peters, Kethley and Bullington 2005; Gonzalez, Quesada, Mueller and Mueller 2011). Other methods discussed in the curriculum development literature includes system theory (Deng 2010), domain analysis (White 2001) and structural models (Bunăiaşu and Strungă 2013). Additionally, there is some literature about how universities collaborate with industry on curriculum, as in (Vinten 1996; Orecchini et al. 2011; Azevedo, Apfelthaler and Hurst 2012), but little attention is given to process or modeling. Generally speaking, there seems to be little in the business curriculum development literature about methodologies for developing college business programs.

The following section focuses on processes and models for curriculum development that will aid in addressing the mismatch between college programs and employer expectations. I first draw from the scholarly education literature on curriculum evaluation and development, and then look to the purchasing and supply management literature on buyer-supplier relationships to provide the conceptual background for modeling university-industry relationships. Next, a model is developed that categorizes these relationships using select characteristics as dimensions. Finally, I discuss implications of this research and future research opportunities.

CONCEPTUAL BACKGROUND

Curriculum Development

The scholarly education literature on college curriculum is extensive, and includes numerous works related to the influences of external stakeholders on curriculum evaluation and development. Lattuca and Stark’s (2009) work on academic plans in a sociocultural context is of particular interest in this context, as it focuses on post-secondary education and gives attention
to external influences in curriculum planning, including employers. These authors follow in a line of research on higher education curriculum that includes Halliburton (1977), Dressel (1980), Conrad and Pratt (1983), Toombs and Tierney (1993), Diamond (2008) and others. Lattuca and Stark build on these earlier works, and define academic plans broadly in terms of its elements, which include learners, purposes, content and sequence, instructional resources, instructional processes, assessment and evaluation. Importantly, these authors also define a process for developing curriculum at all levels, from an individual class meeting, to a course, to a major, to a university as a whole. The academic plan is continuously evaluated in this model, based on educational outcomes and then adjusted for improvement. Lattuca and Stark’s curriculum development process is both descriptive and prescriptive, providing practitioners with a foundation for curriculum reform in a college setting and academics with a basis for future research in curriculum planning.

An important concept in Lattuca and Stark’s academic plan is the role of internal and external influences, both of which are important aspects of the sociocultural context in curriculum development in higher education. The internal influences at the institution relate the college mission, resource limitations, and governance style to the curriculum, as well as influences at the unit level from faculty, the discipline, and student characteristics. Of particular interest in this research are the external influences, which include market forces, government, accrediting agencies, and disciplinary associations. Market forces include, but are not limited to, employer needs for skills, competencies and knowledge in the new hires, which are often prepared at a university, and via the curriculum.

The scholarly literature in this field further speaks to market and employer needs as an influence on curriculum planning. Deng (2010) advocates for a comprehensive view of influential stakeholders in the curriculum planning process, including business, government, educational agencies, universities, schools, and communities at large. Alfonso, Ramírez, and Díaz-Puente (2012) advocate for cooperation between universities and industry in curriculum development in Spain, and identify mechanisms to support that aim that include: participation of professionals in teaching, training of faculty in the industrial domain, use of grants and prizes to encourage student theses that closely reflect industrial problems, and availability of student internships in a wide variety of fields. Zhiwen and van der Heijden (2008) also take up an international view and explain how curriculum is advanced in China to address labor market demands. Vinten (1996) takes the alternate viewpoint, and explains how a British firm, Whitbread, sees their relationship with educational institutions as a community service. Whitbread’s education partnership mission is “to help secure for all young people the education, training and personal development opportunities they need to become productive and responsible members of the public, prepared for the world of work” (Vinten 1996 p 28).

Thus, the scholarly education literature in curriculum development supports involving industry in the curriculum planning process. Industry is an important stakeholder, and many universities have made progress toward developing relationships that lead to both understanding their needs and contributing to the process for integrating recent college graduates into the workplace. I would argue, though, that understanding how to best “partner” with industry in this context is not a simple decision. Given the large number of potential company partners, and the variety in university mission, it is important to determine the appropriate type of relationship in each circumstance. No doubt, capturing the needs of employers in the curriculum development process requires that a structure be built to ensure that expectations are both well-articulated and understood. In the next section, I turn to the supply management literature to aid in building
this structure, and investigate whether the communication between industry and universities are well modeled using a buyer-supplier relationship construct.

