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The development and application of a systematic approach to evaluating an academic department's brand meaning

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THE DEVELOPMENT AND APPLICATION OF A SYSTEMATIC APPROACH TO EVALUATING AN ACADEMIC DEPARTMENT'S BRAND MEANING

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ABSTRACT

Research of existing literature indicates that below the university level, there has been little effort made in branding academia, namely academic departments. The lack of branding may significantly affect the perceptions that potential students and future employers of these students have about one of these academic units. The impact may be most significant for units where the fields of study that are represented by the department may be unclear, such as in the case of engineering management. However, even in the cases of better-understood fields of study, for example, electrical engineering, the competition for students with other fields of study and within the field of study itself may drive the need for better branding.

A model for assessing and understanding a brand's meaning for an intangible service as provided by an academic department has been developed and applied to the case of an engineering management department. The results show that the model does provide a way to identify and catalog brand meaning and to locate the understanding of the brand in a hierarchy of branding elements across various stakeholder groups. These outcomes provide a path for future brand improvement in the minds of future students and employers of the graduates of a department representing the field of study.

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1. INTRODUCTION

1.1. OVERVIEW OF BRANDING MARKETING AND ITS APPROPRIATENESS TO HIGHER EDUCATION

1.1.1. What is a Brand? Typically, a brand is thought of as a "look." [5] The word brand is derived from the Old Norse word "brandr," meaning "to burn." Traditionally this method of branding referred to livestock owners burning a symbol onto their livestock to identify them. However, that old philosophy does not apply to modern day industry and the business world. The American Marketing Association (AMA) defines a brand as a "name, term, sign, symbol, or design, or a combination of them, intended to identify the goods and services of one seller or group of sellers and to differentiate them from those of competition." [4] Simply put, a brand is a trust mark, a warrant, and a promise [5]. It should be noted that, however, in a practical sense the term brand refers to more than just a name, term, sign, symbol, or design. Many practicing managers use the term brand to refer to an amount of awareness, reputation, prominence, and so on in a marketplace. Therefore, according to the AMA definition, the key to creating a brand is to be able to choose a name, logo, symbol, package design or other attribute that identifies a product and distinguishes it from others. Therefore, a brand is a common perception about a deliverable that is assigned by its market. Ultimately, a brand is something that resides in the minds of consumers [4].

1.1.2. Why Is Branding Important? Branding is important because it is the perception, or general notion, that people have about a good or service. What distinguishes a brand from its unbranded competition and gives it value are overall consumers' perceptions and feelings about a product's attributes and how they perform, about the brand name, what it stands for, and ultimately about then company or

organization associated with the brand. A brand can be a physical good, a service, a store, a person, a place, an organization, or an idea. Brands can create competitive advantages by product performance, continual innovation, non-product related means, or by understanding consumer motivations and desires creating relevant and appealing images surrounding their products (ie – Marlboro Man, Calvin Klein, etc). Typically, a strong brand will have multiple associations to it by its consumers. By developing a strong brand which differentiates a product or service from its competition, marketers create value in the brand which translates into profits. At times, in a crowded market, brands are what differentiate one product from another. Often, the most valuable asset to a company or organization is an intangible asset such as marketing, keen financial planning and management skills, and ultimately the brands themselves [4]. An example of a strong brand is Kellogg's corn flakes. Many people will remember "Corny" the rooster on the box and commercials advertising the quality product of Kellogg's corn flakes. Alternatively, people are not as likely to remember Sam's Choice corn flakes for quality and catchy advertising. Corny the rooster is an image, or brand, that resides in the mind of Kellogg's customers. See Figure 1.1.

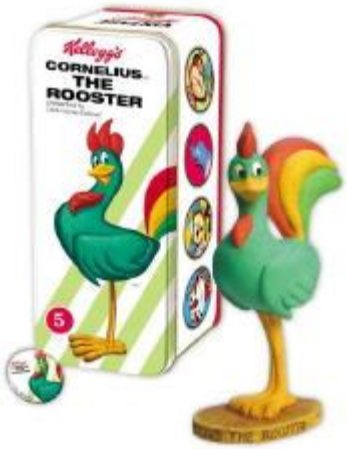

Figure 1.1: Corny, the Kellogg Rooster [1]

1.1.3. Marketing Appropriateness in Higher Education. The literature has summarized the conclusion that marketing's appropriateness at the higher education level has been debatable throughout the last century [6]. There has also been debate as to whom higher education's customers are; some argue that the market of higher education is prospective students and some argue that the future employers of graduates are the customers are the market of higher education [7]. For this study, the market segments will be two fold: prospective students and future employers of the graduates of a higher education program [8] (See Figure 1.2).

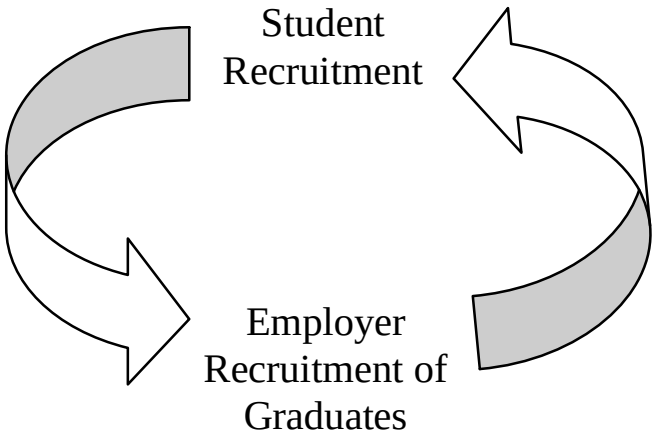

Figure 1.2: Cyclical Student to Industry Process

These two market segments are a circle that depends on each other for existence; students enroll in higher education programs with the expectation that employers will hire them and employers look to higher education institutions to provide them with graduates to employ [7]. Since there is a strong bond between these two existing markets, it is imperative that their perceptions, or brand meaning, of a higher education institution's "brand" are aligned.

There is also debate as to whether or not marketing efforts in higher education should be applied to a product or a service, which stems from the debate of who academia's customers are; students receiving a the service of an education or employers receiving a product of educated students [7]. The efforts of marketing academia through a "products" standpoint are evident in the literature, yet some literature views academic marketing more appropriate to be looked as a service [6, 7, 9-15]. Marketing techniques differ for goods and services based on the fundamental differences in products and services, which are tangibility and how customers experience the product or service. A customer can potentially touch, feel, taste, hold, or smell a product since it is tangible,

however a service is often times experienced in a different manner. A service generally consists of physical aspects, as does a product; however, what makes a service unique is the service package that is purchased along with the physical good. The service package consists of the psychological and sensual benefits that are purchased along with the physical aspect [16]. Consider an evening meal: the physical aspect of a meal is the tangible food that you can prepare yourself, or you can choose to go to a restaurant to enjoy a relaxing evening of a chef preparing the same physical food for you while you enjoy the relaxed, stress relieving ambiance of the restaurant and the pleasing aromas of all of the foods being prepared around you. The psychological relaxation and mixed aromas of other foods being prepared around you are the differentiating aspects of a service from a product.

1.1.4. Branding in Higher Education. Branding has become a basic tool of marketing [17]. Branding is one avenue of marketing efforts for a product or service [4], therefore making it an appropriate approach to marketing higher education. Branding applies to higher education in the sense that a university, for example, is making a "promise" to prospective students about what their academic departments have to offer and to industry regarding the caliber of graduates that they will turn out to the employment pool. The same literature regarding higher education realizing the need for branding and how institutions are seeking out the process of developing a good brand at the overall university level, but there is a significant gap in the literature regarding this process at the academic departmental level [17-24]. It can be speculated that the branding undertaking is not as prevalent at the departmental level and is being pursued at the university level because universities are by definition very complex, making it a

challenge to channel the complexity into a simple, compelling brand concept [25]. The variation in similar academic departments that represent the same field of study also complicate the issue of trying to establish a strong brand for the academic department and increases the need to develop individual department brands, rather than relying on an "industry standard" to represent all academic departments in the same field of study. Anecdotal evidence suggests that variation in academic departments target student populations, outreach efforts, and industry relations create substantial differences in academic departments representing the same field of study. Universities are also more visible than academic departments due to shear size. Institutions of higher education are looking to develop a brand identity to develop a sustainable advantage. Building a strong brand is desirable because when a strong brand identity can be developed, a sustainable advantage in the marketplace can be established [26]. This sustainable advantage is especially important in the field of higher education because there is growing competition for the limited market available.

1.2. RATIONALE FOR STUDY

The complexity of the market in higher education, and the lack of literature regarding marketing, particularly branding, at the academic department level, presented an opportunity to establish a systematic approach to understand an academic department's brand meaning. This approach will aid academic departments experiencing a perception problem to better understand their existing brand meaning to their markets and aligning the student to industry market (see Figure 1.2). The systematic approach will be applied to an academic department that is an example of a department with a

potential perception problem in both the student and industry markets. Lessons learned from the application of the systematic approach to understanding an academic department's brand to the case study academic department will strengthen and solidify the usefulness and functionality of the general model for further application in other academic departments in various fields of study.

1.3. BRANDING IN ENGINEERING MANAGEMENT

The application of the systematic approach will be applied to an engineering management department where anecdotal evidence suggests that market alignment and perception problems exist. Engineering management is described in many different ways, by many different sources. Consider the following descriptions of the academic departments from the five Accreditation Board for Engineering and Technology (ABET) accredited programs offering a Bachelor level degree in Engineering Management (some a Bachelor of Science in Engineering Management and some a Bachelor of Engineering in Engineering Management).

