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

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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 75% now have university-wide programs, most of which follow a magnet model. In interviews with stakeholders at sample institutions (some ranked, others not), 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 pathway of least resistance, and 4) While the magnet model is simpler to implement, it may lead to conflicts in the longer term because the benefits (in terms of flow of students and donors) may not be shared equally across the university.

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## **Part I. Entrepreneurship Education – it’s not just for business majors anymore**

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. Our goals are to: 1) provide an accurate view of the current state of entrepreneurship education by describing existing programs with meaningful terms and definitions, and 2) clarify the costs and benefits involved in pursuing a particular pathway toward university-wide entrepreneurship education.

### ***Background for the discussion***

#### ***Terms and definition***

The discussion that follows uses a variety of terms including program, centers, schools, universities, etc. The definitions below clarify our use of these terms:

- **universities, institutions** –used interchangeably to designate the highest level of organization, or the entire educational body
- **schools, colleges, academic units** –used interchangeably to indicate the next level of organization within universities, (e.g., School of Business, College of Engineering)
- **programs and centers** – used to indicate the unit of organization that embodies entrepreneurship within a university. The program or center may be inside or outside of the schools and colleges within an institution.

#### ***General Growth in Entrepreneurship Education***

Growth in educational programs focusing on entrepreneurship has been striking in the last decade. A prospective graduate or undergraduate student searching for a university with opportunities to study entrepreneurship will find about 655 such institutions listed at the Kaufman Center’s Resource center (<http://www.entworld.org>), most of them 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. For example, a survey administered by St. Louis University reports that in 1999 there were 271 endowed positions in U.S. colleges in entrepreneurship, up from 123 in 1994. Such endowed professorships provide an anchor for entrepreneurship education at universities, virtually assuring the continued teaching of the subject as long as the position is filled.

At the end of the 20<sup>th</sup> century, entrepreneurship programs continued to grow and gain legitimacy within the world of academics, although in many places the programs struggled to find legitimacy as a respected subject of study and research. The typical home for entrepreneurship programs has been in schools of business and/or engineering colleges. Undergraduates and graduate students studying business and undergraduates studying engineering have had increasing opportunities to study topics related to the entrepreneurial career track (as opposed to the corporate track).

### *The Appeal of Entrepreneurship*

Interest in entrepreneurship comes not only from those students who have a drive to create a business as soon as they graduate. Increasingly, students are interested in entrepreneurship regardless of their declared fields of study, because entrepreneurship classes are seen as serving long-term career goals. In other words, students increasingly understand the value, if not the necessity, of becoming **the sole proprietors of their own careers**. Whether they plan to practice a profession, become a leader in a corporation, run a not-for-profit organization, return to a family business or work in government, students see value in learning what is taught in entrepreneurship classes: opportunity recognition and analysis, leadership, teamwork, and creative problem-solving. The entrepreneurship education they gain while in college will enable them to be flexible and agile in the workplace.

The fundamental forces of globalization and information technology that began to transform our economy in the 1980s greatly accelerated the interest of individuals in becoming entrepreneurial. Regardless of future career plans, increasing numbers of students began to realize the importance of being able to think from an entrepreneurial point of view.

What is it about entrepreneurship education in particular that helps students become leaders, innovators and creative problem-solvers? From listening to educators and students around the country, we believe it is the fact that most programs are infused with experiential learning. Faculty teaching entrepreneurship routinely seek out ways to blend real world experiences with conceptual learning in the classroom. The entrepreneurship programs we studied abounded with examples, such as:

- Business plans written by students and presented to real world audiences
- Consulting courses involving students in working with small businesses
- Student involvement in product development teams
- Students helping to run venture capital funds
- Focused internships in small or entrepreneurially-run businesses

Recruiters increasingly look for entrepreneurially oriented students. For example, at Cornell University, recruiters from financial institutions and major consulting firms have sponsored special recruiting sessions for the undergraduate club in entrepreneurship. They expected to find students who have had experience seeking out opportunity and assessing risk, whether or not they have had a traditional business education. Students (including non-business majors) who have taken courses that include real world elements are seen as sentinels of change and opportunity. For parents, entrepreneurial education also has strong appeal. Courses relating

real world elements to conceptual learning signal a connection between education and the world of earning a living, which parents see as a competitive advantage for their children.

The experiential learning base of entrepreneurship education is also extremely appealing to alumni. Many alumni who desire to improve and enhance the programs from which they graduated are especially supportive to programs featuring courses that incorporate real world elements. Once in the working world (whether practicing medicine, doing free-lance art, running a consulting practice, doing marketing for a large firm, or other activities) alumni suddenly have what we would call their “teachable moment” -- the urgent need to add business acumen to their other core competencies. Most deal with the problem by learning on the job, but looking back at their own educational institutions, they are interested in ways they might help students have that “teachable moment” much earlier. Alumni see entrepreneurship classes as having the applied focus that can achieve this goal.

### ***Impetus towards university-wide programs***

Although at first entrepreneurship education found itself anchored firmly in business and/or engineering schools, gradually interest in entrepreneurship began to emerge from individuals outside those two fields. Beginning in the mid 90s, rapid growth in numbers of new companies and the highly publicized "dot.com" phenomenon marked an important change in the economic environment, signaling the resurgence of entrepreneurial spirit as an authentic and important American value. The spread of Internet-based businesses, characterized by quick start-ups and low overhead, made self-employment appear more accessible to increasing numbers of Americans, including those who were not specifically trained in business.

As a result, entrepreneurship programs that started in the early 90s began to flourish at the turn of the millennium. Pressure was felt at the graduate level to create e-commerce or e-management programs and other related topics for MBA candidates. Furthermore, due to the fact that many of the champions of the New Economy were under the age of 30, both undergraduate and graduate students became more and more interested in learning about aspects of business start-ups. For example, Jerry Yang was only 26 when he and friend David Filo, then 28, co-founded Yahoo! while graduate students at Stanford. They have managed to maintain and build their site to serve an exploding audience, growing the company \$11 billion by 1998. Despite the more recent phenomenon of the failure of many dot.coms (now called “dot.bombs”), Yahoo remains an icon for those who believe a couple of kids in a dorm room, armed with technology and chutzpah, can make it big in the U.S. economy.

Thus, both donor-driven and demand-driven influences have signaled universities to foster entrepreneurship education. Furthermore, the recognition that the New Economy included entrepreneurial students from a wide variety of majors led academic policy-makers to broaden the reach of entrepreneurship education in response to the demands of students throughout their universities.

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 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 currently many small business owners have little or no formal business education.

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 different majors, university-style 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. At some institutions, moving toward a university entrepreneurship program consists of drawing students from non-business fields into the orbit of the business school in order to educate students in an entrepreneurship classroom characterized by diversity. For others, a university-wide approach consists of having the lessons of entrepreneurship presented from within a specific field, providing a message specifically relevant to the field itself.

### *Focus of this paper*

Compared to many other academic programs, entrepreneurship programs are relatively young and have experienced considerable growth in just 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 programs<sup>2</sup> 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
3. Use the framework to further analyze a selection of entrepreneurship programs currently identifying themselves as university-wide. In particular, we want to discuss how models differ in terms of:
  - Motivation for becoming university-wide
  - Strategies used to create the program
  - Challenges in gaining academic legitimacy
  - Measurable outcomes of pursuing an integrated approach

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<sup>2</sup> 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), **National Consortium of Entrepreneurship Directors** (annually publishes a compendium of programs), **St. Louis University** (lists entrepreneur programs in U.S.), **Success Magazine** (ranks top business schools for entrepreneurs annually), or **U.S News and World Report** (ranks undergraduate programs annually).

4. 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.

## Part II. 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 faculty, 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, Columbia, Duke, Harvard and University of Maryland.