**Buyer-Supplier Relationships**

The theories of buyer-supplier relationships are fundamental in the purchasing field. Traditionally, buyers and suppliers were accustomed to an approach where multiple suppliers were played off against each other, and where few synergies between the firms were achieved. As supply chain management principles have been implemented that advocate for an inter-enterprise view of processes, closer relationships with select suppliers have become more common. Collaboration is an important tenet, but only for select suppliers where synergies may be developed, and includes practices such as cost sharing, joint improvement efforts, dispute resolution, communication, marketplace adjustments, and quality management processes (Monczka, Handfield, Giunipero and Patterson 2011). Four types of value have been observed as an outcome of these closer relationships between buyers and sellers: operational performance improvements, integration-based improvements, supplier capability-based improvements, and financial performance outcomes (Terpend, Tyler, Krause and Handfield 2008). Of particular interest, and the focus of this review, are classification schemes and taxonomies that have been developed for an industrial setting to help understand when each type of relationship is appropriate.

Buyer-supplier relationships are, however, more varied than the two states that are commonly referred to as “transactional” and “collaborative” and the right choice of relationship for a given situation is a complex decision. Earlier research has developed a variety of systems for classifying buyer-supplier relationships, each with distinctive dimensions. These include: information exchange and buyer’s commitment (Helper 1991); information processing needs and information processing capabilities (Bensaou and Venkatraman 1995); scope and intensity (Zinn and Parasuraman 1997); buyer specific investment and supplier specific investment (Bensaou 1999); collaboration and technology (Kaufman, Wood and Theyel 2000); buyers strategic priorities in terms of cost, quality and delivery (Stuart and McCutcheon 2000); supplier and buyer dependence (Cousins and Crone 2003); operational impact and exchange criticality (Saccani and Perona 2007); and complexity/risk and value potential (Monczka et al. 2011). Some of the classification models are more advanced with expanded relationship states, as in Cannon and Perreault (1999), who identify six dimensions (technology and collaboration information exchange, operational linkages, legal bonds, cooperation, and relationship-specific adaptations by buyers and sellers) and eight relationship states ranging from “basic buying and selling” to “cooperative systems” to “mutually adaptive” and finally “customer is king.” Many of these typologies refer back to Kraljic’s (1983) seminal work in supplier classification, which is structured to support the selection of a relationship type based on critical characteristics of the commodity that is purchased, and so are product oriented. Other buyer-supplier relationship models were specifically developed for a service context, as is the case with Zinn and Parasuraman who consider logistics services (1997) and Bastl, Johnson, Lightfoot and Evans (2012) who extend Cannon and Perreault (1999) model to encompass the express characteristics of a service-based environment.

In this research, we explore relationships between university and industry at this general level, recognizing that in practice these relationships take many forms. Universities fill different roles in these relationships, both as educators as well as researchers. Universities educate future employees of the industrial workforce, in a wide variety of degree programs. Universities also fulfill a need for research, which is often defined and sponsored by industry. Industry serves as
a “customer” or “buyer,” both when employing graduates of university programs, as well as in funding the cost of university research programs. When viewed in this light, roles and responsibilities of universities and companies seem very clear, and indeed, many types of relationships do exist at this simplified level. Other universities and companies, however, have achieved a level of integration between the education and employment processes, where companies participate in the educational process beyond their traditional role as the employer that steps in at the educational end point. Similarly, universities and companies often integrate the process of knowledge generation with the product and service development process.

We can view the processes that prepare young people for the work force as a supply chain for talent, beginning with K-12, into college programs, perhaps graduate studies, and on to employment and continuing education. In the most general supply chain management terms, employers would do well to integrate their processes with universities to find synergies that drive improvements to the total process. Which processes are most important to integrate and what can be expected when this is done is an important question, and one that we begin to address here by building a relationship model that captures the essence of integration in this context. No doubt, integrating processes in this way requires an advanced level of collaboration. This may include employer participation in the classroom as a speaker, in providing projects for students, and in providing company visit venues as an aid to educators to illustrate key concepts from the classroom. Universities also educate current employees. Interdependencies are readily observed in supply management practice, motivated by the opportunities driven by the synergies found at these interfaces (Zinn and Parasuraman 1997; Perona and Saccani 2004; Kim, Park, Ryoo and Park 2010).