From Stevens Institute of Technology:

> Engineering Management is a rapidly growing field that combines engineering and business. In demand by pharmaceutical, chemical, electronics and other major industries, engineering managers work at the interface between technology and management. Technology-based companies typically recruit and promote engineers not only for their technical expertise but also for their potential as effective managers. Recent studies show that most engineers will ultimately take on managerial positions, and that most will spend a considerable part of their professional careers in a management or supervisory capacity. In a recent survey conducted by the American Association of Engineering Societies, it was found that within ten years of the start of their careers, more than 50 percent of engineers find themselves in technical management positions, often without the benefit of formal training in management.

> In the Engineering Management program you can combine a strong engineering core with training in accounting, cost analysis, managerial economics, quality management, group dynamics, production and technology management and engineering design. The course selection offered by this concentration exemplifies the Stevens interdisciplinary approach to developing strong problem-solving skills. The program prepares you for careers that involve the complex interplay of technology, people, economics and organizations, and provides the skills and knowledge needed to enable you to assume professional positions of increasing responsibility [27].

From the University of Arizona:

> Managers with good business skills and solid technical backgrounds have a broad variety of jobs from which they can choose. In the past, most managers who work at the interface of technology and business designed their own educational programs because there was no single degree program that met their needs. The University of Arizona College of Engineering is pleased to offer a Bachelor of Science in Engineering Management degree program that combines managerial and engineering classes to prepare graduates for positions that require broader skills and capabilities than those provided by either a business or a traditional engineering degree alone.
>
> Since nearly every company involved in manufacturing, public utilities, transportation, construction, processing, and mining uses technical principles and processes, and engineering and consulting firms address problems that involve both technical and economic issues, University of Arizona's Engineering Management program prepares students for management positions in these technology-based companies. The degree is flexible enough to allow a student to concentrate his or her technical electives on a particular industry or technology of interest to him or her. The managerial courses cover all of the material needed to understand and function within the business environment, and yet the degree is a fully ABET-accredited engineering degree. The result is a wide variety of career opportunities available to the graduate [28].

From the University of Pacific:

> The Engineering Management degree is designed to combine study in Engineering with selected course work in the fields of Economics and Business Administration. The sample curriculum shows how the first two years of engineering study is integrated with business courses. Students take a full year of upper division engineering courses and then specialize in the area of their choice by choosing engineering electives [29].

From the United States Military Academy at WestPoint:

> Engineering Management (EM) examines the engineering relationships between the management tasks of staffing, organizing, planning, and financing, and the human element involved in production, research, and service. EM teaches the concepts and principles of engineering to manage the fundamentals of organizational leadership, personnel management, fiscal management, and systems understanding. EM is a highly relevant program which builds on the traditional roles of systems analysis and basic and applied sciences by emphasizing management functions in a technical setting [30].

From the University of Missouri – Rolla:

> Engineering Management is the degree that "bridges the gap" between engineering and management and it is the degree that enables a graduate to work with and through people to get things done. More technically speaking, this is the degree that provides graduates with both excellent technical and managerial skills. The degree, in essence combines a typical engineering education (technical) with key elements of a typical management or business education (managerial) [31].

From the cited engineering management program definitions and descriptions, it is evident that there is no clear, succinct definition of what engineering management is. It is a lengthy process to describe to an inquirer as to what the academic department encompasses due to the diversity of the field. So while the program offers a vast array of emphasis areas, skill sets, and career choices making a graduate very diverse, it is very difficult to market that graduate to industry due to the ambiguity involved with this diversity. Therefore, it is expected that engineering management is not well understood by its market, and has been supported by preliminary research that looked for commonalities and differences in definitions of engineering management programs and the programs' curricula [32].

The literature suggests that there is little commonality in engineering management definition and curriculum between the five ABET accredited engineering management

programs [33]. The engineering management program at UMR offers its own emphasis areas to it undergraduates including industrial engineering, manufacturing, quality, management of technology and a general option and does not require a cooperative learning experience in industry before graduation [34]. On the other hand, the University of Pacific engineering management program offers only the UMR equivalent "general" emphasis area to its students where they take their emphasis courses in another engineering discipline and the program requires a one year cooperative learning experience in industry before graduation [35].

When each of the five ABET accredited school's definitions were mined for common terms and themes, little commonality was found, which may develop into a problem with perception, or brand meaning. This lack of common definition in both definition and curriculum makes it difficult to market all engineering management departments as performing the same job functions to industry because each department's focus is slightly different. If engineering management students from UMR and the University of the Pacific were trying to market themselves to the same potential employer simultaneously, no doubt there would be two differing marketing pitches for the same academic department background due to the inherent differences in nature of those two programs. UMR's definition mentions "bridging the gap" between engineering and management while the University of the Pacific mentions combining studies between engineering and economics and business administration. UMR offers specific emphasis areas while the University of the Pacific does not. The University of the Pacific requires a cooperative learning experience while UMR does not. This lack of similarity in curriculum and definition among the top accredited programs offering the degree

exacerbates the problems with marketing a clear objective of the academic departments and field of study to its markets. It could be inevitable that the industrial market will indeed be confused if two graduates from two different programs try to market themselves and have two different marketing strategies of what constitutes engineering management.

Since the engineering management program at UMR is unique in definition, curriculum, and experience from the other four ABET accredited programs in engineering management, the department represents excellent example on which to apply the systematic approach of understanding an academic department's brand meaning so as to align its student and industrial markets (see Figure 1.2). Since UMR is the founding program of engineering management, it is important that the department develop its own unique brand of what engineering management is, specific to UMR, to make the value of the degree evident to each of its markets, both student and industry.

Therefore, the concept of branding will be considered for the UMR engineering management program, as an extreme case compared to more traditional engineering departments, to understand perceptions from both student and industry markets. Further, this study will attempt to identify key brand meaning attributes and factors of branding by both student and industry markets to enhance or improve the UMR Department of Engineering Management's "brand." It is important to align brand perceptions from both markets in order to insure a successful educational program which will develop employable graduates, raise industry awareness of the degree thereby increase recruitment of graduates.

Perception is reality [36] and a brand can influence a product or service's success in the marketplace [4]. Therefore, it becomes crucial that the UMR engineering management program established a good brand perception with industry to insure continued cooperation, research opportunities, and graduate employment for the future.

2. LITERATURE REVIEW

2.1. THE CUSTOMER BASED BRAND EQUITY MODEL

Brand equity is one of the most interesting topics among both academic researchers and marketing practitioners [37, 38]. The following discussion regarding the customer based brand equity model and its implications were derived and published by Kevin Keller [3, 4]. Applications of Keller's Customer Based Brand Equity model appear in the literature in contexts such as business to business scenarios and evaluating customer based restaurant brand equity [39, 40]. This model was chosen for use in evaluating and understanding brand meaning since it has been established in the branding literature [3, 4].

Not all brands are created equal. Developing a brand is important, but developing a brand that accurately reflects your product or service is even more important. Often companies have trouble initiating the branding process because it is hard to get started since there are so many variations of brands. Keller developed the customer based brand equity model (CBBE) to help answer common questions such as "What makes a brand strong?" and "How do you build a strong brand?" Keller's model reflects the four questions that customers will ask about a brand, either implicitly or explicitly: 1) Who are you? (brand identity) 2) What are you? (brand meaning) 3) What do I think or feel about you? (brand responses) 4) What kind of association and how much of a connection would I like to have with you? (brand relationships). These questions are important, because they follow a hierarchy in the process of strong brand building as outlined in Figure 2.1 below.

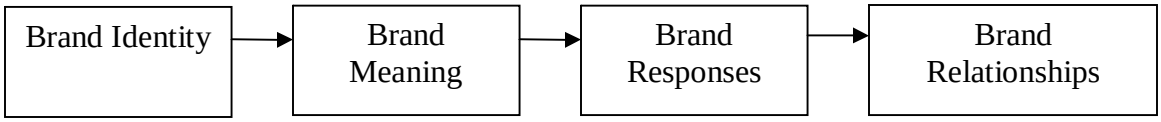

Figure 2.1: Strong Brand Building Hierarchy [3, 4]

2.1.1. Brand Identity. Brand identity is the art of creating the proper brand awareness through building brand "salience" with customers. Brand salience relates different aspects of brand awareness, for example, how often or how easily a brand is brought to mind in numerous situations or circumstances. Brand awareness refers to the customer's ability to recognize or recall a brand under various situations or circumstances. Brand awareness often times involves more than just identifying a brand that they have seen numerous times; it involves linking a brand logo, name, symbols and such together. Overall, brand awareness focuses on ensuring that a customer knows which needs that a particular brand will satisfy; what basic functions does the brand serve the customer [3, 4]. Brand identity answers the general question of "who are you?" to customers. For example, many customers are aware that Toyota™ provides equipment for transportation; customers can associate the brand and the "circular logo" with equipment that meets their transportation needs.

2.1.2. Brand Meaning. It is important to ensure that a brand has meaning to its customers. Brand meaning should create an image in the customer's minds about what the brand stands for and is characterized by. In general, typically brand meaning can be distinguished in terms of more functional, "performance" based factors versus more abstract "image" related factors. These brand meanings can be formed directly by a customer's experiences and/or contact with a brand via advertising, marketing efforts, or

other sources of information [3, 4]. Brand meaning answers the general question of "what are you?" to customers. For example, the brand meaning of Toyota™ may be that Toyota™ provides reliable, multi-functional transportation equipment which people with fun and adventurous personalities purchase. This information could have been conveyed, for example, through media (for example, advertisements on television or billboards of people smiling, laughing, and driving a Toyota™ through a forest trail) or through word of mouth. This brand meaning has built upon the brand identity of just that Toyota™ provides transportation equipment.

2.1.3. Brand Response. Brand response creates the need for attention to be paid to how customers react to a brand. Typically, these reactions follow the performance and imagery perceptions they have of a brand which address the question of "what do I think or feel about you?" Generally, brand responses are classified as either a "judgment" or a "feeling." For example, if a customer views a commercial of people laughing, smiling, and driving a Toyota™ through a forest trail, seemingly having a pleasurable experience, the customer may view the Toyota™ as a quality product (judgment) that makes the customer associate the product with having fun with friends (feeling). This brand response has built upon the identity that Toyota™ provided transportation equipment, the brand meaning that it is reliable, multi-functional equipment, and has established that it is also a piece of equipment that evokes fun and is a quality product.

