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University-wide Entrepreneurship Education: Alternative Models and Current Trends*

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ABSTRACT The paper examines the trend towards university-wide programs in entrepreneurship education. We present a conceptual framework for dividing university-wide programs into two categories: “magnet programs,” which draw students into entrepreneurship courses offered in the business school, and “radiant programs,” which feature entrepreneurship courses outside the business school, focused on the specific context of the non-business students. Examining 38 ranked entrepreneurship programs, we found that about 79 percent now have university-wide programs, most of which follow a magnet model. In interviews with stakeholders at sample institutions, we found that magnet and radiant programs differ in terms of program definition, motivation for the university-wide focus, and costs and benefits. Our major findings are: (1) the trend toward university-wide entrepreneurship education is strong and gaining momentum; (2) our conceptual framework clarifies the different pathways for creating a university-wide approach; (3) while the radiant model is extremely appealing to students, parents, and alumni, the magnet model is easier to administer and represents the path of least

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resistance; and (4) while the magnet model is simpler to implement, it may lead to conflicts in the longer term because the benefits may not be shared equally across the university.

During the past few years, it has become common at entrepreneurship education forums across the country to hear speakers call for the integration of entrepreneurship programs with disciplines outside the traditional majors of business and engineering. The presentations raise such questions as: What exactly is an integrated entrepreneurship program? What are the benefits and costs involved in moving outside the traditional spheres of instruction (business and engineering)? Who has created successful university-wide programs? What are the choices for policy-makers considering a move toward university-wide entrepreneurship? This paper is intended to inform the discussion of such questions by reviewing the evolution towards integrated programs, discussing a conceptual framework for examining alternative models of university-wide education in entrepreneurship, and presenting a detailed discussion of some sample programs.¹

General Growth in Entrepreneurship Education

The concept of entrepreneurship has undergone both periods of disfavor (classical economics) and exaltation (Schumpeter 1962) and today has emerged as central to technological change, productivity, resource efficiencies and economic growth (Plaschka and Welsch 2002). In his review of the role of entrepreneur in economic theory, Formaini (2001:9) describes the contemporary economic concept of the entrepreneur as an “ingenious, risk taking innovator who might also be an imaginative manager and whose actions both disrupt and coordinate our market economy.” As the image of the entrepreneur was gradually transformed from one of a greedy, bloodsucking profiteer to an innovative, creative, economic

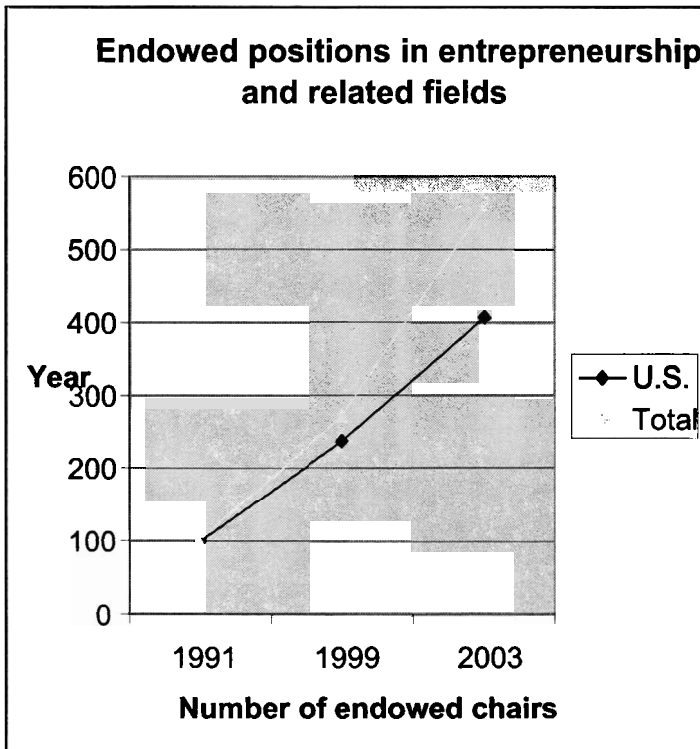
¹The discussion that follows uses the term “program” to indicate a unit of organization that embodies entrepreneurship within a university or institution. The entrepreneurship program or center may be inside or outside of the schools and colleges within an institution.

super-hero, entrepreneurship began to emerge as important subject matter in business programs.

The striking growth in educational programs focused on entrepreneurship has been thoroughly documented and discussed (Cuff 2002; Gartner and Vesper 1994; Sexton and Bowman 1984; Solomon, Weaver and Ferrauld 1994). As one of the lead organizations keeping track of entrepreneurship trends, the Kaufmann Center's Resource center (<http://www.entreworld.org>), lists over 700 institutions where entrepreneurship is taught (most, but not all in the U.S.). Many entrepreneurship programs got their start when entrepreneurial alumni funded initiatives focused specifically on helping students learn about starting and running businesses. Finkle and Deeds (2001) document the ample and growing supply of candidates and faculty positions in entrepreneurship. More recently, a survey administered by St. Louis University in 2003 reports that in the United States alone, there are 406 endowed positions in entrepreneurship and related fields, and growth has been steady since 1991 (see Figure 1). Endowed professorships institutionalize entrepreneurship education at universities by protecting the subject area from being eliminated or subsumed during periods of reorganization or reorientation of the curriculum.