Among focused programs, we can further subdivide programs according to the location of the focus. Theoretically, one could consider all seven possible permutations as shown in the following list:

1. MBA only
2. MBA & UGB
3. MBA&ENG
4. MBA&UGB&ENG
5. UGB only
6. UGB&ENG
7. ENG only

(Abbreviations: MBA=MBA programs, UGB=undergraduate business programs, ENG=engineering programs)

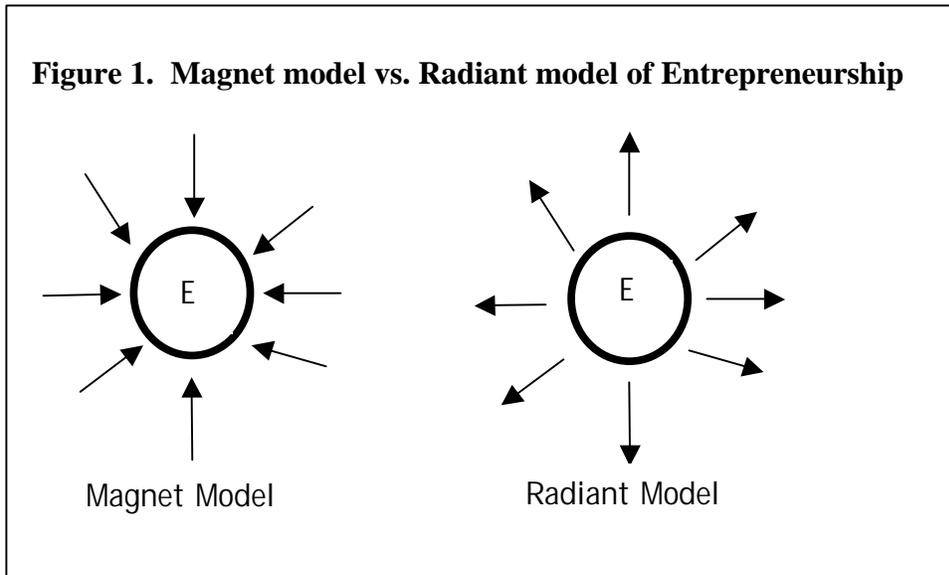
However, in practice, of the above configurations, we only found examples of 1,2, and 4. In other words, having entrepreneurship classes in the graduate school of business seems to be a necessary pre-requisite of a focused program. In addition to educating MBA students in entrepreneurship, courses also may be targeted to undergraduates in business and/or engineering students.

In contrast, **university-wide** programs target students beyond the business and engineering fields. For example, university-wide programs may include courses aimed at those in arts and sciences, or in physical sciences. Examples of university-wide programs include Babson, Cornell, MIT and Stanford. In such institutions, there is a desire to extend the opportunity for entrepreneurship education to all students whether or not they are majoring in business or engineering. However, there are various approaches to infusing the entire university’s curriculum with 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. For example, 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 1, this can be seen as what we will call the **magnet model** (e.g., MIT) where classes in entrepreneurship are offered by a single entity (The Sloan School of Management) but attended by 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).

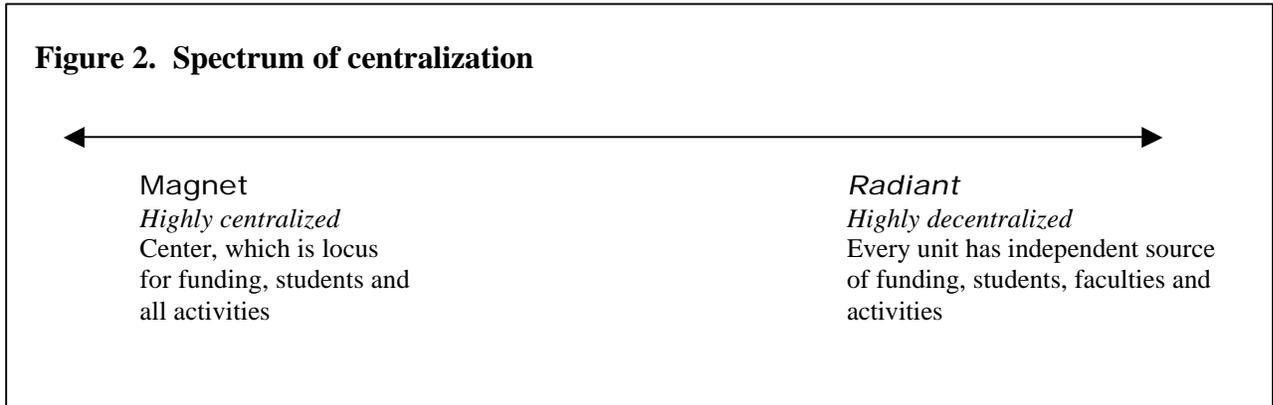


However, the simple approach shown in Figure 1 fails to reveal some important nuances and variations in how programs work. The question of location, or where the program finds its center of gravity, is actually determined not only by where courses are offered, but also by where the money, faculty and students are located. In fact, we can think about the location of the following elements as being crucial to understanding any given entrepreneurship program:

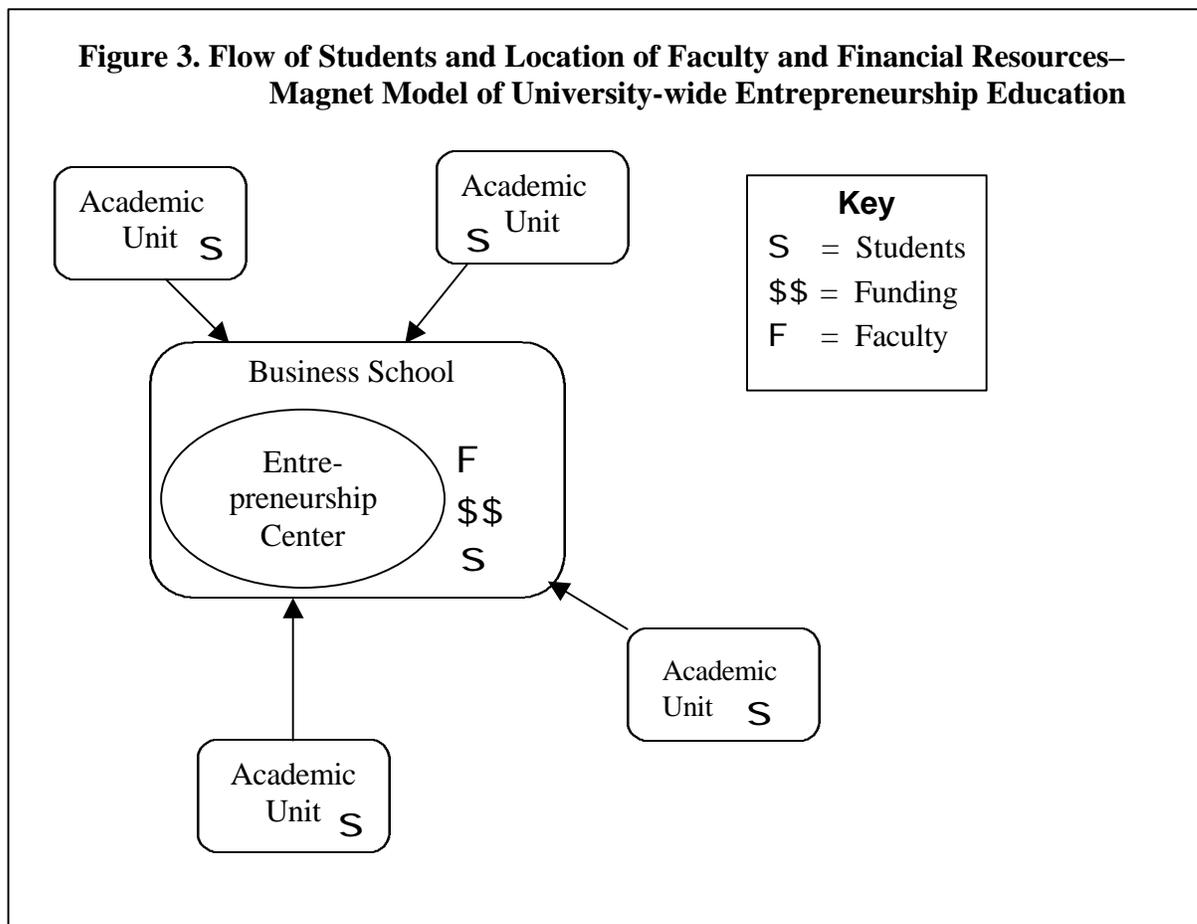
- Funding
- Administrative infrastructure
- Faculty
- Teaching Activities (including courses, internships, special lecture series, etc.)
- Students
- Research Activity
- Outreach Activity
- Alumni Activity

It is not a given that all of these elements are located in any one place in the university. 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 consider a spectrum 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 (see Figure 2).