2.1.4. Brand Relationships. The last step in building a strong brand focuses on the relationships and how much personal identification that a customer has with a particular brand. This addresses the customer's question of "what kind of an association

and how much of a connection would I like to have with you?" Typically, the brand relationship is gauged by the level of psychological bond a customer has with the brand and then how much activity with the brand the loyalty to the brand evokes. This is phenomenon is called brand "resonance." Brand resonance can be broken down into several elements including behavioral loyalty, attitudinal attachment, sense of community, and active engagement. For example, once a customer has identified Toyota™ as being a transportation equipment provider, developed a brand meaning that is one of quality and multi-functional piece of equipment, responded to it as a quality, fun product, and then repeatedly purchases a Toyota™, the customer has established a relationship, or loyalty, to the brand of Toyota™ [3, 4].

The above model reinforces that strong brand meaning cannot be established unless an identity is first created. Responses to a brand cannot be created until a meaning has been placed on the brand; and finally a relationship cannot be established without getting proper responses from a brand's customers [3, 4]. In the aforementioned Toyota™ example, Toyota™ has been established as a strong brand to a customer because they have gone through the sequential steps in building a strong brand, from identity to relationship.

2.2. SIX BUILDING BLOCKS OF THE CBBE MODEL

Within the four questions to building a strong brand lays six foundation factors with the brand's customers: salience, performance, imagery, judgments, feelings, and resonance. Table 2.1 outlines the relationships between the four questions that customers

generally ask when relating to a strong brand, the six factors of the foundation of strong brand and their sub-dimensions.

Table 2.1: CBBE Summary [3]

Four Questions of CBBE	Six Factors of CBBE Model	Sub-Dimensions of Six Factors
Brand Identity	Salience	Category Identification; Needs Satisfied
Brand Meaning	Performance	Primary characteristics & secondary features; Product reliability, durability, & serviceability; Service effectiveness, efficiency, & empathy; Style & design; Price
	Imagery	User profiles; Purchase & usage situations; Personality & values; History, heritage, & experiences
Brand Response	Judgments	Quality; Credibility; Consideration; Superiority
	Feelings	Warmth; Fun; Excitement; Security; Social approval; Self-respect
Brand Relationships	Resonance	Loyalty; Attachment; Community; Engagement

2.2.1. Brand Identity: Salience. In order to achieve the proper brand identity, it is important to create brand salience with customers. This factor of the foundation refers to brand awareness. For example, how often or how easy is the brand brought to mind in an appropriate scenario: When thinking of buying a car, do you readily think of Ford™, Toyota™, or GMC™? How easy is it to recall the brand? For example, when you hear the tune "It's Not Easy Being Green" do you think of Kermit the Frog promoting "green" hybrid vehicles? When you see a red tab on the hip pocket of a pair of jeans do you easily recall Levi Brand Jeans™? Brand awareness is summarized as the ability and ease of a customer to recall and recognize the brand. Brand awareness is essential for ensuring that your customers really understand the brand and how the brand will meet their needs.

There are two key aspects, or dimensions, or brand awareness: depth and breadth. Brand depth refers to how easily customers recall or recognize the brand, for example, if something is spilled on an article of clothing, a Tide Pen™ is sought after. A Tide Pen™ can be readily used in many different situations, not just on clothing. Brand breadth refers to the range of situations where a brand comes to a customers mind, for example, if a Tide Pen™ is sought after when something is spilled on carpet, sofas, or a car seat. A highly salient brand contains both of the key aspects to brand awareness.

2.2.2. Brand Meaning: Performance and Imagery. Creating a brand image, which reflects how a brand is characterized and what it should stand for in a customer's mind, is important when trying to give a brand meaning. The way that a product or service attempts to meet its customers functional needs is called performance.

The performance aspect of a brand includes intrinsic properties of the brand which can include product or service characteristics. There are five types of important attributes and benefits associated with brand performance: 1) Primary characteristics and supplementary features, 2) Product reliability, durability, and serviceability, 3) Service effectiveness, efficiency, and empathy, 4) Style and design, and 5) Price. Any of the aforementioned attributes can assist in the differentiation of the brand from its competitors.

Imagery explains the extrinsic properties of a product or service, such as how the brand attempts to meet more psychological or social needs of the customer. The four brands of brand imagery are: 1) User profiles, 2) Purchase and usage situations, 3) Personality and values, and 4) History, beliefs, and experiences. Strong brands also typically have well established strong, favorable, and unique brand associations.

2.2.3. Brand Response: Judgments and Feelings. An integral part of establishing a strong brand is paying attention to how the customers respond to the brand. Typically these responses are classified as either judgments or feelings. Judgments are based on a customer's opinion or beliefs about a brand which are based on the way the individual assembles different performance and imagery associations. The four most important types of summary judgments that are critical in establishing a strong brand are (in ascending order): 1) Quality, 2) Credibility, 3) Consideration, and 4) Superiority. Quality is the most important judgment a customer can make about a brand or the brand may not receive an opportunity for a customer to make a credibility judgment about the product. Credibility refers to the amount of likeability, expertise and trustworthiness the customer perceives about the brand. If customers perceive that a brand has quality and

credibility, the customer may move on to make consideration judgments about the brand which consists of how relevant the customers find the brand to their needs (is it appropriate and meaningful to them). Finally, if customers have established that a brand has quality, credibility and that the brand is appropriate for their needs, the customers may make superiority judgments about the brand. Superiority judgments refer to whether customers see the brand unique and perhaps better than other alternatives. Superiority is often critical in establishing intense and active relationships with a brand because customers perceive that the brand offers worthwhile advantages over another brand.

Feelings are a customer's emotional reaction to a brand such as "What type of feelings are evoked by the brand?" and "How does the brand make the customer feel about themselves?" There are six types of feelings associated with feelings about a strong brand: 1) Warmth, 2) Fun, 3) Excitement, 4) Security, 5) Social approval, and 6) Self-respect. For example, perhaps a customer purchasing a Toyota™ experiences a sense of fun and excitement planning to go on a road trip to see a friend and knows that the Toyota™ will provide a quality, reliable ride (security) that they can be proud of when they arrive. This customer may also feel a sense of social acceptance if purchasing a Toyota™ has continued from a long line of family history faithful to Toyota™.

Judgments and feelings come from both the head and the heart of a customer and are both important. It is important that all the associated feelings and/or judgments are positive, or the customer may chose another brand that provides more positive feelings and judgments. Those judgments and feelings must also be easily accessible and come to mind easily when a customer thinks of the brand. Ultimately brand judgments and feelings can only positively influence a strong brand if the customers think of positive

responses to any opportunity to encounter the brand. If negative feelings or judgments are encountered, there is an opportunity for the customer to consider an alternate brand, thereby decreasing the strength of the brand to the customer.

2.2.4. Brand Relationships: Resonance. The final step in the CBBE model to building a strong brand revolves around the level of personal identification that a customer has with a brand. The nature of the relationship that a customer has with a brand and how much the customer can personally identify with the brand refers to brand resonance. It is gauged by the amount of psychological attachment a customer has with the brand and how much activity that attachment renders. For example, one may have a strong identification and strong positive feelings about his/her alma mater, which may compel one to give money to that alma mater's alumni association. Brand resonance consists of four basic categories broken down as: 1) Behavioral loyalty, 2) Attitudinal attachment, 3) Sense of community, and 4) Active engagement. Behavioral loyalty refers to repeat purchases that a customer may make with a particular brand. For example, how often does a customer purchase Kellogg's Corn Flakes™? Attitudinal attachment refers to a customer's willingness to purchase a brand because it is perceived as something special or that they look forward to. For example, customers may purchase Ben and Jerry's Ice Cream™ on Friday evening as a means to end a "bad week" or because the customer thinks the ice cream is special and particularly enjoys it. A sense of community refers to the feelings of belonging and commonality with others that may purchase the brand. For example, Jeep™ lovers will purchase Jeep™ after Jeep™ and feel a sense of bonding with other Jeep™ loving individuals. There is a "community" of Jeep™ lovers established and most will go to great lengths to help each other solely based on the fact

that each own a Jeep™ product. Active engagement refers to the strongest affirmation of brand loyalty and is experienced when customers are willing to invest time, energy, money and other resources into the brand beyond just the requirements to purchase the brand. For example, often alumni of a university who have children attending the university are extremely loyal and will give money and donate time and resources to the university to show loyalties to the brand, which is beyond paying adequate funds for the child's tuition to "use the brand."

The two main dimensions in the aforementioned factors in brand resonance are intensity and activity. Intensity is linked to the customers' attitudinal attachment and their sense of community, for example, Jeep™ lovers experience a high intensity toward the Jeep brand because the brand is experienced as a passion. Activity is linked to how often the customer buys and/or uses the brand and engages in other activities not associated with buying or using the brand, for example, promoting a university even though the customer is not attending, or does not intend to attend the university.

2.3. CBBE MODEL IMPLICATIONS

The strongest brands excel at all six of the foundation building blocks of the CBBE Model [3, 4]. According to Keller's CBBE model, brand resonance is the most valuable block of the model as successful brand resonance ensures that customers are thinking of the brand, have good feelings about the brand, and ultimately are buying and using the brand [3, 4]. Successful brand resonance implies successful implementation and harmonious synching of all other blocks of the model, as strong brand building must engage in all other blocks of the model before reaching brand resonance, at the pinnacle

of the model (See Figure 2.2.) Ultimately, using the CBBE model in sequence will help brands achieve strong brand resonance, loyal customers, and greater, more effective marketing programs [3, 4].