Both push and pull factors are cited as reasons for the growth in entrepreneurship programs. On the demand side, students and parents have seen entrepreneurship as a relevant topic and an alternative to the corporate track. As Plaschka and Welsch (2002) put it: "entrepreneurship is seen as a much-needed salvo to the theoretical learning that dominates b-schools." And although entrepreneurship as a field has struggled to find legitimacy (Low 2001), faculty champions have emerged, drawn both by personal interest and endowed chairs. On the supply side, donor-driven programs are common, funded by alumni who find the learning base of entrepreneurship education extremely appealing. Other enticements such as economic development grants and incentive programs have been created by various public and private organizations (e.g., the U.S. Small Business Administration, the National Collegiate Inventors and Innovators Association, the Kaufmann Foundation, and the Coleman Foundation). Such programs have expanded the available supply of entrepreneurship opportunities open to educators, researchers, and students.

Figure 1. Endowed Positions in Entrepreneurship Have Risen Dramatically Since 1991.



Source: <http://eweb.slu.edu/chair.htm>.

Impetus Towards University-wide Programs

As a relatively young subject area, entrepreneurship education has no universally agreed upon pedagogical approach. Various authors have discussed issues associated with the teaching of entrepreneurship. For example, the process model is promoted by Marchigiano-Monroy (1993) and Hynes (1996). Others focus on the experiential dimensions of entrepreneurship (Plascka and Welsch 2002; Porter

1994). Fiet (2001) calls for better teaching of theory in entrepreneurship classes, while Hood and Young (1993) present the opinions of 100 successful entrepreneurs on what entrepreneurs should learn. McMullan and Gillin (1998) discuss the role of graduate level degree programs.

Despite ample literature on content and approach of entrepreneurship education, there is scant discussion of a more recent phenomenon: the fact that demand for and interest in entrepreneurship courses is starting to emerge outside the business school. The earliest non-business interest came from engineering schools, and has been followed by demand from other science and technology programs. The literature does discuss the importance of interdisciplinary programs, what might be called "scientists learning business; businesspeople learning science." Laukkanen (2000) suggests that such an approach is essential if entrepreneurship education is to lead to increased economic growth, and Hill and Kuhns (1994) also document the value of the interdisciplinary experience for technology transfer.

Demand for entrepreneurship from outside the business school is not limited to engineering, science, and technology. Because so many small business owners and entrepreneurs come from majors outside of business and technology, and because of the prominent role of entrepreneurs in the media, there is a growing belief at many institutions that entrepreneurship education should be of concern across the entire university. Larry Penley, Dean of the College of Business at Arizona State University, noted the move toward entrepreneurship across the curriculum in his address to the USASBE-SBIDA (United States Association for Small Business and Entrepreneurship Small Business Institute Directors' Association) conference in Spring 2000. He referred to university-wide entrepreneurship education as a "diversity issue," and addressed the need to look "beyond the business school for how we help students learn about small business." He made the argument that university-wide programs will help to build a stronger small business sector because right now most small business owners have little or no formal business education.

Although it may seem that entrepreneurship and the arts make strange bedfellows, they are integrated in programs such as those at University of St. Thomas, where the entrepreneurship cur-

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riculum is grounded in the liberal arts and at Case Western Reserve, where entrepreneurship classes are part of the theatre program. At University of Arizona, students take entrepreneurship courses in the medical and agricultural programs as well as in the Mexican, Latin, and Native American Studies Program. The trend toward university-wide entrepreneurship is being accelerated through the actions of major foundations, such as the Ewing Marion Kauffman Foundation, which recently created a national initiative focused on creating entrepreneurship programs that span the curriculum.

Taken together, the increasingly broad appeal of entrepreneurial values and education and the eagerness of alumni from all fields to introduce a real world dimension to their home schools intensify the pressure to view entrepreneurship education from a university-wide perspective. For students with non-business majors, university-wide entrepreneurship education can help to bridge the gap between the concepts and theories of the classroom and the realities they will face in their careers.

Although various institutions may be motivated by common factors, the actual implementation of university-wide entrepreneurship education takes many different forms. For example, at some institutions moving toward a university-wide entrepreneurship program consists of attracting students from non-business fields into the orbit of the business school. At other institutions a university-wide approach is manifested by the creation of courses or modules in non-business departments themselves, providing entrepreneurship lessons specifically relevant to the field itself.

Focus of this Paper

Compared to many other academic programs, entrepreneurship education is relatively young and has experienced considerable growth in just over a decade of existence. With a firm foothold established in many business and engineering schools, champions of entrepreneurship education are now scanning the rest of the university for opportunities to reach and attract students with their programs. However, little is available in the literature to guide such efforts.

While many of the inventories of entrepreneurship programs² contain descriptors such as “university-wide program” there is no widely agreed upon model for what makes an entrepreneurship program university-wide or how an academic policymaker might go about evaluating the challenges and benefits of such programs.

Therefore, the primary objectives of this paper are to:

1. Present a conceptual framework for discussing various models of university-wide entrepreneurship education programs,
2. Use the framework to categorize 38 programs selected using various ranking systems and to analyze a smaller group of programs in-depth, and to
3. Share advice and insights from those currently administering, teaching and studying in university-wide programs.