**Figure 2. Spectrum of centralization**



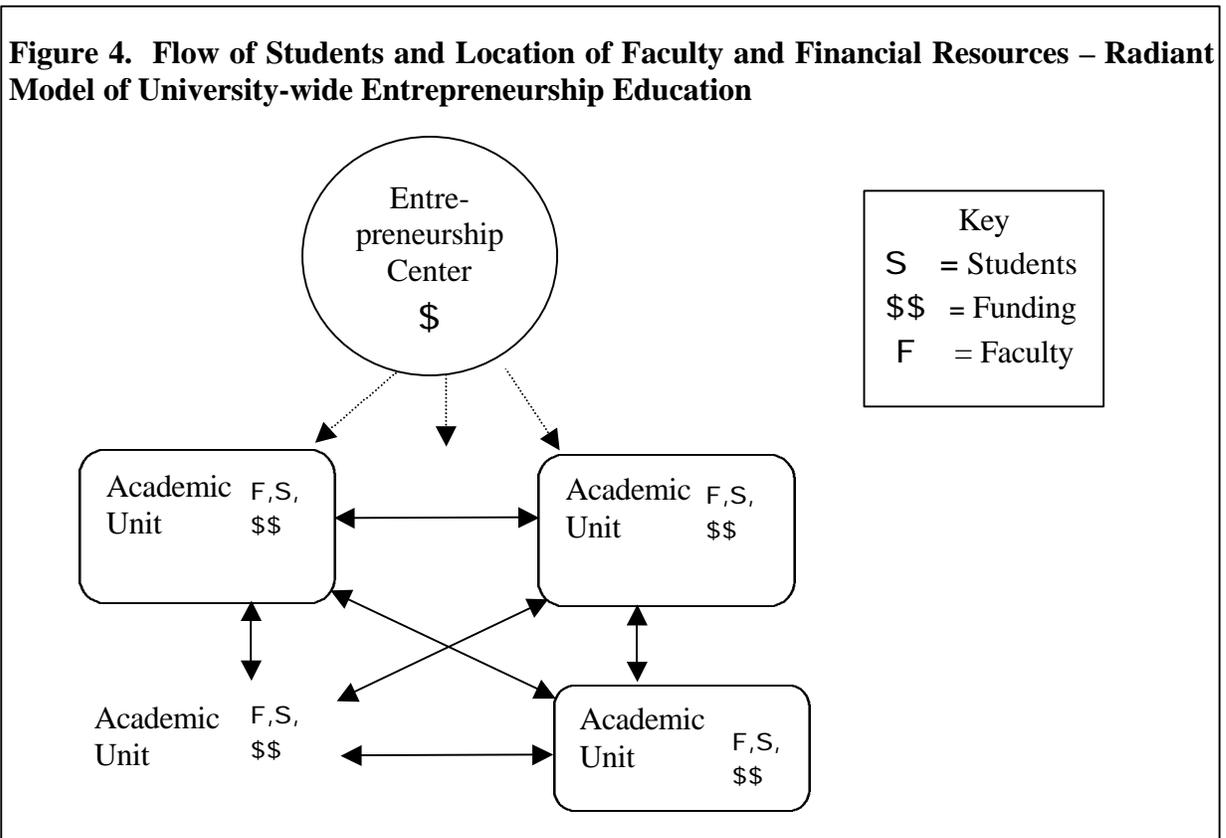
If we look specifically at the funding, the flow of students, and the interaction between and among faculty, there is a pattern at each end of the spectrum. As shown in Figure 3, in what we will call the pure Magnet Model, the administrative office, the faculty, and



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 (see Figure 4), 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. For example, 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

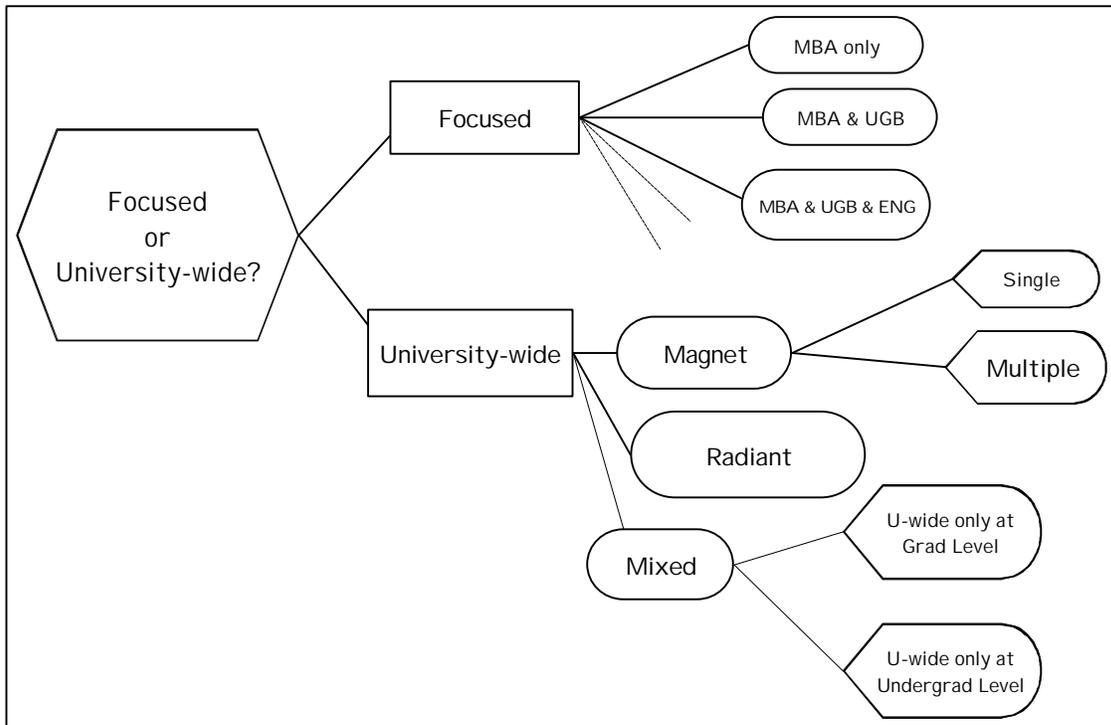
students. Notwithstanding these variations, the basic framework is helpful in illustrating a key difference in approaches to creating a university-wide program. For those universities closest to the magnet model, “university-wide” means **non-business students** have access to certain entrepreneurially 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.

### *Summary*

We can summarize the discussion above, by creating a method of classifying programs as shown in Figure 5. 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 is to determine just what combination of programs are involved in the entrepreneurship program. If the program is intended to infuse the institution with entrepreneurship education, we call it a **university-wide** program.

The next step in classifying the program is to 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 within various academic units (not just business and engineering), then the program can be 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 5, we can classify every program. We now turn to applying this framework to existing programs.

**Figure 5. Classifying Entrepreneurship Programs**



## Part III. 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 highly visible, ranked programs (including both **focused** and **university-wide** models) and then 2) a more detailed look at nine university-wide institutions in particular (both **magnet** and **radiant** models), including some universities with programs that are unranked but offer additional 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 included in either or both rankings are shown alphabetically in Appendix 1, (pp. 34-36) along with information about what options are open to students interested in entrepreneurship education. 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 courses. Over half also offer some sort of concentration in entrepreneurship, be it a Career Path (Babson), an emphasis (Baylor), a track (DePaul and others) or a major (NYU and others). At five of the universities (Chicago, Harvard, Illinois-Chicago, Northwestern 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. Only 3 universities offer a specialization to engineering students (Cornell, RPI, USC), but 21 have courses open to engineering students<sup>3</sup>. In the case of undergraduate business majors, 15 offer some type of major out of the 28 universities where classes are available to the major<sup>4</sup>.

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<sup>3</sup> Five of the 38 universities do not have an engineering program: Babson, Bentley, DePaul, Indiana, Georgia, . Babson is currently working on forging ties with the newly created Franklin W. Olin College of engineering, a stand-alone independent engineering college.

<sup>4</sup> Three of the institutions have no formal undergraduate business major (Duke, Harvard, Stanford).

About 60% of the programs recruit non-business/engineering students to take entrepreneurship courses, if you include both graduates and undergraduates. But only 7 institutions currently have any courses in entrepreneurship that are housed and taught outside the graduate school of management (e.g., Colorado, Cornell, DePaul, Duke, Indiana, NYU, RPI). RPI plans to infuse courses in other majors with entrepreneurship in the fall of 2002, including creating a specialization in its new engineering program. Cornell has the broadest offerings in terms of courses outside the graduate and undergraduate business programs (e.g., Entrepreneurship in Chemical Enterprise, Designers as Entrepreneurs, and Entrepreneurship and Organizations).

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. For example, 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 is a display of where each institution seemed to best fit the framework presented in this paper.<sup>5</sup> Figure 6<sup>6</sup> shows how the 38 universities are categorized in terms of the framework presented in Figure 5.

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5 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.

6 At each step of the tree, the percentages in parentheses represent the proportion as compared to all other branches at that step of the tree (not as compared to all 38 programs).