When viewed in this light, roles and responsibilities of universities and companies seem very clear, and indeed, many relationships do exist at this simplified level. Other universities and companies, however, have achieved a level of integration where companies participate in the educational process beyond their traditional role as the employer that steps in at the educational end point. Similarly, universities and companies often integrate the process of knowledge generation in the form of research with the product and service development process that creates the next generation of corporate work forces. For example, Saltz, Serva and Heckman (2013) address the use of internships in the MIS field as an integral part of the university curriculum. Huber and Watson (2013) address integration in curriculum, also in the MIS field, through an enhanced engagement of an advisory board. Humphrey (2007) addresses integration with the profession, also using advisory groups, as an aid in the development of exemplary professional behaviors at the University of Chicago’s Pritzker School of Medicine. McCarthy and McCarthy (2006) argue for direct, experiential learning as an important component of college business programs, a practice that requires participation and integration with employers and their processes. Mughan and Kyvik (2009) investigate paradigms in international business, and argue that curriculum reform in their discipline should be based on increased collaboration between faculties, universities and businesses.

In the next section, these concepts are adapted and formed into a four-cell model that reflects the important characteristics and processes associated with university-industry relationships.

**A UNIVERSITY-INDUSTRY RELATIONSHIP MODEL**

The model proposed here, and illustrated in Figure 1, describes university-industry relationships using two dimensions, **scope**, defined as number of roles the university and companies take on relative to each other, and **scale**, the frequency with which university and companies interact.
The resulting four-cell model describes university-industry relationships as high or low on the scope dimension, and high or low on scale. The model is described in detail below, related to the buyer-supplier literature, and explained in the context of the university-industry relationship.

The number of roles that each party fulfills in a relationship, *scope*, applies to the university-industry context as universities typically take on a number of roles when relating to industry. Some universities have a strong teaching focus, while others focus more on research, with a variety of activities undertaken within each of these areas. In this model, we measure number of roles at an activity level, so companies that employ graduates of a program as well as fund graduate work for their employees at a particular university will have a higher measure in scope than those consuming only one. Similarly, companies who provide research ideas to a university level participate at a lower level than one that also provides data, which is a lower level than one that also provides funding for the research. Several authors use a similar dimension with reference to supply management, such as Zinn and Parasuraman (1997) who define relationships in their model in part based on scope, defined as the range of services to be included in the arrangement. Zinn and Parasuraman base their classification scheme on integration opportunities, and argue that there are cases where limited services are most appropriate between a buyer and a seller because few interdependencies and synergies will emerge from integration; in other cases, managers would do well to carefully select a multiplicity of services to integrate so that when combined, benefits are generated that could not be achieved without collaboration. A similar dimension also appears in Bensaou (1999), who base their classification model on buyer's and supplier's specific investments, and use information sharing mechanisms as a characteristic where “narrow-band and limited” describes market exchange, and “broad-band and rich” describes partnerships. Certainly interacting on many fronts – curriculum, research, consulting, and continuing education – increases a relationship to the broader end of the continuum.

The second dimension proposed here for university-industry relationships, *scale*, also appears in several buyer-supplier relationships classification models. Zinn and Parasuraman (1997) use intensity as a dimension in their model, defined as the extent of direct involvement between the parties. Intensity may be measured using the number of worker-hours dedicated to the relationship or the amount of specific investment. Saccani and Perona (2007) use operational impact as a dimension, which is measured as volume or frequency and running cost of the exchange. Frequency of interaction is perhaps pertinent in a university-industry setting, although perhaps is not complete in explaining relationships as most employers do not hire many graduates from a specific school, nor do they interact very often as hiring cycles are typically annual, suggesting that the frequency of interaction is low when it might not be. Cousins and Crone (2003) define supplier and buyer dependence in their classification scheme using percentage of total business. A number of other models use a profit-related dimension, which has some relationship to frequency of interaction, and is similar to Kraljic’s (1983) dimension for importance of purchasing – often measured using cost of materials, which is sensitive to frequency. Monczka et al. (2011) also use an intensity-related measure, as value-potential may be measured in part based on frequency of interaction between the buyer and supplier.