The next section of the paper is a presentation of a proposed conceptual framework for entrepreneurship programs, followed by a discussion of the methods of study and an explanation of how institutions were selected and categorized. The remainder of the paper is devoted to discussing the results of the study, with a final section summarizing the findings and implications.

Models of Entrepreneurship Education

Focused vs. University-wide Approaches

In categorizing institutions that feature entrepreneurship education, we divide the programs into two broad categories, which we call “focused” and “university-wide.” A program is *focused* if its fac-

² For inventories and/or ranking of programs, see for example, *Financial Times of London* (rates entrepreneurial programs in MBA schools), the Kaufmann Center for Entrepreneurial Leadership (lists and describes programs), the National Consortium of Entrepreneurship Directors (annually publishes a compendium of programs), St. Louis University (lists entrepreneur programs in United States), *Success Magazine* (ranks top business schools for entrepreneurs annually), or *U.S News and World Report* (ranks undergraduate programs annually).

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ulty, students and staff are located exclusively in the academic area of business, or in the combined areas of business and engineering. Examples of focused programs include Ball State, Harvard, and Loyola Marymount.

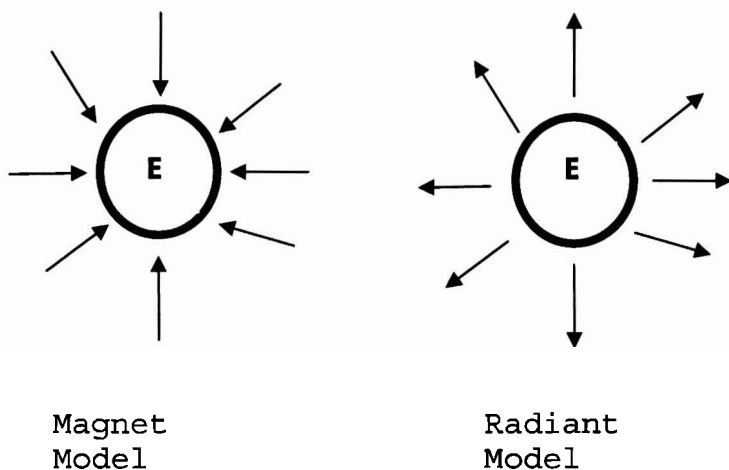
Among focused programs, we can further subdivide programs according to which departments or schools feature the entrepreneurship courses. Although the MBA curriculum is always involved, there are various combinations of business and engineering and of graduate and undergraduate courses. In other words, having entrepreneurship classes in the graduate school of business seems to be a necessary pre-requisite of a focused program. In addition to educating MBA students in entrepreneurship, courses also may be targeted to undergraduates in business and/or engineering students.

In contrast, *university-wide* programs target students beyond the business and engineering fields. Such programs may include entrepreneurship courses aimed at students majoring in arts and sciences or in physical and life sciences. Examples of university-wide programs include Babson, Cornell, MIT, and Stanford, where the opportunity for entrepreneurship education is extended to all students regardless of their majors. Although all university-wide programs take a sort of evangelizing approach to entrepreneurship, there are two different methods for accomplishing the goal of involving non-business/engineering students in entrepreneurship education.

University-wide Programs—Magnet vs. Radiant Models

A simple way to distinguish among approaches to integrated entrepreneurship education is to consider the basic differences in where the teaching of entrepreneurship occurs. In some programs, all courses are taught in one college or school, whereas in others, courses exist in various colleges/schools. As depicted in Figure 2, this can be seen in what we will call the *magnet model* (e.g., MIT) where classes in entrepreneurship are offered by a single entity (MIT Entrepreneurship Center, located in The Sloan School of Management) but attract students from all over the university. By comparison, in programs that fit what we term a *radiant model* (e.g., Cornell), the teaching of entrepreneurship education is diffused throughout the university (nine schools and colleges).

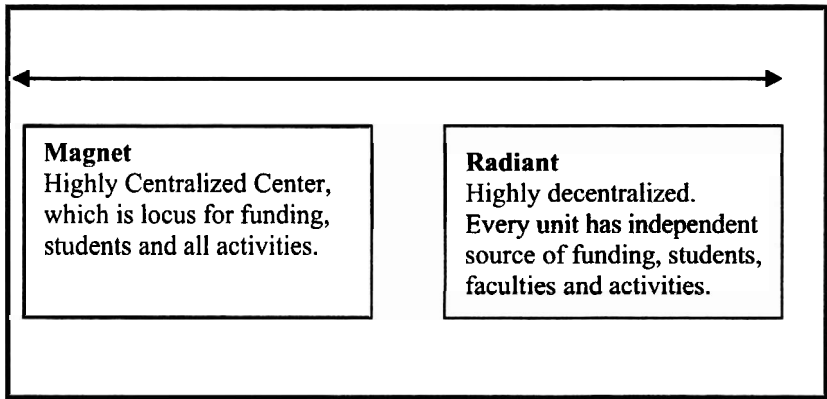
Figure 2. Magnet Model vs. Radiant Model of Entrepreneurship.