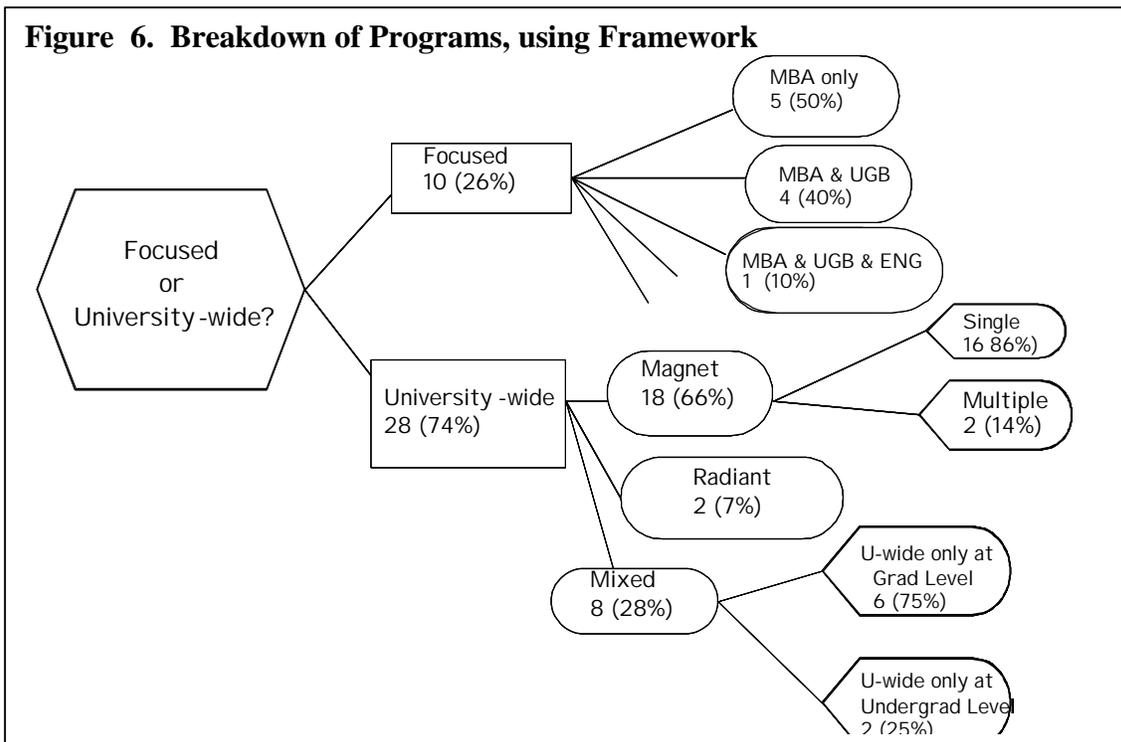
**Table 1. 38 Ranked Universities by Category of Entrepreneurship Programs**  
**(Based on 2000 Rankings by Success Magazine and U.S. News & World Report)**

Focused Programs			University-Wide Programs			Mixed Programs	
MBA Only	MBA & UGB	MBA & UGB & ENG	Magnet - Single	Magnet - Multiple	Radiant	(Focus/U-wide)	
Chicago Harvard Illinois-Chicago Northwestern Wake Forest	Ball State Loyola Marymount Pennsylvania San Diego State	Louisville	Arizona Babson Baylor Bentley Carnegie Mellon Case Western Columbia (G)* DePaul Georgia Indiana Maryland MIT North Carolina-Chapel Hill St. Thomas UCLA (G) USC	Duke Stanford	Cornell RPI	<u>U-wide at Undergrad</u> South Carolina Wisconsin -Madison  <u>U-wide at Grad</u> California-Berkeley Colorado Michigan New York Texas Virginia	
Total number (% of category)	5 50%	4 40%	1 10%	16 80%	2 10%	2 10%	8 100%
Total (% of total)	10 26%			Total (% of total)	20 53%		8 (% of total) 21%

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

## Issues in Categorizing Institutions

One important caveat to the discussion that follows is that while the classifications of some institutions are the unambiguous (e.g. Cornell is radiant, MIT is magnet), other universities are in transition. For example the University of Pennsylvania has courses and programs in the development stage that could move it to the category of magnet program. UCLA is exploring new joint initiatives with the graduate program in Education. 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 Figure 5 are simply a snapshot of an evolving entrepreneurship education field. 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. Therefore Table 1 and Figure 6 show a conservative picture of movement towards university-wide models of entrepreneurship education in the sample institutions.



### *Focused programs*

Ten of the programs (26%) in selected institutions can be categorized as purely focused programs. (Universities with mixed programs are discussed in the next section.) Most of the universities in this category have programs that focus on the business school, with five programs for MBA students only and 4 including both MBA students and undergraduate business majors. Only one (University of Louisville) includes entrepreneurship classes for MBA, undergraduate, and engineering students.

### ***University Wide – Magnet, Radiant, and Mixed***

Of the remaining 74% of the ranked institutions, 16 have programs that fit magnet or radiant models and 8 are mixed programs (with part of the university following a focused approach and the other taking a university-wide approach).

The intensity of the effort to make entrepreneurship university-wide varies greatly. Many business schools allow outside students to take entrepreneurship classes, which is a relatively passive approach to creating a university-wide program. Others have courses specifically designed to attract other majors and aggressively recruit non-business students. For example, the entrepreneurship program at University of Maryland includes a 4-course (12 credit) sequence explicitly for non-majors. In such classes, 60% of the enrollment must consist of non-business students. Non-business students who complete the sequence are awarded a citation in entrepreneurship.

In other cases, it is clear that certain non-business programs have collaborated with the graduate school of management to create entrepreneurship experiences for non-business majors. Most often mentioned were Law, Medicine (e.g., Case Western Reserve, UCLA), but other institutions include additional fields. One interesting case is University of Arizona, where entrepreneurship classes are offered to students in Science, Medicine, Agriculture, and Mexican, Latin and Native American Studies. Another example of collaboration is UCLA, where the management school is working with the Education Department on a new center to examine entrepreneurial educational initiatives.

### ***Magnet Programs***

About 58% of the university-wide programs are magnet programs, and most of those are single magnet. At the graduate and undergraduate levels, magnet programs are drawing students from across a broad range of majors.

Duke and Stanford have programs that are multiple magnets. For example, at Stanford, entrepreneurship has emerged in three separate centers: Stanford Venture Partners Program (anchored in the Engineering School), the Center for Entrepreneurial Studies (anchored in the Graduate School of Business), and the Program in Law, Science and Technology. In addition, there are a variety of technology transfer entities, such as the Stanford Medical Device Network. A special task force coordinates the independent activities of the various groups. Duke University, which has three separate centers, is currently exploring ways to bring these together in a more cohesive structure. Two issues that emerged in studying multiple magnets were: 1) the difficulty of coordinating programs across various centers and 2) the challenge of communicating each entity's specific function to students, faculty, the university, and the community at large.

### ***Radiant Models***

If we consider the 28 institutions providing university-wide entrepreneurship programs using the framework presented above, only 2 (Cornell and RPI) fit the radiant model (note that in

mixed models, the university-wide element is a magnet type). This may be an indication of the difficulties of building and maintaining a radiant model.

### *Mixed Models*

Eight institutions with a university-wide dimension are what we called mixed models. Six have a university-wide program on the graduate side (California-Berkeley, Colorado, Michigan, New York, Texas, Virginia) and two are university-wide only at the undergraduate level (South Carolina, Wisconsin-Madison).

### *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.

After examining the ranked institutions, we are still left with many questions, including:

- Why have programs chosen to become university-wide?
- 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 experienced in becoming integrated and how have they overcome the barriers?
- Are university-wide programs experiencing measurable positive outcomes?

To answer these questions, it is necessary to look more carefully at the views of stakeholders in entrepreneurship education. Toward that end, the next section of this paper reports our findings from a more in-depth look at university-wide entrepreneurship programs.

## **Part IV. Views of Stakeholders in University-wide Programs**

To gain a deeper understanding of university-wide entrepreneurship programs, we interviewed stakeholders at nine institutions. Four were selected from the 38 ranked schools described in Part III. 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. We sought to include institutions of various sizes and in different positions on the spectrum shown in Figure 2. We talked to stakeholders in both magnet and radiant programs as well as several who are in transition from a magnet to a radiant approach.

### ***Magnet***

We chose three institutions with magnet programs:

- Lehigh University
- MIT
- Northern Kentucky

MIT is considered a classic and well-known magnet model. It is representative of magnet models in many of the ranked institutions. We added Lehigh and Northern Kentucky to include a range of sizes and emphases.

### ***Radiant***

We chose two institutions with radiant programs:

- Cornell
- Iowa State

Cornell is unique among the ranked institutions because it is clearly a radiant model that is structured quite differently from other entrepreneurship programs. Examining other sources and consulting experts, Iowa State emerged as an institution with a similar approach to offering entrepreneurship education across the curriculum. RPI, although listed as radiant in Table 1, is actually an institution in transition for purposes of this part of our analysis.

### ***Transition***

Each of these universities have recently announced new initiatives intended to move their university-wide entrepreneurship programs from a magnet model to a radiant model:

- California State-Fresno
- RPI
- George Mason
- Northeastern University

Of these four, only RPI is among the ranked institutions. The others are included in order to reflect institutions of different sizes of programs that are emerging.

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

### ***Overview***

As can be seen in Appendix 2, Tables 2-a, 2-b, and 2-c, the nine selected institutions cover a range of sizes and emphases. Among the nine universities examined, there is considerable diversity in terms of the details of how programs are organized, but some common themes emerged. We have organized the discussion of the themes by the three categories (magnet, radiant, transition).