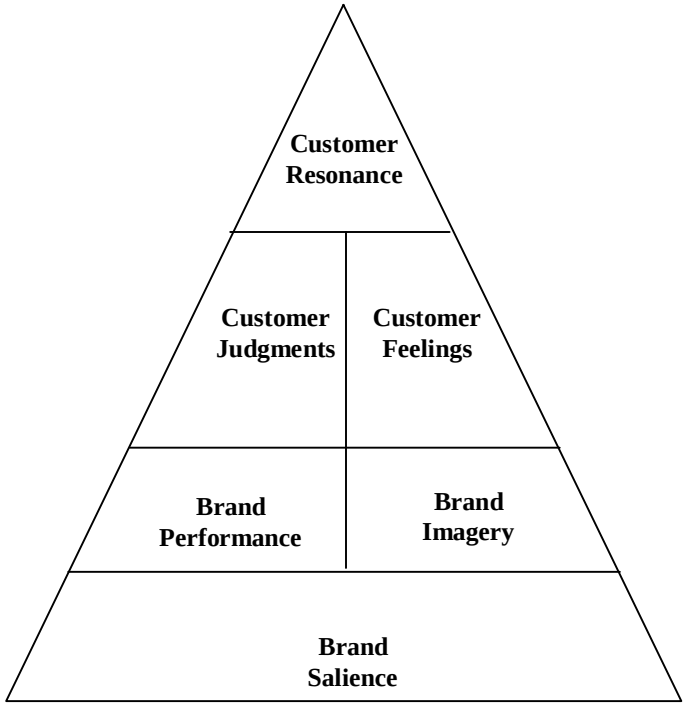

Figure 2.2: Customer Based Brand Equity Ideal Pyramid [3]

2.4. CBBE MODEL APPLIED TO A BRAND

Perhaps one of the most established, well known, strong brands is Kleenex™. Kleenex™ is a brand, not a product although it is very common for one to say "Will you hand me a kleenex?" when referring to any brand of facial tissues. This brand has established itself through the various aspects of the CBBE Model. It has been successful

at meeting customer needs and being established in its category of products (Brand Identity) and it has been identified as a durable product and of value (Brand Meaning). Customers have also determined it to be a quality and credible brand (Brand Response) and they continue to go back and use the product decade after decade since 1924 (Brand Resonance) [41]. Kleenex™ has the history of 83 years of exposure to the market by which to have strengthened their brand. Kleenex™ has also moved through numerous trends of style and product and catered to many markets, from the average worker to high profile celebrities which were involved in marketing efforts to aid the customer in seeing the brand as desirable. Kleenex™ also caters to markets by allowing customers to develop their own design on Kleenex™ boxes which develops a very personal bond with the brand. Kleenex™, for the most part, has been established as a strong brand through a long history in the marketplace and meeting market demands which is evident merely by observing that Kleenex's™ brand name is used interchangeably with its product category, the facial tissue.

2.5. EXISITING BRANDING EFFORTS IN HIGHER EDUCATION

Currently, universities and institutions of higher education are focusing on branding techniques to enhance their visibility and attract more attendees [17-24]. For example, the University of Missouri – Rolla is currently in the process of re-branding itself to the Missouri University of Science and Technology. These efforts are being implemented to increase awareness both nationally and internationally so that prospective students and industries will better understand that the university is one of science and technology based programs [42]. This will also facilitate the university's image to compete and meet

its strategic goal of becoming of the “top five technological universities.” The literature is scarce regarding university efforts to understand brand meaning to improve alignment between the student and industrial markets and ensure a smooth, cyclical process from one to another (see Figure 1.2)

3. RESEARCH METHODOLOGY

3.1. RATIONALE FOR STUDY

The literature does not support the notion of brand meaning and/or brand development at the academic department level, rather it yields concentration of academic branding efforts at the university or institution level [18, 20-23, 42]. In general, the nature of academia requires prioritization of research and teaching efforts with all those involved leading a very busy career, which yields little time to devote to adequate academic department branding and marketing.

Therefore, this systematic approach was designed to help academic departments suffering from unknown causes of poor perception and understanding of their academic department or degree field. The model developed will help speed the process of identifying problems that an academic department may, or may not, be having. Much like a medical doctor's patient, often the symptoms of a problem are evident, yet the diagnosis of the problem is often hard to determine. However, the doctor cannot offer advice to remedy the symptoms until a problem is diagnosed. Often trying to understand marketing issues are much like the problem facing the medical doctor: hard to diagnose, therefore leaving no clear treatment options. Therefore, seemingly a logical place to begin fixing a perception or understanding problem would be to first understand the problem or issue at hand and develop a theory about a plausible cause to analyze.

This study sought to identify a systematic approach to addressing a perception and understanding problem by first identifying potential causes or sources of the problem. The impact of the implementation of this systematic approach is crucial to ensuring a

correct understanding and diagnosis of a poor perception or understanding of an academic department in a timely manner.

3.2. INITIAL RESEARCH

Preliminary research of the literature should be conducted and existing data available regarding an academic department and their markets should be gathered. Typically, the markets for an academic department consist of both prospective students and companies who will later hire those students, which in turn creates additional demand for more students. This phenomenon of obtaining students, educating them, and then companies hiring them creates a cyclical process that is pertinent to the continued success of the academic department (see Figure 1.2).

3.3. RESEARCH APPROACH

The approach to evaluating an academic department used in this study will incorporate both quantitative and qualitative data. Often times, gathering data regarding "brand meaning" to a stakeholder market involves open ended responses, resulting in qualitative data. It is important to understand accepted logic behind qualitative research.

In a qualitative study, researchers state research questions which take the form of a central question and then stem into related sub-questions, rather than stating research objectives and hypotheses [43]. This technique affords the researcher an opportunity to gather unbiased responses from the stakeholder group. Care must be taken in devised the "right question" to ask the stakeholder group to ensure the validity of the answers to the question.

This study uses a quantitative technique to evaluate each stakeholder market's overall understanding of the academic department being evaluated as well as other academic departments in the same overall field of study. A technique using qualitative research by asking questions about "brand meaning" that allow open ended responses will also be used. This approach to evaluating brand meaning captures an unbiased response to the respondent's reaction regarding "brand meaning" to the academic department being evaluated. The specifics of the techniques of evaluating brand meaning via open ended responses will be further discussed in Chapter 4.

3.3.1. Research Objective. In this research a systematic approach to evaluating an academic department's brand meaning will be developed. With the systematic approach:

- Stakeholder markets to an academic department will be identified
- Stakeholder markets will be selected in which to evaluate brand meaning
- A survey instrument will be developed to gather pertinent data regarding stakeholder brand meaning
- The responses will be compared to guidelines for appropriate responses as outlined by the customer based brand equity model.
- An application of the systematic approach to the Department of Engineering Management at the University of Missouri – Rolla (UMR) will also be presented.

It is the goal of this research to investigate brand meaning of academic departments by stakeholder markets and to determine if the stakeholder responses to

brand meaning are appropriate and also to determine if the stakeholders from more than one market share brand meaning response alignment for the same academic department.

4. THE SYSTEMATIC APPROACH TO EVALUATING AN ACADEMIC BRAND MEANING

4.1. INITIAL RESEARCH

Before considering the implementation of the following systematic approach to evaluating an academic department's brand meaning, research of the existing literature should be conducted to gain insight on any existing information regarding the academic department at hand. The review will establish the foundation upon which the systematic approach will be based. Once established, the following systematic approach can be followed to gain understanding of the existing department and its markets.

As discussed in the original formulation of the case study presented in Chapter 5, the notion of a "brand" came about and the Customer Based Brand Equity model was chosen as a viable method to understand what the brand of an academic department meant to its markets. The following model, as displayed in Figure 4.1, depicts the necessary steps in identifying the underlying perception and understanding problems by using a branding model as the foundation for gathering data to analyze.

The systematic approach offers the option to gain knowledge about overall self reported understanding of the academic department by different stakeholder groups. The approach will also offer the option to gather data regarding overall self reported understanding of the field of study that the academic department resides in, as well as other academic departments within that overall field of study. For example, the engineering management academic department that the systematic approach will be applied to in Chapter 5 is an academic department within the overall field of study of engineering, and other academic departments in this field are electrical engineering, civil engineering, and mechanical engineering.

The academic department that wishes to implement the systematic approach must be sure to develop the parameters and markets in which they wish to evaluate their brand and implement the systematic approach accordingly.

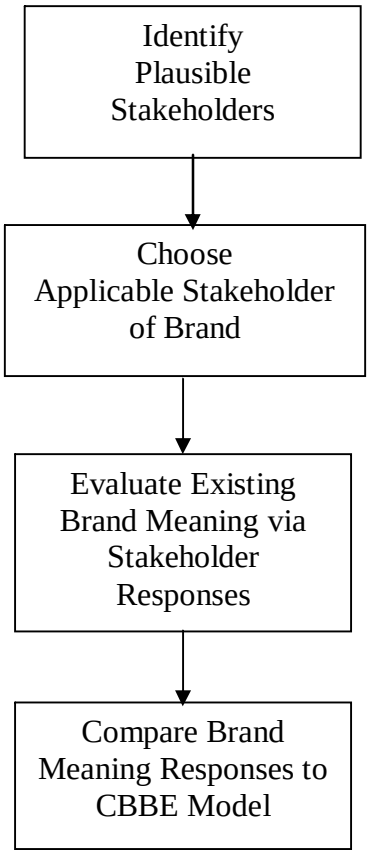

Figure 4.1: Systematic Approach to Evaluating an Academic Brand

4.2. STAKEHOLDER IDENTIFICATION AND SELECTION TO EVALUATE BRAND MEANING

To evaluate brand meaning to various markets of an academic department, the plausible stakeholders for the academic department must be identified. In general, the literature describes academic stakeholders as being donors, alumni, prospective students,

and current students. Other possible stakeholders are faculty, trustees, administrators, and journalists [44].