However, the simple approach shown in Figure 2 fails to reveal some important nuances and variations in how programs work. The question of location, or where the program finds its center of gravity, is actually determined not only by where courses are offered, but also by where the money, faculty and students are located. In fact, we can think about the location of the following elements as being crucial to understanding any given entrepreneurship program: funding, administrative infrastructure, faculty, teaching activities (including courses, internships, special lecture series, etc.), students, research activity, outreach activity, business development activity (including technology transfer), and alumni activity.

Because it is not a given that all of these elements are located in any one place in the university, many configurations are

Figure 3. Spectrum of Entrepreneurship Programs.



possible, making it difficult to define a precise “model” of university-wide entrepreneurship. To complicate matters, it is also important to understand the interaction of these factors between and among academic units. In fact, it is useful to think about programs placed along a spectrum (see Figure 3) where at one extreme all factors are located in one academic unit (school, college) and at the other end factors are replicated throughout many different units.

If we look specifically at the funding, the flow of students, and the interaction between and among faculty, there is a pattern at each end of the spectrum. In what we will call the *pure magnet model*, the administrative office, the faculty, and the financial resources of the entrepreneurship program or center are most often located completely within an academic unit, typically the business school. Students in the business program, as well as those from other academic units, take courses taught by business school faculty. What makes the program university-wide is the fact that *non-business students*, from other parts of the university, such as arts and sciences or medicine, also can take entrepreneurship courses.

The *pure radiant model*, in contrast, is characterized by having the administrative activities of the entrepreneurship program or center located outside all academic units. The administrative unit serves as a mechanism for distributing money and performs a coordinating function for all participating academic units. Each academic unit (not just the business school) has some funding located

internally and has faculty and students taking courses. In addition, entrepreneurship classes are available to students throughout the university. Faculty members may collaborate across academic units on research, teaching and outreach, but are allied primarily with their own departments. In the pure Radiant Model, what makes the entrepreneurship program university-wide is its *infusion* into various academic units, resulting in an entrepreneurship curriculum that reaches across the institution and is taught by faculty in various disciplines.

As we shall see, in the real world there are many variations on these two models. Some universities have what could be called *multiple magnets*, created by centers located in different schools and colleges across the university. Another variation is a *mixed model*, in which part of the entrepreneurship program (typically at the graduate level) is university-wide, but the rest of the program stays focused on business and/or engineering students. Notwithstanding these variations, the basic framework is helpful in illustrating a key difference in approaches to creating a university-wide program. For those universities closest to the magnet model, "university-wide" means non-business *students* have access to certain entrepreneurial-oriented business classes. For the radiant models, "university-wide" means that in addition to the entrepreneurship courses offered in the business school, non-business *faculty* are creating entrepreneurship courses outside the business program, and that both business and non-business students are traveling to different academic units to take courses.

What determines the shape of programs? Donor stipulations may be one element that impacts the structure. At Cornell, chairs were endowed in the Engineering School, the Graduate School of Management and the undergraduate department in Applied Economics and Management. These professorships created the three-legged stool that is the base of Cornell's university-wide program. Funding models and the culture of the university may dictate structure as well.³ Some institutions, such as the University of Southern

³ The authors thank Bruce Gartner (Henry W. Simonsen Chair in Entrepreneurship, USC) for these insights, offered in his review of the working paper version of this publication.

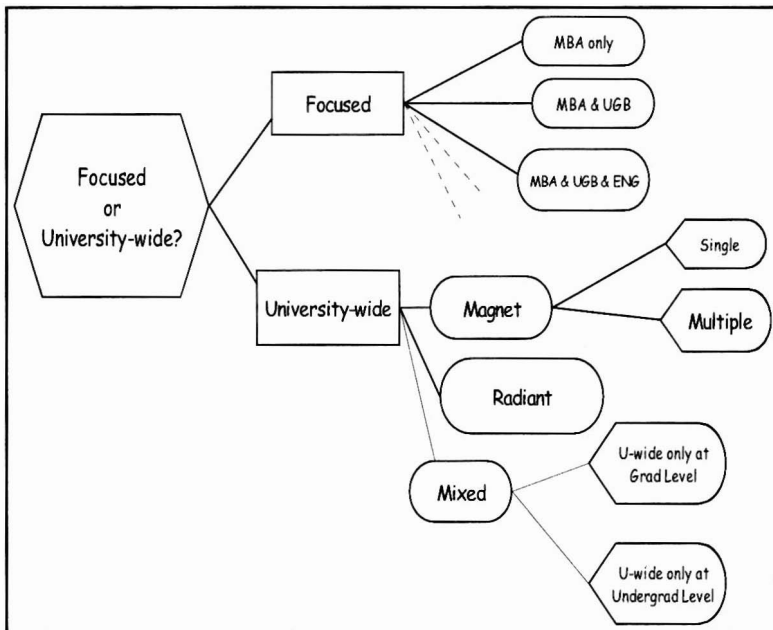
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California, allocate money based on the number of students taught, thereby encouraging the lead unit to pursue a magnet model. In other places, such as the University of Washington, budgets are allocated based on estimates or the number of majors, providing little or no financial incentive to attract students from other schools because the business school is not rewarded (in monetary terms) for teaching non-business students.