### ***Motivation and strategies for choosing a university-wide emphasis***

#### ***Magnet programs: MIT, Lehigh, Northern Kentucky***

For all three institutions, motivation for the university-wide emphasis seems to come from the belief that non-business students can benefit from receiving entrepreneurship education from the business school. For example, Dr. Rebecca White, director of Northern Kentucky's program (the Fifth Third Bank Entrepreneurship Institute) says, "We recognized that creative ideas and entrepreneurial efforts don't come just from business majors." A related goal, according to Dr. White, is to bring together a diverse group of students for the study of entrepreneurship. Accordingly, instead of creating specialized classes for each major, Northern Kentucky's entrepreneurship program brings business and non-business students together and creates synergies by mixing together different backgrounds.

A similar focus is reflected in the other magnet programs. For example, the mission statement of the MIT Entrepreneurship Center is to "inspire, train and coach new generations of entrepreneurs from all parts of MIT." At Lehigh University, the magnet model is manifested in the Musser Center for Entrepreneurship, which provides access to entrepreneurship courses to both undergrads (who can specialize in entrepreneurship) and graduates (who can design an interdisciplinary program to fit their needs.)

To implement a university-wide focus, the major strategy of magnet programs is to open enrollment in business classes to non-majors. Most of the business courses related to entrepreneurship have a general focus (business planning, new ventures, global entrepreneurship) rather than any particular disciplinary emphasis, and do not have any prerequisites, such as marketing or accounting. Thus, there is broad access to introductory classes on new ventures for students from other (non-business) departments. In addition, students can specialize or minor in entrepreneurship, if they wish to add such a credential to a non-business resume.

### *Radiant Programs: Cornell, Iowa State*

Stakeholders from radiant entrepreneurship programs expressed a motivation similar to the magnet programs, acknowledging the broader need for entrepreneurship education. For example, this is expressed in the vision for Cornell's Entrepreneurship and Personal Enterprise Program, "... create a diverse, university-wide program that finds and fosters the entrepreneurial spirit in every Cornell participant – from every college, every field, and every stage of life."

However, the manifestation of the university-wide emphasis is different in the radiant programs as compared to the magnet programs. The PappaJohn Center for Entrepreneurship, while located in the College of Business at Iowa State, is the home of a program that has courses in each of the university's eight schools and colleges. Ms. Judi Eyles, Assistant Director, points out that these may be standing courses that are changed to include an entrepreneurial aspect. For example, a horticulture class may be transformed into a course on starting your own greenhouse.

Radiant models are driven by the belief that entrepreneurship education is most effective when linked to a student's own discipline. At Cornell, Veterinary students study practice management, while students in the College of Human Ecology focus on family business, and human resource management in entrepreneurial firms is taught in the College of Industrial and Labor Relations. As in the magnet programs, some generic entrepreneurship classes are offered and both business and non-business majors can specialize or minor in entrepreneurship in radiant programs. But unlike the magnet programs, radiant programs also include courses which are much more context specific. For example, course titles include specific emphases such as: "Entrepreneurship and Chemical Enterprise," "Entrepreneurship for Designers," and "Small Business Law Clinic." While most courses in the radiant program are open to students from all schools and colleges, the expectation is that courses located outside the graduate and undergraduate business majors will be especially appealing to students in a particular non-business discipline.

How did the radiant program at Cornell evolve? Previous to the establishment of the university-wide model at Cornell in 1992, parallel programs in entrepreneurship had emerged in various parts of the university. In the 1980s two endowed chairs were created: the Don C. Berens Chair the Johnson Graduate School of Management (JGSM) (1980) and the Bruce F. Failing, Sr. Chair (1990) in the undergraduate business program, located in the College of Agriculture and Life Sciences (CALs). Interestingly, although the Berens chair was established to serve MBA candidates, it included the explicit directive that entrepreneurship courses taught by the chair holder have a parallel course offered to **undergraduates** as well, perhaps making Cornell the very first **magnet** model in the country.

In 1992, the deans from Cornell's JGSM and CALs agreed to combine forces for a university-wide approach to entrepreneurship education and in 1995, the Kinzelberg Engineering Program was established, adding a third endowed position. The mechanism for involving faculty beyond the three initial schools was a rotating endowed professorship, funded by the Thomas and Nancy Clark Family and awarded on a competitive basis as limited-term renewable positions. As a result, all nine of Cornell's schools and colleges now participate in

the program and while the magnet courses in JGSM continue to thrive, the university-wide approach has moved toward the radiant end of the spectrum.

What the Cornell and Iowa State experiences illustrate is that in order to infuse entrepreneurship education across the curriculum in the radiant style it is necessary to have faculty champions and the potential to locate resources in each participating school. An equally important requirement is that integration and coordination must be a goal of the leaders at the highest level of leadership.

### ***Transition Programs: Northeastern, RPI, George Mason, and California State-Fresno***

The motivation for moving to a university-wide emphasis among transition institutions is similar to that of the magnet and radiant models: the desire to extend entrepreneurship education outside the traditional audiences of business and engineering students. It is interesting that in almost every case, the move to a more radiant-style program is linked in some way with new funding. For example, RPI's Severino Center for Technological Entrepreneurship received a \$1M gift to infuse entrepreneurship education throughout the curriculum, with the ambitious goal of creating a general curriculum requirement in entrepreneurship. At Northeastern, new funding has inspired the creation of a virtual school for entrepreneurship studies, linking business, engineering, and computer science.

The institutes in transition have pre-existing programs focused on business students, but are now moving away from a model centered in the business schools. For example, at California State-Fresno, the new Center for Innovation and Entrepreneurship will be moved out of the business school and has the aim of becoming "a stamp on many different degrees." Likewise at George Mason, the Mason Enterprise Center is evolving to meet its challenge: "...to link entrepreneurship to every academic program at the university." The transition involves making the whole university, rather than just the business school, the support structure for entrepreneurship-related activities.

The strategies for infusing entrepreneurship education across the curriculum include creating high-level steering committees that have an interdisciplinary membership (RPI) and creating courses outside the business program (California State-Fresno). Thus, the institutions in transition illustrate programs that have had a traditional home in business schools and are now trying to involve non-business students and faculty in entrepreneurship education. According to William Stitt, Director of the Center for Technological Entrepreneurship at RPI, the move to university-wide entrepreneurship education is not as easy as creating one class being taught to all freshmen. Instead, at RPI the plan is to incorporate entrepreneurship education into freshmen activities and orientation workshops. In addition they hope to infuse entrepreneurship education throughout the curriculum by including it as a part of the coursework in many different classes. Another idea under consideration is to make a requirement that all students attend a certain number of events or activities related to entrepreneurship.

## ***Challenges and Benefits of the University-Wide Program***

### ***Magnet Programs***

For magnet programs, a key challenge is to spread the word that entrepreneurship programs are accessible and appropriate for non-business majors. In some cases, such as MIT, the university culture is that all students have access to courses throughout the institution. Dr. White, director of Northern Kentucky's program, mentioned that they had to make an effort to get the word out on campus. She started by working with faculty in a popular degree program (construction) to create a degree in entrepreneurial construction management. At Lehigh, graduate students are allowed to design interdisciplinary programs, a policy that led to the creation of an integrated business and engineering program. From a curriculum standpoint, the magnet model also faces the challenge of creating courses for non-business majors that do not have onerous pre-requisites.

Meeting the challenges seems well worth it to those we talked with from universities with magnet programs. A critical mass of faculty interested in entrepreneurship within the graduate school of management can lead to enhanced credibility for the research dimension of the program. Having a magnet model also leads to a clear focus during fund raising from alumni and recruiting for new faculty. Opening entrepreneurship classes to non-business students is seen as a way to increase the connections between graduate business schools and the rest of the university.

### ***Radiant Programs***

Conversations with stakeholders at radiant-type programs yielded slightly different perspectives. Challenges seem to relate more to coordination. At Cornell, for example, a wide range of entrepreneurship courses has emerged from nine different schools and colleges. For example, veterinary students study practice management, while students in the School of Human Ecology focus on family business issues. Each course fits into the curriculum of the relevant academic unit, but there is not yet a clearly defined pathway through all the courses. In addition, Director John Jaquette works with nine different deans as part of the governing structure of the entrepreneurship program. The decentralized nature of the benefits makes it challenging to raise money for a centralized program.

Dr. David Hunger, a faculty member in Iowa State's entrepreneurship program points out that it is also hard to get faculty buy-in. In addition, he pointed out the challenge of teaching to non-business majors, since you need to assume they have no background in the basics of accounting, finance, and marketing. Some colleagues may not view entrepreneurship courses as "academic enough" but he emphasizes that it is important for entrepreneurship courses to be taught by permanent faculty members (not only practitioners or temporary appointments) so that the field can grow and gain academic credibility. Special incentives for faculty seem to be an important tool for radiant programs. For example, Cornell's program has rotating endowed faculty positions as a way to encourage and attract prospective faculty in non-business fields to become involved in teaching entrepreneurship.