The academic department implementing the systematic approach of evaluating brand meaning must determine which stakeholder markets they are interested in evaluating. All stakeholders can be evaluated as a comprehensive study, or a particular group of stakeholders can be evaluated and compared to another. For example, to evaluate the alignment of the student to the employer market, as depicted in Figure 1.2, both prospective and current students can be evaluated and compared to the results from existing or potential employers of those students. It is important that the brand has the same meaning to both stakeholders, so as to not create a disruption in this circle of demand between prospective student and potential employers, as shown in Figure 1.2.

4.3. EVALUATE EXISTING UNDERSTANDING AND BRAND MEANING VIA STAKEHOLDER RESPONSES

As previously discussed in Section 4.1, self reported overall understanding of an academic department compared to other departments offering the same type of degree program and the overall field of study in which the department resides can be evaluated using quantitative research methods. Gathering and analyzing self reported levels of understanding of the department, overall field of study, and other departments in the same field can potentially help the academic department predict as to whether or not they have an overall understanding and/or brand meaning problem. It is suspected that academic departments which are not well understood by their stakeholders will display a problem with their brand meaning to those stakeholders. Gathering self reported levels of understanding by stakeholder groups yields the potential for skewed data in that

stakeholders may report a “high” level of understanding, yet their true understanding of the department may not be accurate.

The method used to gather overall understanding of an academic department, their field of study, and other departments within the same field of study was via a 5-point Likert scale with questions asking the stakeholder to rate and self report their levels of knowledge and understanding with 1 = None and 5 = Extremely Familiar.

To establish a brand or evaluate the effectiveness of a branding campaign, Kotler [45] mentions three commonly used research methods for uncovering brand meaning to customers. “Word association” is a common technique employed to evaluate customers’ feelings, knowledge, motivations and brand meaning where researchers ask stakeholders what words come to mind when presented with the brand [4, 45-48]. For example, if a stakeholder’s response to Pepsi is “a quality, well priced, refreshing beverage.” The stakeholder has responded to the brand from the prospective of “what are you?” which is an appropriate response to brand meaning, as it reflects some level of performance and imagery. Secondly, “personifying the brand” might include asking people to describe what kind of person or animal they comes to mind when a brand is mentioned, or any question that will offer a human quality or aspect of the brand. For example, perhaps the Mercedes Benz™ brand make people think of rich, sophisticated executives or that it is smooth and sleek much like a panther; it delivers a human or animalistic aspect of the car’s brand. Finally, “laddering up to find the brand essence” relates to the deeper, more abstract goals consumers are trying to satisfy when they select a brand. For example, one might ask why someone wants to buy a GMC™ truck. Potential buyers may respond that “GMC™ trucks look well built” which is an attribute of the brand. A follow up question

could be “why is it important that the truck be well built?” The response might be “because it is used in the livelihood of my business” which is a functional benefit of the brand. A further question could be “why is it important to the livelihood of your business?” to which a response might be “so that I can feed my family.” which represents the “brand essence” to the customer [45]. Brand essence is what ultimately matters to the stakeholder, as it will be what the stakeholder ultimately will choose the brand based on. In this example, the stakeholder needed a truck to feed his family through a myriad of associations to arrive at that conclusion.

The systematic approach to evaluating an academic department’s brand meaning developed in this study will implement the “word association” method of evaluating brand meaning. The open ended format for responses to brand meaning will afford the stakeholder the opportunity to submit unbiased, “knee jerk” reactions to the brand which will reflect what the brand initially means to that stakeholder when it is presented. Gathering these initial reactions from both student and potential employers will aid in developing insight as to if the brand meaning of the two markets is aligned as depicted in Figure 1.2.

4.3.1. Survey Instrument Development. After parameters of the academic department’s markets have been established, stakeholders have been identified and a method of evaluating brand meaning is chosen, an instrument to measure brand meaning for the particular academic department or organization must be developed.

Basic population demographics should be incorporated in the survey instrument so as to identify any gaps, biases, or weaknesses in the population such as gender bias or sample sizes inadequate to compare to another sample.

As previously discussed, to evaluate the overall understanding of the academic department, their overall field of study and other academic departments in the same field of study, a 5-point Likert scale can be used to measure a question asking the stakeholder to self report their knowledge, understanding or familiarity with the department or field of study (See Appendix A).

The systematic approach to evaluating an academic department's brand meaning utilizes the "word association" method of evaluating brand meaning and will incorporate open ended responses. Items to include in the questionnaire instrument can include, but are not limited to: population demographics, overall understanding or familiarity with your brand, product, or service, how the respondent is familiar with your brand, product, or service, and open ended questions to allow unbiased reaction from the respondent on what your brand, product, or service means to them. This qualitative data must be coded for analysis and will be discussed further in Section 4.4.

4.3.2. Institutional Research Board. Before the survey instrument is distributed to a stakeholder, due diligence must be given to ensure that no respondent to the survey instrument will be harmed mentally or physically, and to ensure that no respondent was coerced into participating in the study. An Institutional Research Board or equivalent should be consulted prior to administering the survey instruments.

4.3.3. Population Demographics. A simple analysis of the population demographics should be performed to understand and address any potential biases or limitations afforded by the respondent population (See Appendix A). Total samples sizes for the population from each market and total overall population size should be reported.

4.3.4. Overall Understanding of an Academic Department's Field of Study and Other Academic Departments Within Same Field of Study. If data regarding the overall understanding of an academic department's field of study is desired to develop a baseline understanding of the field of study by stakeholder market as well as overall, a 5-point Likert scale can be used to ask the stakeholder to self report their levels of knowledge, familiarity or understanding (See Appendix A). Analysis of this data can be done either overall, or by each stakeholder group which may aid in uncovering potential marketing gaps in a certain stakeholder market.

The same questions regarding knowledge, familiarity, or understanding can be asked of the same stakeholders regarding other academic departments in the same overall field of study. These departments will vary in availability and size depending on the academic department being evaluated. For example, the engineering management department that the systematic approach was applied to in Chapter 5 belongs to the overall engineering field of study which houses many more academic departments such as electrical, civil, and mechanical engineering.

4.3.5. Analysis of Stakeholder Understanding of Specific Academic Department. From the previous section, an example of a specific academic department in the engineering field of study might be engineering management or electrical engineering. If a specific academic department wanted to evaluate the self reported levels of understanding regarding its department that were reported on a 5-point Likert scale, the responses from each stakeholder group, and then overall, should be averaged. After the average level of understanding per stakeholder market is calculated, it can be

compared to other academic department's understanding and the understanding of the overall field of study across like stakeholder markets.

4.4. COMPARE ACADEMIC DEPARTMENT BRAND MEANING RESPONSES TO CBBE MODEL

In order to evaluate the brand meaning of an academic department after data has been gathered via a survey instrument using the "word association" method of brand meaning evaluation [4, 45-48], the data must be coded per respondent into the six factors of the CBBE model. The researcher must use a rubric for establishing a method or assigning "like responses" to the same factor in the CBBE model. These responses and assignments will vary for each academic department due to the various natures of the fields of study they represent. However, in general, responses can be coded as they fall into the "sub-dimensions of the six factors" of the CBBE model for guidance in coding them, as outlined in Table 2.1. For example, responses reflecting a "category identification" or some type of "needs fulfillment" would fall into the "salience" factor and be coded as 1. A response of "my dad's degree" reflects some level of loyalty and identity, which are sub-dimensions of the "resonance" factor and be coded as 6. See Appendix C for an example rubric.

This method of coding will require accuracy and judgment for the researcher, so care should be taken to place each response into the proper factor. Since this method requires the development of a rubric for coding by one researcher, to ensure the reliability of the coding method, the researcher should recruit another person to implement the developed rubric of coding on the same sample of the data set. The goal of this method of establishing inter-rater reliability is to ensure that the coding has been performed

consistently and that the rubric will consistently return the same results [49]. A Cohen's kappa should be calculated to determine the confidence in the inter-rater reliability of the data coding between the researcher and research assistant. See Appendix B for the model used to determine the Cohen's kappa value for the case study responses to brand meaning. A Cohen's kappa value above 0.7 is considered to be a good rule of thumb for inter-rater reliability confidence [50]. After all responses have been coded and the reliability of the coding has been verified, the frequencies of the response occurrences per factor of the CBBE model per market population must be assessed.

The responses to the "word association" question will assess whether or not the brand meaning is an appropriate response to brand meaning as outlined by the CBBE model. Also, it will access whether or not the responses to brand meaning are aligned across the stakeholder markets. If the responses are consistently coded into the "brand meaning" level of the CBBE model (Performance and Imagery categories) by all markets, then the brand meaning can be considered aligned and on the right path to a strong brand. However, if the responses are not consistent across the "brand meaning" level of the CBBE model, or are not consistent across markets (for example if one market's responses are mainly Judgments and another market's responses are mainly Performance) then a misalignment of brand meaning may be realized.

4.5. CASE ANALYSIS FINDINGS AND CONCLUSIONS

A summary of findings should be composed regarding what stakeholder markets were addressed and why those markets were chosen. A synopsis of the self reported levels of understanding regarding the academic department, the overall field of study the

department resides in as well as other departments within that field of study should be reported and discussed as to findings. Stakeholder responses that are coded as Performance or Imagery factors that make up brand meaning in the CBBE model should be considered "appropriate" responses to brand meaning. Responses that fall into other categories of the CBBE model should be considered "inappropriate" responses to brand meaning. For example, if engineering management is the department being evaluated, how does its understanding compare with the overall field of engineering, and also how does its understanding levels compare with electrical, civil, and mechanical engineering departments? The overall brand meaning response conclusions should be reported by frequency of responses falling into each of the six factors of the CBBE model. For example, 44% of the responses were Performance, 22% were feelings and the remaining 34% of the responses were Salience suggests that the brand meaning responses for the department are not appropriate due to the fact that 56% of the response fell outside of appropriate responses for brand meaning as outlined by the CBBE model (see Table 2.1). After the frequencies of responses are assigned for each stakeholder market, comparisons can be made to ensure proper brand meaning alignment between stakeholder markets. For example, if 56% of industry stakeholders' responses to an academic department's brand meaning fell into the Feelings sub-dimension of brand response and 75% of the department's student responses fell into the "Performance sub-dimension of brand meaning a clear misalignment of brand meaning between the two stakeholder markets would be present.