A Framework for University-wide Entrepreneurship Education

We can summarize the discussion above by creating a method of classifying programs as shown in Figure 4. To determine the model that best fits the program in a university, the first question is whether or not the goals of the program include reaching beyond the business and engineering fields. If not, then it is what we call a *focused program*, and the next step in classifying it is to determine what parts of the university are involved with entrepreneurship education. If the program is intended to infuse the institution with entrepreneurship education, we call it a *university-wide* program. Next, we examine the location of the faculty and teachers to determine if it is a magnet or a radiant program. If the program draws students into courses located in the business and/or engineering schools and taught by engineering and/or business faculty, then it is a *single* or *multiple magnet* program. Magnet schools tend to further subdivide into categories depending on whether they focus on attracting graduates or undergraduates (or both). If entrepreneurship courses and faculty are located throughout various academic units (not just business and engineering), the program is considered *radiant*. In cases where elements of a focused program exist at one level, but the other level is a magnet, we call them a *mixed model*. Thus, using the scheme depicted in Figure 4, we can classify every program. We now turn to applying this framework to existing programs.

Figure 4. Potential Pathways for Entrepreneurship Programs.



Source: Streeter, Jaquette and Hovis 2002.

Categorizing Ranked Programs

Methods of Study and Selection of Universities for Inclusion in the Study

To study integrated entrepreneurship education for the purposes of this paper we reviewed existing compendiums of program information, analyzed existing program materials (including websites), and conducted interviews with stakeholders at selected universities.

Choosing a set of universities for the study was challenging. We were not trying to create an exhaustive list, but we did want to see how the conceptual framework might be useful in categorizing a wide range of programs. Furthermore, we also wanted to investigate more closely programs at specific points on the spectrum. Thus our analysis is divided into two parts: (1) an overview of the visible,

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ranked programs (including both *focused* and *university-wide* models), and then (2) a more detailed look at selected university-wide institutions in particular (both *magnet* and *radiant* models), including some universities with programs that do not appear in the rankings but offer interesting variations of entrepreneurship education.

We selected the universities in the first part of the study by consulting two ranking systems published in 2000: the top 25 institutions as ranked by *Success Magazine*, and the top 25 as listed by *U.S. News and World Report*. The resulting list of 38 universities appearing in either or both rankings are categorized in Table 1.⁴ In particular, we asked about where courses are offered and to whom they are available.

General Findings

Not surprisingly, entrepreneurship education has its most secure anchor in graduate schools of management. All ranked universities reported graduate schools of management offering entrepreneurship courses. Over half also offer some sort of primary and/or secondary concentration in entrepreneurship at the graduate and/or undergraduate levels. These concentrations have a variety of names, such as: a Career Path (Babson), an emphasis (Baylor), a track (DePaul and others) a major (NYU and others), a minor (Indiana) or a Secondary Concentration (Pennsylvania). At four of the universities (Chicago, Harvard, Illinois-Chicago, and Wake Forest), MBAs are the exclusive focus of the entrepreneurship program, while at the remaining institutions, undergraduates have varying levels of access to entrepreneurship classes. At the time of our review, only a handful of the universities offered a specialization to engineering students (e.g., Cornell, RPI, USC), but 23 had courses open to engineering students either at the graduate or undergraduate level.⁵ In the case of undergraduate business majors, 16 offer some type of

⁴ For more details, see the working paper version of this study.

⁵ Five of the 38 universities do not have an engineering program: Babson, Bentley, DePaul, Indiana, and Georgia. Babson is currently working on forging ties with the newly created Franklin W. Olin College of engineering, a stand-alone independent engineering college.

major out of the 29 universities where classes are available to the major.⁶

About 79 percent of the programs recruit non-business/engineering students to take entrepreneurship courses, if you include both graduates and undergraduates. About a quarter of those schools have courses in entrepreneurship that are housed and taught outside the graduate school of management (e.g., Colorado, Cornell, DePaul, Duke, Indiana, Northwestern, NYU, RPI).

Entrepreneurship centers, most carrying names with donors who have endowed the programs, are nearly all located inside business schools. Relationships between programs and academic units are difficult to interpret and can have many nuances. Maryland's Dingman Center for Entrepreneurship is focused heavily on outreach to emerging companies in the region, and operates in some ways quite independently of the business school. But the Dingman Center does support the undergraduate, MBA and Ph.D. academic programs in entrepreneurship at the University of Maryland, including joint academic programs with the School of Engineering. Cornell's Entrepreneurship and Personal Enterprise Program (EPE) was the only example among the ranked schools we found to be an independent, non-academic office that is allied with all its associated nine schools and colleges.

Applying the Framework

Although categorizing universities in the framework was challenging in some cases, Table 1 shows our interpretation of how each institution fits the framework presented in this paper.⁷ While the classifications of some institutions are unambiguous (e.g. Cornell is radiant, MIT is magnet), other universities are in transition. UCLA is exploring new joint initiatives with the graduate program in the education department. Other programs, such as the one at University of Southern California, seemed to be in a gray area between a magnet and a radiant model. Thus, the classifications in Table 1 are

⁶ Duke and Stanford have no formal undergraduate business major.

⁷ Individual universities were contacted to confirm their positions on the table. For those who did not respond, we used publicly available information such as brochures and websites to reach a decision on which model was the best fit.

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Table 1: 38 Ranked Universities by Category of Entrepreneurship Programs. Based on 2001 Rankings by Success Magazine and U.S. News & World Report.