Overcoming the challenges in the radiant models yields a variety of benefits. Director Jaquette points out that at Cornell, there is collaboration in teaching, research and outreach as a result of the entrepreneurship program. "When top leaders at Cornell observe the Roundtable Meetings of the entrepreneurship faculty – they ask me: How do you get so many

diverse faculty to meet and talk with each other on a volunteer basis?” Having a university-wide program has attracts faculty with interdisciplinary interests and also provides a fertile environment for sharing and collaboration.

From the student’s perspective, the major outcomes are the availability of entrepreneurially focused courses that fit inside one’s own major. In addition, James Zehr, a student in Iowa’s program, points out that taking entrepreneurship classes encouraged him to take calculated risks even outside his own core expertise.

### ***Transition Programs***

Programs moving toward a radiant model of entrepreneurship education echo some of the challenges and benefits voiced by those in radiant programs. For example, at California State-Fresno, Dr. Bob Hill, Edward M. Heighard Chair of Entrepreneurship, reiterated some of the problems coordinating across academic units when it comes to funding, managing credits, and hiring and promoting faculty. “There are also, as always, the politically-charged cross-campus moats to be bridged.” At RPI, Director Mark Rice<sup>7</sup> identified the biggest challenges as “organizational inertia and rigidity.”

Because they are trying to attract non-business faculty, universities with programs in transition are especially aware of the “credibility issues” related to entrepreneurship among academics. William Stitt, Director of the Center for Technological Entrepreneurship at RPI puts it this way: “it’s not one big happy interdisciplinary band. There are all kinds of strong pressures within the academic background to stay in your silos.” He sees the challenge as convincing research-oriented faculty that entrepreneurship is a credible field. “At a university, lots of research is pursued by drilling a deeper hole, not by trying to connect a bunch of things.” He sees entrepreneurship education as more of a process of connecting things rather than becoming specialized.

Transitional programs have already started yielding successes as their students benefit from the interdisciplinary settings. For example, at Northeastern, teams of undergraduates with science and business backgrounds are now working together to submit plans to the business plan competition. Dr. Lei Yu, a student in Northern Kentucky’s program and also a professor at University of Cincinnati Medical School said, “Being an academic, I’m familiar with the need to do basic research. But what I and many of my colleagues have felt is the need to bridge the somewhat disconnect between knowledge expanding from biomedical research at academic institutions and drug development.”

When institutions feature entrepreneurship classes in non-business programs, it broadens the reach of the program and offers an easy entry point for students. In addition, it lowers barriers between different fields for faculty. For example, cross-disciplinary research is starting to emerge at California State-Fresno as a result of the university-wide approach to entrepreneurship. In addition, leaders at RPI believe that moving to a radiant model of entrepreneurship education has greatly increased the number of faculty involved since 1985.

### ***Discussion***

After examining both the big picture and individual cases, some interesting insights emerge regarding the university-wide approach to entrepreneurship education.

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<sup>7</sup> At the time of our interviews, Mark Rice was the Director of the Severino Center for Technological Entrepreneurship at RPI. He is now the Dean of Babson College’s Graduate School of Management.

### ***Major differences between magnet and radiant models***

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. Table 3 summarizes many of the differences between the two 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, 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.

**Table 3. Summary of Results**

	<b>Magnet</b>	<b>Radiant</b>
<b>Definition of university-wide</b>	<b>Non-business students</b> 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"> <li>➤ <b>non-business faculty</b> are creating courses outside the business program, and</li> <li>➤ both business and non-business students are <b>traveling</b> to different academic units to take courses</li> </ul>
<b>Motivation for university-wide focus</b>	<ul style="list-style-type: none"> <li>• Expand program beyond traditional business student audience because of realization that many non-business students will eventually be involved in created businesses</li> <li>• Desire to create a <b>diverse population</b> within classroom</li> </ul>	<ul style="list-style-type: none"> <li>• Expand program beyond traditional business student audience because of realization that many non-business students will eventually be involved in created businesses</li> <li>• Desire to create a <b>context specific</b> environment for non-business majors to study entrepreneurship</li> </ul>
<b>Curriculum issues</b>	<ul style="list-style-type: none"> <li>• <b>Coordinated</b> course sequence, with general emphasis</li> <li>• Must structure courses to take advantage of <b>heterogeneous</b> backgrounds of diverse student body</li> <li>• Some pre-requisites</li> </ul>	<ul style="list-style-type: none"> <li>• <b>De-centralized</b> curriculum with courses designed for each specific major</li> <li>• Few (if any) pre-requisites</li> </ul>
<b>Strategies for Creating Program</b>	<ul style="list-style-type: none"> <li>• <b>Open courses</b> to non-business students</li> <li>• <b>Create minors</b> or specializations for non-business students</li> <li>• Create <b>joint-degree</b> programs, with entrepreneurship taught in the business school</li> </ul>	<ul style="list-style-type: none"> <li>• Recruit <b>faculty champions</b> in non-business fields</li> <li>• Recruit <b>alumni leaders</b> from non-business majors</li> <li>• Look for ways to <b>align the self interest</b> of deans, faculty and alumni</li> <li>• At university level, create incentives/mandates for students to <b>require entrepreneurial course</b> or experience during their undergraduate program</li> <li>• Create <b>multi-disciplinary governing body</b></li> <li>• <b>Secure funding to:</b> <ul style="list-style-type: none"> <li>➤ fund non-business faculty develop entrepreneurial components</li> <li>➤ support program administration which supports the alignment of</li> </ul> </li> <li>• Create clear and simple qualifications for faculty membership in the program</li> </ul>

**Table 3. Summary of Results**

	<b>Magnet</b>	<b>Radiant</b>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• <b>Marketing availability and value</b> of entrepreneurship courses to the rest of the university</li> <li>• Gaining <b>credibility in research</b> arena</li> <li>• With a defined faculty, <b>growth is limited</b></li> <li>• Draws alumni only to one affiliation, thereby creating pressure to <b>create parallel</b> programs in other schools</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Coordination</b> across the various disciplines involved in the program (curriculum, fundraising, etc)</li> <li>• <b>Communicating</b> the univ.-wide model to stakeholders</li> <li>• Gaining <b>credibility in research</b> arena</li> <li>• <b>Maintaining a secure foothold in non-business</b> units (often depend on a single faculty and so his/her departure can be especially damaging)</li> <li>• Getting <b>faculty buy-in</b> (due to academic credibility issues)</li> <li>• Dealing with <b>rigidity and inertia</b> of university/academic units</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• <b>Easiest</b> to establish and maintain</li> <li>• <b>Critical mass</b> among faculty leads to credibility in entrepreneurship research arena</li> <li>• Creates a <b>clear target</b> for giving opportunities</li> <li>• <b>Diversity</b> of students drawn to classes</li> <li>• For the <u>business school</u>, builds <b>larger constituency</b> loyal to the school</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Broader reach</b> because students can easily find an entrepreneurship class in their own major</li> <li>• <b>Context-specific training</b> for non-business students</li> <li>• <b>Collaboration</b> among faculty across academic units</li> <li>• <b>Collaboration</b> among students across academic units</li> <li>• Potential for appeal to a <b>broader group of alumni</b></li> <li>• For the <u>university</u>, students become <b>more loyal</b> because they have a career-enhancing experience</li> </ul>
<b>Measuring Success</b>	<ul style="list-style-type: none"> <li>• Depending on focus, can look at measurable outcomes in short time frames (e.g. business creation)</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to measure; more likely to be reflected in longer term career outcomes of diverse alumni population</li> <li>• Creates difficulty in current national ranking systems because difficult to enumerate faculty resources</li> </ul>
<b>Best Practices for Program Management</b>	<ul style="list-style-type: none"> <li>• Get buy-in from the top of the university and support for seeking donor funding</li> <li>• Coordinate mission/goals with those of the business school</li> <li>• Use alumni advisory council strategically</li> <li>• Seek ways to take advantage of the diversity resulting in bringing other students into the business school</li> </ul>	<ul style="list-style-type: none"> <li>• Get buy-in from the top of the university, but seek donor funding</li> <li>• Find ways to reward and support non-business faculty</li> <li>• Diversify the alumni advisory council to reflect the multi-disciplinary focus of program</li> <li>• Seek out ways to show each academic unit the benefits of allying with the entrepreneurship center</li> <li>• Develop mechanisms for bringing together faculty and students from diverse parts of the program</li> </ul>

### *Creating a University-wide Program*

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

### *Challenges and Benefits of the Two Approaches*

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.

By contrast, most faculty in radiant models face skepticism of their 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 teaching load (such as funding a 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 eligible donors are alumni from other fields, and therefore may not wish to pour resources into a single 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 messier. 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.