Presentation of these findings is critical in aiding additional research in finding a strategy to improve the market alignment or pursue a newly found marketing gap in the stakeholder markets.

5. APPLICATION OF A SYSTEMATIC APPROACH TO EVALUATING THE ENGINEERING MANAGEMENT BRAND AT THE UNIVERSITY OF MISSOURI - ROLLA

5.1. RATIONALE FOR STUDY

Anecdotal evidence suggests that the engineering management academic department at the University of Missouri – Rolla (UMR) is not well understood by its student and industrial market as outlined in Chapter 2 of this paper. Even though members of both the student and industrial markets have a perception about what engineering management is and what job functions the graduates of the program are capable of performing are, they are not always accurate. This disconnect between the facts about an academic department and its markets' perceptions create a less than ideal relationship in understanding, recruiting and hiring the graduates of the program. Even with evidence that this phenomenon was happening, the administration of the academic department did not understand where the fundamental problem was, and thereby where to most efficiently invest resources to improve the situation. In order to efficiently solve a problem or address an issue, one must first understand what the problem is. Therefore, this study was initiated to flush out and understand disconnects the understanding and brand meaning between the engineering management academic department at UMR and its stakeholder markets. It is thought to be a worthwhile endeavor to better understand the market and how they perceive and understand the field since, as Kocaoglu reported nearly a decade and a half ago, the interest in engineering management was growing [51].

5.2. INITIAL RESEARCH

Preliminary research was conducted to understand what studies had been conducted and what literature was available regarding the entire degree field of. It was found that there are five undergraduate programs accredited by the Accreditation Board for Engineering and Technology (ABET). However, after analyzing the engineering management programs carefully, many significant differences were found between them in curriculum and program definitions [33]. Given this considerable difference in programs, it was concluded that the study focus should be shifted to a particular academic department, rather than the entire field of engineering management. Therefore, for the engineering management academic department housed inside the Department of Engineering Management and Systems Engineering at the University of Missouri – Rolla will be used as a specific case for the application of the systematic approach to evaluating an academic brand model since it is the founding program of engineering management and seemingly the most diverse.

It was also found that there are limited formal studies and information available regarding engineering management in the literature, specifically regarding what the academic department has to offer and how best to promote it, especially for the undergraduate level of study. More information exists regarding the graduate levels programs. Babcock, a retired professor of engineering management attempted to define "what is engineering management" in his book entitled "Managing Engineering and Technology" [52]. Lannes [53] also authored an article entitled "What is engineering management" in an effort to explain what the degree field involves, why it is important, and the tasks required of an engineer at various steps of their careers as engineers. Yet

none of the literature addressed how to improve engineering management awareness to both the student and industry markets or evaluated what engineering management "meant" to its markets.

5.3. RESEARCH APPROACH

Since gathering data regarding "brand meaning" to a market involves open ended responses, which results in qualitative data collection, it is important to understand accepted logic behind qualitative research. As discussed earlier, this study uses a technique of qualitative research by asking questions that address stakeholders' "brand meaning" by allowing open ended responses that capture the stakeholder's unbiased reaction regarding "brand meaning" engineering management.

5.3.1. Research Problem. Given the anecdotal evidence and preliminary data regarding the lack of understanding in engineering management at UMR, which is the oldest and most well known program in the United States, it seems logical to assume that the same lack of true understanding be evident in other engineering management academic departments. Given that engineering management is an academic brand, it will also be assumed that if the proposed systematic approach to understanding the existing lack of understanding in engineering management can be successfully applied, it will be transferable to other engineering management departments facing the same problem with lack of understanding.

5.3.2. Research Objective. In this research the systematic approach discussed in Chapter 4 will be applied to evaluate the brand meaning of the UMR Department of Engineering Management. With the systematic approach:

- The stakeholder markets of this department will be identified
- The stakeholder markets in which to evaluate brand meaning will be selected
- A survey instrument will be developed to gather pertinent data regarding stakeholder brand meaning
- The responses will be compared to guidelines for appropriate responses as outlined by the customer brand equity model.

It is the goal of the application of this systematic approach to investigate the brand meeting of the UMR engineering management department and to determine if the stakeholder responses to brand meaning are appropriate response to brand meaning and are aligned within and between its stakeholder groups.

5.4. APPLICATION OF THE SYSTEMATIC APPROACH TO EVALUATING AN ACADEMIC BRAND TO ENGINEERING MANAGEMENT

Given the evidence that there was little existing literature on engineering management, especially at the undergraduate level aimed at improving understanding and awareness of the degree field, it was important to develop a methodical sequence of steps to follow to lead to a logical analysis of identifying how to improve the understanding and brand meaning of engineering management at UMR. The Customer Based Brand Equity Model developed by Keller [3], as discussed in Chapter 2 of this paper, was employed to help understand engineering management at UMR as a brand providing a product of the engineering management Bachelor of Science degree to both students, and ultimately to industry who will hire those students after they complete the degree requirements.

5.4.1. Stakeholder Identification and Selection to Evaluate Brand Meaning.

In order to understand a market's response to a brand, pertinent stakeholders of the brand must be identified and selected based on relevance to the question at hand. Careful thought was given first to determine who engineering management's at UMR program stakeholders were, and then selecting them for analysis relative to the market understanding issue at hand. The literature has identified key stakeholders to academia as being donors, alumni, prospective students, and current students [44].

Prospective students, including science technology-track high school, UMR freshmen engineering, UMR engineering management upperclassmen students and both existing and potential industrial employers were identified to be particularly important in ensuring a smooth cyclical process in student to industrial flow through in the market as discussed in Chapter 2. Donors, alumni, and current out of department students were not identified as being pertinent stakeholders in the quest to smooth the recruitment and placement cycle of engineering management students at UMR.

5.4.2. Evaluate Existing Understanding and Brand Meaning Via Stakeholder Responses. Quantitative research methods will be used to evaluate the levels of understanding that stakeholders hold for the engineering management department at UMR, the engineering field of study in which engineering management resides, and other engineering departments at the UMR campus that also reside in the engineering field of study. Stakeholders will be asked to self report their levels of understanding of these departments and field of study on a 5-point Likert scale with 1 = No Familiarity and 5 = Extremely Familiar (see Appendix A).

It is ideal for any brand which wants to resound in the minds of its market and stakeholders to successfully establish itself as a "strong brand" as outlined by Keller's CBBE Model in Chapter 2. In general, the model entails a hierarchy of steps that a brand must go through, bottom up, from "salience" to "resonance" to ensure that they are seen by their target market as a strong brand. If the integrity of any step in this hierarchical process wanes, the overall integrity of the brand will ultimately suffer.

Since the lack of literature and anecdotal evidence suggests that engineering management as a degree field or academic department is not well understood by its market, analyzing the "brand meaning" was pursued as a valuable measurement to start in assessing the brand. One of the established methods of measuring "brand meaning" to a stakeholder in the market is by "word association" as discussed in Chapter 4 and will be applied to the engineering management department at UMR [4, 45-48]

In this study, stakeholders were asked to respond to the question of "After you read the following phrases, one at a time, please respond with the first terms that come to mind and record them on the following lines:" followed by the terms "engineering management" and then also other academic departments in the same field of study such as "electrical engineering," "civil engineering," or "mechanical engineering." Stakeholders were also asked to respond to a similar question to evaluate brand meaning regarding the overall engineering field of study in which engineering management.

5.4.2.1. Survey Instrument Development. After identifying pertinent stakeholders to the engineering management brand, and putting a branding research method in place, the next step to analyzing this brand is to develop a method of collecting

data that will measure an established method of measuring brand meaning from our market.

A survey instrument was developed to gather demographic data about the population being sampled, as well as information any existing relationship with or knowledge about engineering in general, and also with each of the sixteen engineering disciplines offered at UMR. Per the method of measuring brand meaning via "word association" [4, 45-48], survey items were also included to gather open ended responses regarding brand meaning about the sixteen different engineering disciplines offered on the UMR campus. See Appendix A for the survey instruments administered to the student and industrial markets.

5.4.2.2. Institutional Research Board. After the stakeholder populations were identified and selected, and the survey instruments were developed, proper documentation was submitted to the Institution Research Board (IRB) to obtain permission to conduct the study in the best interest of the populations being surveyed. Permission was granted by the IRB to conduct the study after an "Exempt" status was granted ensuring that no human subject would be harmed physically or psychologically by responding to the survey instrument.

5.4.2.3. **Population Demographics.** The student stakeholder market consisted of both potential and current students from the high school level, college freshman level and college upperclassman level. Rolla High School (RHS) was chosen due to its proximity to the University of Missouri – Rolla and due to its intensive science and technology track of courses of students. UMR and RHS are currently partnering to offer the high school students an "engineering academy" option in their curriculum to study

introductory engineering principles. There were 118 total respondents to the survey instrument from RHS.

Adding to the student market population responses were 705 college freshman students enrolled in the Basic Engineering 10 (now Freshman Engineering 10) course in the Fall 2005 semester. This group of students was selected under the pretense that they would be a "best case" scenario of assessing freshmen understanding of engineering since they were freshmen engineering students.