Focused Programs			University-Wide Programs			Mixed Program (Focus/U-wide)
MBA Only	MBA & UGB	MBA & UGB & ENG	Magnet - Single	Magnet - Multiple	Radiant	
Chicago	Ball State	Louisville	Arizona	Duke	Cornell	<u>U-wide at Undergrad</u>
Harvard	Loyola Marymount		Babson	Stanford	RPI	South Carolina
Illinois-Chicago	San Diego State		Baylor			Wisconsin - Madison
Wake Forest			Bentley			North-western
			Carnegie Mellon			
			Case Western			
			Columbia (G)*			<u>U-wide at Grad</u>
			DePaul			California-Berkeley
			Georgia			Colorado
			Indiana			Michigan
			Maryland			New York
			MIT			Texas
			North Carolina-Chapel Hill			Virginia
			Pennsylvania St.			
			Thomas			
			UCLA (G)			
			USC			
Total 4	3 38%	1 12%	17 81%	2 9.5%	2 9.5%	9 100%
Total	8		Total	21		9
(% total)	21%		(% of total)	55%		24 %

Source: Melville 2001 and U.S. World & News Report 2001

* (G) indicates Entrepreneurship is offered only at graduate level

simply a snapshot of an evolving entrepreneurship education field and by the time this study is published, Table 1 may no longer be completely accurate. One thing we *can* report unequivocally is that all the proposed changes mentioned by those interviewed indicated movement of their institutions *towards* university-wide models, and none are moving in the opposite direction.

Summary

The key findings from our study of the ranked universities are:

1. University-wide entrepreneurship programs are more prevalent than we expected.
2. The program structure and delivery system for taking entrepreneurship across the curriculum vary widely.
3. Currently, the most widely used method for creating a university-wide program is to follow a magnet model, created simply by opening courses to students outside the business/engineering majors.
4. Some universities are pursuing more aggressive approaches to creating magnet models, including:
 - Creation of a set of courses specifically aimed at the non-business students (University of Maryland)
 - Collaboration with non-business schools where entrepreneurship education is relevant to student careers (particularly where the graduates of the school may have a professional practice)
5. Although the trend toward university-wide programs is strong, there is still untapped potential for increasing the reach of entrepreneurship, especially at the undergraduate level.

Additional In-Depth Analysis

After examining the ranked institutions, many questions remained, including: How do different programs define the term “university-wide”? Why have programs chosen to become university-wide and what strategies are they using to achieve the goal of moving entrepreneurship education across the curriculum? Why are most universities opting for a magnet model? (i.e., what are the pros and cons of alternative strategies?) What challenges have such programs

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experienced in becoming integrated and how have they overcome the barriers? How is success measured in university-wide entrepreneurship education? To address these questions and to add to what we learned in studying the 38 ranked schools, we did more in-depth interviews with stakeholders at nine institutions.

Selection of Additional Institutions for In-Depth Study

We sought to include in our investigation institutions of various sizes and in different positions on the spectrum shown in Figure 2. Accordingly, we talked to stakeholders in magnet and radiant programs as well as several who are in transition from a magnet to a radiant approach. Four were selected from the 38 ranked schools described earlier. To choose the other five, we examined program descriptions in the *Compendium of Entrepreneurship Centers 2000* (compiled by the National Consortium of Entrepreneurship Centers) and selected institutions with programs that explicitly mention a university-wide approach.

Lehigh University, MIT, and Northern Kentucky were chosen as *magnet* schools. MIT is a classic magnet model and we added Lehigh and Northern Kentucky to include a range of sizes and emphases. We chose two institutions with *radiant* programs: Cornell and Iowa State. Cornell's program is well known as a university-wide model and Iowa State emerged as an institution with a similar approach to offering entrepreneurship education across the curriculum. The universities chosen as *in transition*, California State-Fresno, RPI, George Mason, and Northeastern University, have announced new initiatives intended to move their university-wide entrepreneurship programs from a magnet model to a radiant model. Of these four, only RPI is among the ranked institutions. The others are included in order to reflect institutions of different sizes and missions.

We spoke with directors of the programs; faculty members doing teaching, research, and outreach related to entrepreneurship; and students taking entrepreneurship courses. In addition to asking questions outlined above, we also asked directors and faculty what advice they would give others considering integrating their entrepreneurship programs. Among the nine universities examined, there

is considerable diversity in terms of the details of how programs are organized, but some common themes emerged.

Major Differences Between Magnet and Radiant Models

Definition of University-Wide

For magnet programs, becoming university-wide entails inviting students into the existing program, while for radiant programs it involves creating new, context-specific courses. Clearly the latter is more challenging from an administrative perspective, because creating new initiatives throughout the university involves finding champions at each independent site. By contrast, for magnet programs allowing enrollment in entrepreneurship courses to non-business and/or non-engineering students is a matter of convincing faculty and curriculum committees in a single location (or two at most).

Motivation for Spreading Entrepreneurship Across the Curriculum

For magnet programs, university-wide entrepreneurship helps expand existing initiatives and create a diverse group of students studying together. Such diversity can facilitate cross-disciplinary teams and a broadening of the perspective of participants in courses, which include students from other majors or programs.