The model in Figure 1 shows four relationship types: traditional, sprawling, focused, and allied. Traditional relationships are the most common type of relationship between universities and companies, where the scope and the frequency of the interaction is low. This would be the case where a company hires from one or a few degree programs, or perhaps participates in one or a few research projects. A relationship is established, but there is little interaction in this relationship type.
A *sprawling* relationship would describe the scenario where a university or company has a high degree of scope, that is, a large number of roles they undertake, but the frequency is low. Perhaps a company that hires from a few programs and provides input on a few research programs at the university would fall in this category. In the aggregate, there is a fair amount of interaction in this relationship type, but it is scattered and uncoordinated. There are limited opportunities for collaboration in this relationship type.

The *focused* relationship type refers to cases where the scope is low as there are relatively few activities on which the university and company interact, but the scale is high due to an increased frequency of interaction. A company that actively and aggressively recruits from a specific academic program, perhaps hiring continuously, participating in job fairs through the year, and sending managers to aid in career services events like resume reviews and mock interviews would fall into this focused category. This type of relationship can be seen for programs where there is a shortage of supply relative to hiring needs. In this type of relationship, a high level of interaction is observable, but it is narrow in the number of different activities that the company undertakes on campus, and so it is limited in scope. There are fewer opportunities for collaboration in this relationship type.

The final cell in the model is for *allied* relationships, where both the scope and the scale of the interaction are high. In an allied relationship, multiple roles are assumed by both the company and the university. Perhaps the university feeds graduates from multiple degree programs to multiple department or divisions in the company. In return, the company might provide in-depth and well organized input to the curriculum across the university. Additionally, the company might provide project and case study materials for classroom use that identifies and helps students to grasp the challenges faced in industry. Similarly, industry might bring their intractable problems for faculty to address through research. Industry input to the generation of research ideas would certainly help faculty choose topics with high impact, an increasingly important objective under accreditation expectations, but also a source of personal satisfaction to researchers. University departments may also find ideas for cross-departmental, multi-disciplinary teaching and research through this type of industry relationship. Companies would also provide input on types of graduate programs that are most needed for their employees, and for their advanced hiring needs, so that in turn, universities could fulfill these needs. Universities might also provide short course opportunities for focused educational needs of their allied companies.

Figure 1. University-Industry Relationship Classification Model

However, achieving collaboration through an allied relationship requires the right setting in addition to the requisite levels of scope and scale. The literature is informative in suggesting...
facilitators and barriers in the form of contextual factors, moderators and mediators for realizing the benefits of collaboration. Lambert, Emmelhainz and Gardner (1996) identify possible facilitators (corporate compatibility, managerial philosophy, mutuality, and symmetry) when forming partnerships in the supply chain. Nyaga, Lynch, Marshall and Ambrose (2013) investigate asymmetrical power and its influence on outcomes in buyer-supplier relationships. Other moderating factors include cooperation complexity (Schmoltzi and Whu 2012); power, trust and supplier network size (Terpend and Ashenbaum 2012); and suppliers’ reputation (Wagner, Coley and Lindemann 2011). Authors also explore how programs, such as quality management, interact with buyer-supplier relationships to influence firm performance (Fynes and Voss 2002). Certainly in a university-industry setting, there are drivers and facilitators, as well as components of the relationship, although some of the specific factors in each category might differ given the nature of non-profit education.

Other authors explore mechanisms that are useful in creating a desired relationship type, such as negotiation strategies (Thomas, Thomas, Manrodt and Rutner 2013); technical approaches for relaxing behavioral constraints (Kull, Ellis and Narasimhan 2013); e-reverse auctions (Lösch and Lambert 2007); socialization (van de Vijver, Vos and Akkermans 2011); time pressure coping mechanisms (Thomas, Fugate and Koukova 2011); and cooperative norms (Cai and Yang 2008). Bensau and Venkatraman (1995) identify structural mechanisms for inter-organizational coordination, (i.e. multiplicity in the number of communication channels, frequency of mutual visits, formalization of control and coordination) and process mechanisms (i.e. conflict resolution commitment, and joint action). Cousins, Lawson and Squire (2008) investigate the role of socialization mechanisms in buyer-supplier relationships. All of these approaches are potentially applicable in university-industry relationships.

NEXT STEPS

The next step is to further develop and test the model using interview and survey data. Research questions for these next phases include:

- What drivers exist for more collaborative relationships in industry and in university organizations?
- What are the barriers to this type of collaborative relationship?
- What moderators and mediators act in the university-industry setting to influence outcomes?
- How should a successful relationship be measured in this context?
- What strategies are appropriate for each relationship type?

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