Students enrolled in their upperclassmen years in the engineering management department at UMR were also asked to participate in the survey, and a total of 116 responded to the survey instrument. This group of college students was chosen to participate due to their close relationship with the engineering management academic department at UMR. It is thought that this student demographic will have greater understanding of the engineering management program to weigh understanding against for those thought to not have a clear understanding.

Since the goal of this study is to evaluate the cyclical process of recruitment of students and hiring of graduates by industry and to determine the alignment of the understanding of engineering management between both markets, a population of respondents from industry and academia was recruited to participate in this study. A total of 56 respondents were obtained from this "expert" group to evaluate what the understanding of engineering management is and what brand meaning exists for the industrial stakeholder market. This industrial stakeholder market was also asked to report what the engineering management brand meaning should be. Thirty three of these expert respondents were from an academic setting while 23 were from industrial companies

such as Anheuser-Busch™, Ford Motor Company™, Boeing™ and John Deere™. Responses from academic settings included UMR, University of Colorado – Boulder, University of Pacific, University of Tennessee and Stevens Institute of Technology. Again, this population was surveyed to represent perceptions and understanding of professionals that could potentially be employers of engineering management graduates, both in academia and industrial companies. See Table 5.1 below for a summary of respondent demographics.

Table 5.1: Population Demographic Summary

Population	N	Male	Female
RHS	118	66	52
UMR Freshmen	705	579	126
UMR EMGT Upperclassmen	116	84	32
Industry	23	NA	NA
Academia	33	NA	NA

5.4.2.4. Overall Understanding of Engineering Analysis. Stakeholders were asked to self report their overall understanding of engineering as a field of practice. Stakeholders were asked to self report levels of understanding on a 5-point Likert scale with 1 = Not Familiar and 5 = Extremely Familiar. The self reported data is a possible limitation of the study since stakeholders may skew responses due to a self serving bias of reporting a higher level of understanding than what is realistic. Another limitation of the self reported data is that the responses are not necessarily accurate in nature. For example, someone could report a "5" being extremely familiar with engineering and not accurately understand what engineering comprises. The industry market was not asked to respond to their understanding of engineering in general as it was not thought to add

valuable information to the study and would increase the length of the survey instrument, possibly decreasing the number of respondents.

Below Table 5.2 summarizes the finding of overall self reported understanding of engineering as a practice by each population group. Note that the N reported in the following table represents the valid N for the self reported data because each respondent may have not given a response to each item in the survey questionnaire.

Table 5.2: Summary of Mean Responses to Overall Understanding of Engineering

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
UMR Freshmen	699	3.2911	.71517	.02705	3.2380	3.3442	1.00	5.00
RHS	117	2.5342	.88990	.08227	2.3712	2.6971	1.00	5.00
UMR EMGT Upperclass	117	3.5855	.72007	.06657	3.4536	3.7173	1.00	5.00

Data were collected regarding overall self reported levels understanding of engineering as a field so as to draw a baseline of understanding to compare self reported levels of understanding by specific disciplines to. Table 5.2 and Figure 5.1 display the increase in engineering as a whole from high school students through upperclassmen at UMR. This increase in understanding was expected due to the natural phenomenon of increase in knowledge with time and familiarity.

Therefore, it would be expected that the upperclassmen engineering students have higher self report knowledge of engineering than high school students even though the high school students were in close proximity to UMR.

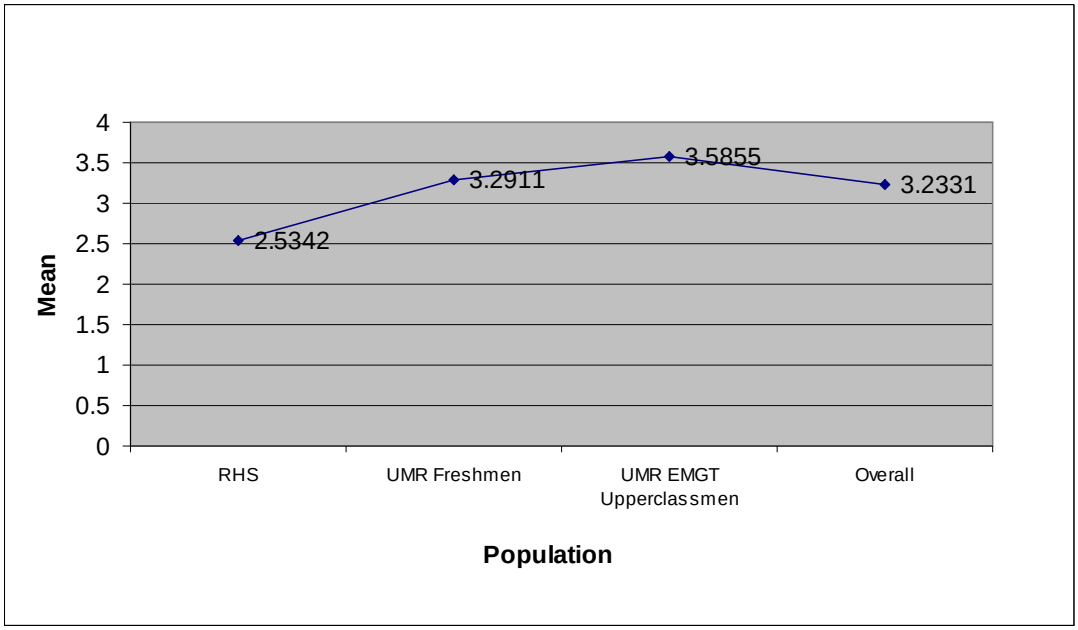

Figure 5.1: Mean Responses to Overall Understanding of Engineering

There is an obvious difference in means between the student stakeholder markets, however a statistical significance in the difference will prove that there is meaningful data in the differences. Table 5.3 shows the results from an ANOVA analysis of variance conducted between the self reported response means for the RHS, UMR freshmen, and UMR engineering management upperclassmen populations. The ANOVA test is used to test the hypothesis that means are equal, and then disprove that hypothesis if means differ from one another. There is a significant difference of means between the three student

populations, indicated by an F value of 67.632 at the $\alpha = .05$ significance level (see Table 5.3).

Table 5.3: ANOVA for Overall Understanding of Engineering

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	74.033	2	37.017	67.632	.000
Within Groups	509.014	930	.547		
Total	583.047	932			

Table 5.4 represents the Post Hoc Tukey values for the difference in means for each of the student populations. There is a significant difference in means for each comparison combination for the three student populations ranging from .29434 to 1.05128 at the $\alpha = .05$ significance level.

Table 5.4: Tukey Post Hoc for Overall Understanding of Engineering

(I) Population Code	(J) Population Code	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
UMR Freshmen	RHS	.75694(*)	.07390	.000	.5835	.9304
	UMR EMGT Upperclassmen	-.29434(*)	.07390	.000	-.4678	-.1209
RHS	UMR Freshmen	-.75694(*)	.07390	.000	-.9304	-.5835
	UMR EMGT Upperclassmen	-1.05128(*)	.09673	.000	-1.2783	-.8242
UMR EMGT Upperclassmen	UMR Freshmen	.29434(*)	.07390	.000	.1209	.4678
	RHS	1.05128(*)	.09673	.000	.8242	1.2783

* The mean difference is significant at the .05 level.

Table 5.5 also displays results from the Tukey Post Hoc test ensuring that none of the means for each student population group are the same, hence no two means being present in the same column. For example, the RHS mean of 2.5342 is displayed in column one, with no other mean from any other student population also being displayed in column one, thereby indicating that no other population mean is equal to the RHS mean.

Table 5.5: Tukey Post Hoc Comparison of Means for Overall Understanding of Engineering

		Subset for alpha = .05		
Population Code	N	1	2	3
RHS	117	2.5342		
UMR Freshmen	699		3.2911	
UMR EMGT Upperclassmen	117			3.5855

Table 5.6 shows the rankings of each of the sixteen engineering disciplines at UMR for each group of the student population. This table also shows an increasing trend in the understanding of the engineering management field specifically through the academic timeframe for a student. The self reported mean understanding for engineering management for RHS students ($\mu = 1.62$) was lower than the self reported mean understanding for UMR freshmen ($\mu = 2.54$). Intuitively, the self reported mean understanding of engineering management by engineering management upperclassmen should be, as is the case, the highest mean of 4.23. Engineering management was ranked twelfth out of sixteen in self reported understanding of the engineering disciplines at

UMR by the Rolla High School students while the UMR freshman ranked it eighth out of sixteen. Expectedly, the engineering management upperclassmen ranked engineering management first out of sixteen based on self reported understanding.

Tables 5.7 and Figure 5.2 show trends in the understanding of each of the sixteen engineering disciplines offered at UMR by all academic stages of the student population. This data demonstrate a critical lack of student understanding of engineering early that may impact college career planning. Given that there is a downward trend in the interest of high school students in engineering [54], this potential market needs to be addressed to improve understanding and awareness.