Radiant programs share the goal of expanding the program through a university-wide approach. However, instead of gathering diverse audiences to a single site, radiant programs create context specific courses tailored to each major.

Curriculum Issues

The curriculum issues of the two approaches differ accordingly. When designing a course in a magnet program, it cannot be assumed that non-business students have the same depth of business education as students in business and/or engineering. Conversely,

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business students may lack knowledge that is standard for the non-business students in the class (for example, technology or science-oriented knowledge). Thus, the curriculum must be structured to “bring everyone up to speed” and to take advantage of the diversity of the audience.

In radiant programs, there is stronger homogeneity in terms of the base knowledge of students in entrepreneurship classes. For example, design students entering the entrepreneurship class in their major at Cornell share the same basic knowledge. The entrepreneurship faculty member is a design specialist and can focus more deeply on the industry and issues relevant to the career path of the students. In addition, if the students have a common gap in their knowledge of business practices (for example, finance and accounting), the faculty member can deal with the gap in a more uniform manner.

Discussion

Choosing the Right Model

It is important to review the differences between magnet and radiant models without judging one model superior to the other. The comparisons that emerged from analyzing the examples in this study simply help reveal differences and implications of choosing one model or the other.

Clearly the simplest strategy for creating a university-wide entrepreneurship program is to open up existing classes to non-business majors. Thus, the magnet model is the “fast track.” In addition, magnet models often create minors or specializations for non-business students, which consist of courses that already exist in the business school and may have unused capacity. A third strategy for magnet programs is to take advantage of situations where joint-degree programs already exist between the MBA program and others, such as Law or Science programs.

By contrast, radiant programs require more work to coordinate and launch. It is crucial to have faculty and alumni champions in the non-business fields. In addition, it is helpful to secure funding both for supporting faculty initiatives and support for program administration. Some programs have created incentives or mandates at

Table 2: Magnet and Radiant Programs Differ on Definitions, Motivation, Curriculum and Strategy.

	Magnet	Radiant
Definition of university-wide	Non-business students have access to certain entrepreneurially-oriented business classes	In addition to the business courses offered in the business school, <ul style="list-style-type: none"> ➤ non-business <i>faculty</i> creating courses outside the business program ➤ both business and non-business <i>students</i> are traveling to various academic units to take entrepreneurship courses
Motivation for university-wide focus	<ul style="list-style-type: none"> • Expand program beyond traditional business student audience • Desire to create a diverse population <i>within</i> classroom 	<ul style="list-style-type: none"> • Expand program beyond traditional business student audience • Desire to create a context-specific approach for non-business majors to study entrepreneurship within their own majors or fields
Curriculum Issues	<ul style="list-style-type: none"> • Coordinated course sequence, with general emphasis • Courses are structured to take advantage of heterogeneous backgrounds of diverse student body • Some pre-requisites 	<ul style="list-style-type: none"> • De-centralized curriculum with courses designed for each specific major • Courses structured for homogeneous population • Few (if any) pre-requisites

	Magnet	Radiant
Potential Strategies for Creating or Building the Entrepreneurship Program	<ul style="list-style-type: none"> • Open existing courses to non-business students • Create minors or specializations for non-business students • Create joint-degree programs, with entrepreneurship taught within the business school 	<ul style="list-style-type: none"> • Recruit faculty champions in non-business fields by <ul style="list-style-type: none"> ➢ directing funds in ways that support the mission of the faculty mission (teaching, research, outreach) and draw non-business faculty members (e.g. traveling professorships) ➢ creating clear and simple qualifications for faculty membership • Look for ways to align the self interest of deans, faculty and alumni • Recruit alumni leaders from non-business majors in order to create multi-disciplinary governing body • At university level, create incentives/mandates for students to require entrepreneurial course or experience during their undergraduate program • Secure funding to support program administration at the university level

the university level to encourage (or require) undergraduate students to take entrepreneurial courses (e.g., RPI). Others make extensive use of advisory councils to guide and help fund the program.

Institutions with magnet models face a marketing challenge in terms of programs outside the traditional boundaries. In addition, if the program is a multiple magnet, there is the challenge of coordination across independent centers. However, the benefits of diversity and exchange offered by magnet models are motivation to overcome the challenges. Another important benefit of magnet models is that from the viewpoint of academic credibility (an on-going struggle for entrepreneurship faculty) it may be easier to have a critical mass of entrepreneurship faculty, and therefore have a stronger intellectual community of peers. Another positive aspect for the business school is that entrepreneurship programs often create a larger alumni constituency loyal to the school.

Faculty in radiant models do not have the benefit of a critical mass of entrepreneurship interest within their own departments and therefore may face considerable skepticism of peers when teaching entrepreneurship classes or pursuing research related to entrepreneurship. A chemistry professor running a seminar on biotechnology and product development may have to justify the choice to his department and it is unlikely that publishing in entrepreneurship journals will be viewed favorably. This makes the entrepreneurship arena especially tricky for untenured faculty in radiant models. However, if programs can offer research support or teaching funds that help reduce the faculty's load (such as funding a research or teaching assistant) it can help deal with such issues.