### *Measuring 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. For example, 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).

It is interesting to note that a movement toward university-wide models complicates the rating systems currently set up to evaluate entrepreneurship programs. For example, both Success Magazine and U. S News & World Report base rate universities based on their MBA programs. If a ranked program is truly university-wide, it poses an interesting dilemma in terms of measuring size and scope of these programs. What counts as an entrepreneurship class? The quandary is illustrated by the following reaction of an Iowa State official, when asked how many entrepreneurship faculty there are in his program: “This is a tough one...we have faculty from all over campus that teach courses in this program. No faculty person is designated ONLY as an entrepreneurship faculty. We also have temp faculty who may teach entrepreneurship courses. So...if you match the number of entrepreneurship elective courses to faculty, it appears that we have over 100 faculty teaching entrepreneurship, but that is probably not an accurate figure.”

Should different metrics be used to evaluate and rank university-wide models? For example, it might be more useful to try and measure how far “across the curriculum” the entrepreneurship has spread. Or it might be more meaningful to measure how many non-business majors are taking courses, or how many undergraduates (vs. MBA candidates) are involved in the program.

In addition, university-wide programs may be less focused on immediate business creation, so counting the number of business created, or faculty who are entrepreneurs can be less meaningful than for non-university-wide programs. Curriculum should be measured in quite a different manner for university-wide programs, with a further distinction needed between radiant programs and magnet programs. For example, a radiant university-wide program such as Iowa has only two core courses, but has 100 courses that qualify as electives for entrepreneurship minors.

We conclude that as entrepreneurship education moves across the curriculum (using either magnet or radiant models) that ranking programs numerically will become more and more challenging. It would make more sense to measure each program against its stated target focus than to try to standardize the way of quantifying programs with widely varying missions/visions/goals.

## *Best Practices*

A compilation of advice from entrepreneurship directors and stakeholders is included in Appendix 3. However, it is worth mentioning here a few key best practices we found among the programs examined. The importance of getting buy-in at the top level of the university for the university-wide program was mentioned by those involved in both radiant and magnet programs. Donor funding provided core support for all programs. For magnet schools, it was also noted that it is critical to align the mission of the entrepreneurship program with those of the business (or engineering) school(s). In a similar vein, Directors in radiant programs mentioned it is crucial 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.

Alumni advisory councils seem to play a key role in many of the programs. For radiant programs, 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 the radiant model were more apt to mention the need to recruit and coordinate faculty from across the university.

## *Conclusions and Key Issues for 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. For example, even 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 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, eventually its success 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. For example, 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.

To conclude our discussion of university-wide programs we thought it might be useful to present a list of key issues that should be the focus when educators and policy-makers consider moving entrepreneurship education towards a university-wide model. We constructed the following list from talking with current directors and faculty involved in decision-making about the style and approach of entrepreneurship programs.

- **Be clear on the goal of becoming university-wide.** Do you want to gather students together in a diverse audience to interact in an interdisciplinary fashion? Or do you want to provide a context-specific pathway for students into entrepreneurship issues that are customized to their fields of interest?
- **Consider whether being a university-wide program fits well with the overall mission of your institution.** That is, how does the concept fit into the university's "culture"?
- **Clarify whether there is political and monetary support** for moving to a university-wide model at the necessary levels.
- **Seek out faculty champions.** Are there non-business faculty members with the motivation to add entrepreneurship as a dimension to their professional focus?
- **If rankings matter to your stakeholders, consider the impact of becoming university-wide on the university's rankings.**
- **Consider which strategies might be useful in moving entrepreneurship education to a more university-wide scope.** For example, see the strategies listed in tables 2 a,b and c.
- **Consider what measurable outcomes you wish to track and how the institution will evaluate the success of the program.**
- **If a radiant model is chosen, clarify how the program will deal with marketing and education issues.** Consider internal marketing (to students and faculty) and external marketing (to alumni, competing institutions and academe in general)

Our study provides no pat answers for these issues. 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 on the above questions. We intend our work to be just the beginning of what we hope will be useful and productive conversations on the theme of moving entrepreneurship across the curriculum.

## References

Larry Penley's address to the 2000 USASBE/SBIDA conference can be found at:  
<http://www.usasbe.org/conferences/2001/proceedings/pres.pdf>Proceedings,

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## Appendices

**Appendix 1.** Characteristics of Entrepreneurship Programs – 38 Ranked Institutions

**Appendix 2.** Tables on Models

- Table 2a. Magnet Models - Sample Entrepreneurship Programs with Resources centered in Schools of Business (Magnet Model)
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**Appendix 3.**

Appendix 1. Characteristics of Entrepreneurship Programs – 38 Ranked Institutions

	Graduate Students						Courses outside	Center outside
	Business	Engi- neering	Other	Business	Engi- neering	Other	Bus. or Engineering	Bus. or Engineering
<b>Babson U.</b>	** <sub>1</sub>	N.A.	N.A.	*	<sup>2</sup>	*	N.A.	N
<b>Ball State U.</b>	**			**			N	N
<b>Baylor U.</b>	**		*	**	*	*	N	N
<b>Bentley College</b>	*	N.A.	*	*	N.A.	*	N	N
<b>Carnegie Mellon</b>	**	*		*	*	*	N	N
<b>Case Western Reserve</b>	*	*	Law Medicine	**	*	Arts & Science, Theatre	N	N
<b>Columbia U.</b>	*	*	*				N	N
<b>Cornell U.</b>	*	**	Law Vet	*	*	*	Y	Y
<b>DePaul U.</b>	**	N.A.	*	**	N.A.	*	Y (2 courses)	N
<b>Duke U.</b>	**	*			*	*	Y	3 separate centers <sup>3</sup>
<b>Harvard U.</b>	*						N	N

<sup>1</sup> One asterisk indicates individual courses available. Two asterisks means that a major, concentration or specialization is available.

<sup>2</sup> At Babson, the entire university is focused on business. However, they do have a sister school, Olin Engineering.

<sup>3</sup> Three centers located in the engineering college, the graduate school of management, and the undergraduate business program. Duke is currently exploring ways to bring these together in a more cohesive structure.

	Graduate Students			Undergraduate Students			Courses outside	Center outside
	Business	Engi- neering	Other	Business	Engi- neering	Other	Bus. or Engineering	Bus. or Engineering
<b>Indiana U.</b>	**	N.A.	*	**	N.A.	*	Y (a few)	N
<b>Loyola Marymount U. –</b>	*	<sup>10</sup>		**			N	N
<b>Massachusetts Institute of Technology</b>	**	*	*	*	*	*	N	N
<b>New York U.</b>	**		*	*			Y	N
<b>Northwestern</b>	**						N	N
<b>Rensselaer Polytechnic Institute-</b>	**	**	*	*	*	*	Y	N
<b>San Diego State U.</b>	**			*			N	N
<b>Stanford U.</b>	*	*	*	N.A.	*		N	Y-Separate Centers
<b>U. of Arizona</b>	**	*	* <sub>11</sub>	**	* <sub>2</sub>	*	N <sup>12</sup>	N
<b>U. of California – Los Angeles</b>	*	*	Science, Medicine, Law				N <sup>13</sup>	N <sup>14</sup>
<b>U. of California – Berkeley</b>	*	*	*	*	*		N	N
<b>U. of Chicago</b>	**				N.A.		N	N

<sup>10</sup> Plans for courses to involve students in engineering and arts

<sup>2</sup> Courses for students in Science, Medicine, Agriculture, Mexican, Latin and Native American Studies; International College.

<sup>12</sup> No standing courses in other majors, but students may petition for selected subjects to be approved for the entrepreneurship specialization.

<sup>13</sup> MBA students do take one class in the Law School (Venture Law).

<sup>14</sup> UCLA is working on a new center examining entrepreneurial educational initiatives to be joint between the graduate management school and Education.

	Graduate Students			Undergraduate Students			Courses outside	Center outside
	Business	Engi- neering	Other	Business	Engi- neering	Other	Bus. or Engineering	Bus. or Engineering
<b>U. of Colorado</b>	**	*	Law and Music	**	*		Y	N
<b>U. of Georgia</b>	**	N.A.	*	**	N.A.	*	N	No Center
<b>U. of Illinois, Chicago</b>	**							
<b>U. of Louisville</b>	**	*	<sup>15</sup>	*	*		N	N
<b>U. of Maryland</b>	**	* <sup>16</sup>		**	* <sup>17</sup>	*	N	N
<b>U. of Michigan</b>	*		*	*			N	N
<b>U. of N. Carolina at Chapel Hill</b>	*		*	*	*	*	Y	N <sup>18</sup>
<b>U. of Pennsylvania</b>	*		<sup>19</sup>	*			N	N
<b>U. of South Carolina</b>	*			**		*	N	N
<b>U. of Southern California</b>	**	*	*	**	**	*	Y <sup>20</sup>	N
<b>U. of St. Thomas</b>	**	*	*	**	*	*	N	N
<b>U. of Texas at Austin</b>	**	*	*				N	N

<sup>15</sup> Only through joint programs that combine MBA with other degrees (such as JD).