On the benefits side, the radiant model has the highest potential for growth and reach within a university because students can find an entrepreneurship class located conveniently in their own majors. The teaching load is spread across the university and hence potential enrollment numbers can easily be in the thousands. Students also benefit from having the entrepreneurship class tailored to the aspect of entrepreneurship most relevant to their specific field (e.g., practice management for Veterinary school students). Both faculty and students in radiant programs benefit from the opportunity to collaborate with others across fields.

Fundraising is another arena in which radiant and magnet models differ. On the one hand, magnet models may find that many

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eligible donors are alumni from other fields, and therefore may not wish to pour resources into a school different from their own home department. The business school serving as a magnet may also be seen as competing for donors of other programs and thus inadvertently create pressure for building parallel programs in other fields. On the other hand, magnet models may be easier to explain to donors and other sources of funding (grants and contracts).

Radiant models are by nature messy. While a larger pool of donors may be available, coordinating the development effort across many schools within the university is clearly a challenge. On the other hand, radiant models are likely to provide a career-enhancing experience to students and hence breed high levels of alumni loyalty across the university.

How Should We Measure Success?

It is also important to realize that since radiant and magnet programs differ in terms of their *raison d'être*, that it may be appropriate to measure success in a distinct manner for each type of program. Magnet models with a very specific focus, for example business creation, may find it easy to point to measurable outcomes that occur in relatively short time frames. For radiant models, the goal may be to expose a wide variety of students to entrepreneurship and small business management, and thus it can be more difficult to gauge success. The impact of entrepreneurship on students may not be reflected in business startups, but rather in the longer-term skills and perspectives that enhance individual career choices (which include corporate, non-profit and other pathways).

Best Practices

In our discussion with stakeholders of various programs, we heard certain themes over and over again. For both radiant and magnet programs, a top success factor emerged: get buy-in from the top of the university and support for seeking donor funding. For magnet schools, it was considered critical to align the mission of the entrepreneurship program with that of the business (or engineering) school(s). For radiant programs the challenge is to convince deans of participating administrative units that membership in a

university-wide program can lead to specific benefits for his or her particular school or college. For the same reason, it was considered important to involve all units in governance of the entrepreneurship program. This cross-university support is especially critical in order to have collaboration in fundraising. Another important "best practice" in radiant schools is to find ways to reward and support non-business faculty, with particular sensitivity to incentives that are aligned with the specific promotion environment at the given institution.

Alumni advisory councils seem to play a key role in both magnet and radiant programs. For radiant programs in particular, it is especially important to have the membership of such a council reflect the multi-disciplinary nature of the program. Finally, while comments from those allied with magnet programs seemed focused on suggestions of how to bring students into the business school, those closer to the radiant model were more apt to mention the need to recruit and coordinate faculty from across the university.

Conclusions and Issues for Future Discussion

Developing a conceptual framework and studying entrepreneurship education in various settings has led us to three major conclusions. First, the movement toward university-wide entrepreneurship education is more widespread than we imagined, and the trend in this direction has considerable momentum. The second conclusion is that our conceptual framework is most useful as a guide to discussion, not as a means to quantify the precise number of existing programs in each category. In applying the framework to over forty examples we found it difficult to place each case firmly within a precise and specific category. Sometimes this difficulty was due to the changing nature of a university's program. In fact, during the life of this project, the organization and staffing of several of the programs evolved in ways that moved them from one category to another. Undoubtedly, for some universities on our list, we missed certain subtleties in the ways entrepreneurship education is organized. As a result, we may well have placed an institution's program in a category that is not an exact fit. In the end, we think it is less important to apply labels than it is to realize that there are several general pathways for promoting a university-wide dimension to

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entrepreneurship education. To put it another way, we consider the framework a tool for discussion rather than accounting.

Our third conclusion relates to the costs and benefits of choosing different pathways. Our observation is that while the radiant model of entrepreneurship education is extremely appealing to students, parents, and alumni, the magnet model is easier to administer, at least initially. The choice between radiant and magnet models of entrepreneurship education is not an easy one. At first, the magnet model appears simpler, cleaner and more easily sustainable. However, its success eventually leads to competition with the non-business (or non-engineering) academic units, both for students and for donors. As a result, there can be political resistance to keeping the entrepreneurial “win” in just one element of the institution. In turn, this can produce constant pressure to create parallel entrepreneurship programs specific to other (non-business) majors in an attempt to recapture students, alumni, and financial support. By contrast, a radiant model involves all stakeholders. Inevitably, a radiant program is a more complex organism in terms of academics, politics, and finances. Building a radiant program is a longer-term process because the program’s leaders must align the self-interests of individual stakeholders in order to move forward. Each academic unit must perceive that it can lay claim to the larger university-wide program while only making a modest local investment.

From an academic standpoint, the radiant model is difficult. Entrepreneurship classes in non-business majors have to be justified in terms of curriculum and faculty time. Justification depends on the importance given to linking education and preparation for the work world. Accepting that business education is intellectually valid and challenging is not a universally held concept across different majors. In universities where entrepreneurship is not viewed as rigorous outside business and/or engineering majors, it is likely that a magnet model will be easier and more practical to maintain.

Our study provides no pat answers in terms of which model is the best. Each institution must chart a course that makes the most sense in terms of costs and benefits to its stakeholders. This paper is intended to inform and stimulate healthy debate and serve as the beginning of what we hope will be useful and productive conversations on the theme of moving entrepreneurship across the curriculum.

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