<sup>16</sup> U. of Maryland has a biotech entrepreneurship concentration to be offered in spring 2002.

<sup>17</sup> U. of Maryland has created a special 12-credit program for non-business majors. Students receive a special citation. Classes must be composed of 60% non-business students.

<sup>18</sup> The Center for Entrepreneurship and Technology Venturing operates within the Kenan-Flagler Business School's Kenan Institute for Private Enterprise.

<sup>19</sup> U.Penn has several courses under development, including one involving graduate students in Education and another planned to involve undergrads from other majors.

<sup>20</sup> Although USC has some offerings outside the business and engineering schools, it is still primarily a magnet school.

	Graduate Students			Undergraduate Students			Courses outside	Center outside
	Business	Engi- neering	Other	Business	Engi- neering	Other	Bus. or Engineering	Bus. or Engineering
<b>U. of Virginia</b>	*	*	*				N	N
<b>U. of Wisconsin-Madison</b>	**			**	*	*	N	N
<b>Wake Forest U.</b>	**			**			N	N

**Appendix 2**

**Table 2a. Magnet Models - Sample Entrepreneurship Programs with Resources centered in Schools of Business (Magnet Model)**

<b>College or University</b>	<b>Name of Entrepreneurship Program</b>	<b>Location of Program</b>	<b>Accessibility of Program</b>	<b>Enrollment</b>	<b>Courses</b>	<b>Faculty</b>	<b>Statements indicating university-wide focus</b>	<b>Strategies for achieving university-wide reach</b>
<b>MIT</b>	MIT Entrepreneurship Center	Sloan School of Management	MBA Engineering Ug bus. Ug non-bus.	1642 (proj. for '00-'01)	14	27	"Inspire, train and coach new generations of entrepreneurs from all parts of MIT"	<ul style="list-style-type: none"> <li>Classes open to any student at MIT</li> </ul>
<b>Lehigh University</b>	Musser Center for Entrepreneurship	College of Business and Economics	MBA Engineering	N.A. <sup>1</sup>	N.A	N.A	N.A	N.A
<b>Northern Kentucky</b>	Fifth Third Bank Entrepreneurship Institute	Business School	Ug. Bus. Ug. Non-bus	200	5	3	"Creative ideas and entrepreneurial efforts don't come just from business majors"	<ul style="list-style-type: none"> <li>Do not have specialized classes for each major, but try to bring all majors together for purposes of diversity</li> </ul>

<sup>1</sup> Figures not available due to the fact the program is new.

**Table 2b. Sample Entrepreneurship Programs in Transition from Magnet to Radiant Models**

<b>College or University</b>	<b>Name of Entrepreneurship Program</b>	<b>Location of Program</b>	<b>Accessibility of Program</b>	<b>Enrollment</b>	<b>Courses</b>	<b>Faculty</b>	<b>Statements indicating university-wide focus</b>	<b>Strategies for achieving university-wide reach</b>
<b>Northeastern University</b>	Center for Technological Entrepreneurship	College of Business Administration	MBA Engineering Ug bus. Ug non-bus	300	10	15	“Integrate business with engineering and computing”	<ul style="list-style-type: none"> <li>• New funding for virtual school, with engineering, business, and computer science</li> <li>• Certificate in bus for non-bus majors-can focus on entrepreneurship</li> <li>• Business minors can choose entrepreneurship</li> <li>• Engineering students just starting to minor in business</li> </ul>
<b>RPI</b>	Severino Center for Technological Entrepreneurship	Lally School of Management	MBA Engineering Ug bus. Ug non-bus.	200	16	23	“Expose entire RPI community to entrepreneurship”	<ul style="list-style-type: none"> <li>• \$1M gift to provide funds to infuse throughout curriculum</li> <li>• General curriculum requirement</li> </ul>
<b>George Mason</b>	Mason Enterprise Center Enterprise Center for Regional Analysis and Entrepreneurship	Institute of Public Policy	MBA Ug bus. Ug non-bus	N.A.	9	35	“Our challenge is to link entrepreneurship to every academic program at the university. We’re making the whole university the support structure for entrepreneurship and outreach activities.”	<ul style="list-style-type: none"> <li>• Courses under development in five different colleges</li> <li>• Future plan: develop one entrepreneurship-oriented lecture in every introductory course</li> <li>• Training programs, workshops and conferences linked to local economy</li> <li>• Seeking funding to create a major research center</li> </ul>
<b>California State-Fresno</b>	Entrepreneurial Resource Center, but to become Center for Innovation and Entrepreneurship	Sid Craig School of Business But moving it out of business school	MBA Engineering Ug. Bus.	N.A.	7 in MBA	12	“..want to become a stamp on many different degrees”	<ul style="list-style-type: none"> <li>• Creating a new program with faculty drawn from across campus</li> </ul>

**Table 2c. Sample Entrepreneurship Programs with Resources Distributed Throughout the University (Radiant Model)**

<b>College or University</b>	<b>Name of Entrepreneurship Program</b>	<b>Location of Program</b>	<b>Accessibility of Program</b>	<b>Enrollment</b>	<b>Courses</b>	<b>Faculty</b>	<b>Statements indicating university-wide focus</b>	<b>Strategies for achieving university-wide reach</b>
<b>Cornell</b>	Entrepreneurship and Personal Enterprise	Administrative office not housed in any particular program. Faculty located in nine participating schools and Colleges	Students in all schools and colleges, graduate and undergrad	2000	30	26	Create a diverse, university-wide program that finds and fosters the entrepreneurial spirit in every Cornell participant -- in every college, every field, and every stage of life.	<ul style="list-style-type: none"> <li>• Permanent endowed professorships in three schools (graduate management, undergraduate business, engineering)</li> <li>• Rotating endowed professorship</li> <li>• Buy-in to the program from all schools and colleges at Cornell, including the Law School and the Vet School</li> <li>• Roundtable faculty group for collaboration on teaching, research, outreach</li> <li>• Broadly-based advisory council representing</li> </ul>
<b>Iowa State</b>	Pappajohn Center for Entrepreneurship	College of Business and courses in each of eight participating colleges	MBA Engineering Ug bus. Ug non-bus. Vet medicine	300	2 core courses*	**	Collaborate with all academic units at ISU to become a premier provider of education and training in entrepreneurship	<ul style="list-style-type: none"> <li>• Faculty from eight schools sit on a entrepreneurial studies supervisory committee</li> </ul>

\* Iowa State notes that they have more than 100 courses designated as acceptable for entrepreneurship Minor electives.

\*\* Difficult to measure since there are so many courses designated as entrepreneurship electives.

## Appendix 3

### Advice from Champions of Current University-Wide Programs

The stakeholders we interviewed included many champions of the university-wide model (whether radiant or magnet). We asked them about what advice they would offer and whether they could point out some best practices. There was considerable crossover in their comments. Thus, we have decided to arrange the advice by topics, with an indicator of whether the comments came from a Magnet (M) school, a radiant (R) school or a Transition (T) school.

#### *On curriculum issues...*

- Define learning objectives of the university-wide program(R,M,T)
- Need marketing to students (R,M,T)

#### *On engaging faculty...*

- Make sure faculty and students buy into the idea (R,T)
- Need a core group of highly respected faculty (R,T)
- Have leadership say it's important(R)
- For engineering professors – see this as an opportunity to turn out technologists who also have a deep understanding of customer need (R,T)
- Find a faculty champion and use them to raise money, give advice on strategy, donate resources (T)

#### *On program leadership...*

- Use the following as your guiding principle: It's amazing what you can accomplish if you don't care who gets credit. You may have to push away the spotlight and make students the ultimate focus (R,T)
- Get the campus to feel like the entrepreneurship centers are really campus wide and not just focused on the b-school (R,T)
- If you create or move to a radiant model, expect to attract some resistance from the business school unless you have buy-in (R,T)
- Pursue the program using the principles taught in entrepreneurship classes: identify the opportunity, evaluate the risks, build a team, do the planning (T)
- Keeping the program outside the business school with independent funding gives it a better chance to be university-wide (T,R)
- Change takes time, effort and sweat...expect everything to be difficult (T)
- Advisory Council is a critical resource (M)

#### *On university-level buy-in...*

- Be sure to get support at the President level for the program (T,R)
- Collaborate with Alumni development to network and involve alumni (M,T,R)

#### *On resources and fund-raising...*

- Need faculty and financial resources to make it flourish (M,T,R)
- Find a way to measure how it's going (T)
- Don't expect funding to come from the university (M,T,R)
- Look for success stories of professors and students with startup ventures and use them to get the work out