Table 5.6: Ranked Understanding of Engineering Disciplines at UMR (Mean)

Ranking	Rolla High School (N = 118)	UMR Freshmen (N = 704)	UMR EMGT Upperclassmen (N = 117)
1	Architectural Engineering (2.34)	Mechanical Engineering (3.37)	Engineering Management (4.23)
2	Mechanical Engineering (2.26)	Civil Engineering (3.18)	Civil Engineering (3.25)
3	Computer Engineering (2.16)	Electrical Engineering (2.84)	Mechanical Engineering (3.21)
4	Aerospace Engineering (2.14)	Architectural Engineering (2.83)	Electrical Engineering (2.81)
5	Electrical Engineering (2.10)	Aerospace Engineering (2.76)	Interdisciplinary Engineering (2.76)
6	Civil Engineering (2.08)	Computer Engineering (2.64)	Computer Engineering (2.69)
7	Chemical Engineering (2.04)	Chemical Engineering (2.60)	Architectural Engineering (2.64)
8	Mining Engineering (1.92)	Engineering Management (2.54)	Chemical Engineering (2.40)
9	Nuclear Engineering (1.85)	Nuclear Engineering (2.38)	Aerospace Engineering (2.32)
10	Environmental Engineering (1.80)	Metallurgical Engineering (2.34)	Metallurgical Engineering (2.17)
11	Geological Engineering (1.79)	Mining Engineering (2.31)	Environmental Engineering (2.08)
12	Engineering Management (1.62)	Petroleum Engineering (2.20)	Mining Engineering (2.04)
13	Ceramic Engineering (1.61)	Interdisciplinary Engineering (2.17)	Nuclear Engineering (2.03)
14	Metallurgical Engineering (1.55)	Environmental Engineering (2.11)	Petroleum Engineering (2.02)
15	Petroleum Engineering (1.51)	Ceramic Engineering (2.11)	Ceramic Engineering (2.00)
16	Interdisciplinary Engineering (1.29)	Geological Engineering (2.04)	Geological Engineering (1.96)

Table 5.7: Overall Mean Understanding of Engineering Disciplines at UMR

Discipline on UMR Campus	Rolla High School (N = 118)	UMR Freshmen (N = 704)	UMR EMGT Upperclassmen (N = 117)
Aerospace Engineering	2.14	2.76	2.32
Architectural Engineering	2.34	2.84	2.64
Ceramic Engineering	1.61	2.11	2.00
Chemical Engineering	2.04	2.6	2.40
Civil Engineering	2.08	3.18	3.26
Computer Engineering	2.16	2.64	2.69
Electrical Engineering	2.10	2.84	2.81
Engineering Management	1.62	2.54	4.23
Environmental Engineering	1.80	2.11	2.08
Geological Engineering	1.79	2.04	1.96
Interdisciplinary Engineering	1.29	2.17	3.21
Mechanical Engineering	2.26	3.37	2.17
Metallurgical Engineering	1.55	2.34	2.04
Mining Engineering	1.92	2.31	2.03
Nuclear Engineering	1.85	2.38	2.03
Petroleum Engineering	1.51	2.17	2.76

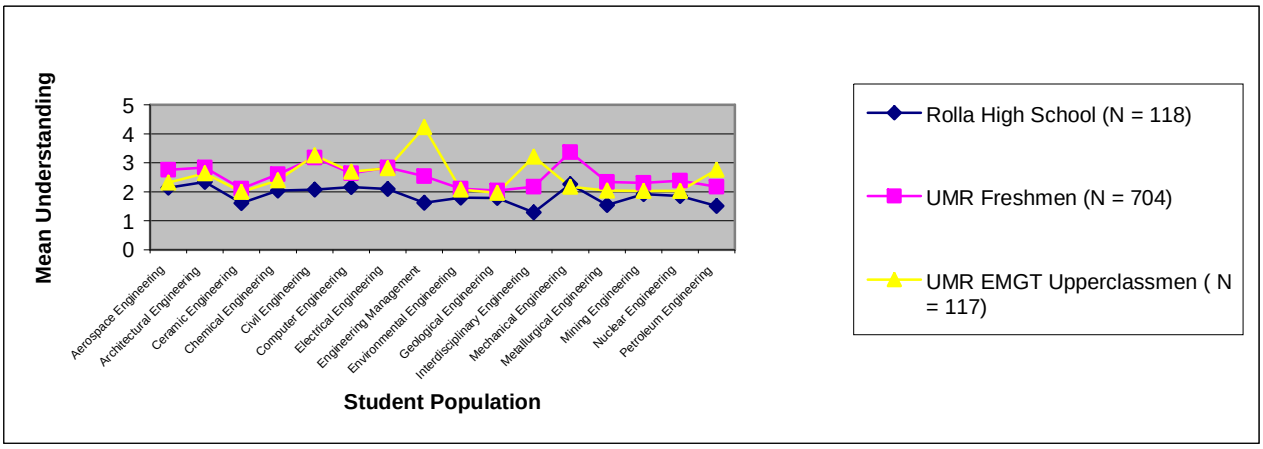

Figure 5.2: Overall Mean Understanding of Engineering Disciplines at UMR – High School Through UMR Upperclassmen

5.4.2.5. Analysis of Stakeholder Understanding of Engineering Management.

After the establishment of a significant difference in the mean level of understanding of engineering in general, the next step is to determine if there is a significant difference in mean self reported differences in understanding of engineering management specifically by the population. Table 5.8 shows the demographics for each student population and their overall self reported mean understanding of engineering management.

Table 5.8: Descriptive Statistics for Understanding of Engineering Management

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
UMR Freshmen	704	2.5419	1.10122	.04150	2.4604	2.6234	1.00	5.00
RHS	118	1.6186	.77260	.07112	1.4778	1.7595	1.00	5.00
UMR EMGT Upperclassmen	117	4.2308	.92275	.08531	4.0618	4.3997	1.00	5.00
Total	939	2.6363	1.24205	.04053	2.5568	2.7159	1.00	5.00

An ANOVA analysis of variance was also conducted to test whether or not the means of the three student populations were the same regarding their self reported understanding of engineering management. An F statistic of 195.212 shows a statistically significant difference of means at the $\alpha = .05$ significance level (see Table 5.9).

Table 5.9: ANOVA for Understanding of Engineering Management

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	425.930	2	212.965	195.212	.000
Within Groups	1021.122	936	1.091		
Total	1447.052	938			

Tukey's Post Hoc test revealed a statistically significant difference in means between all comparison combinations between the three groups with mean differences ranging from .92326 to 2.61213 at the $\alpha = .05$ level (See Table 5.10). Table 5.11 (Tukey Post Hoc) shows a statistically significant difference between the means of the three student populations because no two means reside in the same column.

Table 5.10: Tukey Post Hoc for Understanding of Engineering Management

(I) Population Code	(J) Population Code	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
UMR Freshmen	RHS	.92326(*)	.10390	.000	.6794	1.1672
	UMR EMGT Upperclassmen	-1.68887(*)	.10428	.000	-1.9337	-1.4441
RHS	UMR Freshmen	-.92326(*)	.10390	.000	-1.1672	-.6794
	UMR EMGT Upperclassmen	-2.61213(*)	.13627	.000	-2.9320	-2.2922
UMR EMGT Upperclassmen	UMR Freshmen	1.68887(*)	.10428	.000	1.4441	1.9337
	RHS	2.61213(*)	.13627	.000	2.2922	2.9320

* The mean difference is significant at the .05 level.

Table 5.11: Tukey Post Hoc Comparison of Means for Understanding Engineering Management

Population Code	N	Subset for alpha = .05		
		1	2	3
RHS	118	1.6186		
UMR Freshmen	704		2.5419	
UMR EMGT Upperclassmen	117			4.2308

5.4.3. Compare Engineering Management Brand Meaning Responses to CBBE Model.

To evaluate the brand meaning for each population, each response was coded as Salience, Performance, Imagery, Judgment, Feelings, or Resonance based on the types of responses that make up each of those categories as outlined in Chapter 2. For example, responses encountered such as “man in suit” or “guy at desk” were coded as responses to brand meaning in the imagery factor. Responses such as “supervisor” or “leader” were coded as responses to brand meaning in the performance factor. Responses such as “engineering” or “business” were coded as responses to brand meaning that fell into a category identification slot as a salience response. Responses to brand meaning that were coded as Judgments were often times responses such as “smart people” or “technical understanding” while responses to brand meaning that fell into the feelings factor were responses such as “boring” and “awesome.” Finally, examples of responses to brand meaning that were coded as Resonance were responses such as “Dad” or “Uncle” which reflects a loyalty or attachment to the brand. Each of the six categories, or factors, of the CBBE model were assigned a number, for example, Salience = 1, and Resonance = 6 for the purposes of measuring how often certain types of responses that pertained to each factor occurred. See Appendix C for the rubric used to code responses

to Engineering Management in this study. After each response had been assigned to a CBBE factor by a number coding by the researcher, another person was sought out to recode a sample of the data set to ensure the reliability of the coding method [49]. The high school market population was chosen as a "worst case" response scenario and were thought to have the widest array of responses thereby making it the hardest population to code. If reliability of the coding method can be established for the more erratic population, then it suggests that the rest of the population will be sufficiently coded as well. Responses were coded the same 88.1% of the time by two researchers for the high school student population sample taken from the overall student population. A Cohen's kappa was calculated to determine the confidence in the inter-rater reliability of the data coding between the researcher and research assistant. See Appendix C for the model used to determine the Cohen's kappa value for the case study responses to brand meaning. A Cohen's kappa value of $k = 0.8$ was determined for the confidence in inter-rater reliability for the sample chosen from the respondents to engineering management. A Cohen's kappa value above 0.7 is considered to be a good rule of thumb for inter-rater reliability confidence [50], therefore the data coding is reliable in this study.

After the responses have been coded and tested for reliability, the frequencies for each of the categories of the Customer Based Brand Equity Model (CBBE) were calculated and are displayed in Tables 5.12 and Figure 5.3. These frequencies represent the number of times a response to brand meaning from the population pertained to that factor. Note that not all students in the population for each group responded to all questions on the survey instrument for the sake of time. For example, even though there were 705 UMR freshmen in the population, to minimize the completion time of the

survey instrument each respondent was asked to respond to only a subset of the branding questions for the sixteen engineering disciplines at UMR. The surveys containing subsets of questions were distributed randomly, and as evenly as possible to prevent data skewing. Only 189 valid responses were obtained to the engineering management branding question from the UMR freshmen population because of limited time allotted to the respondents to complete the survey. The frequencies of brand meaning responses were coded and analyzed at all population groups, including industry, to shed light about the congruency of brand meaning between students and potential employers.

Table 5.12: Brand Meaning Responses to EMGT via CBBE Model

		Percent Response					
Population	N	Salience	Performance	Imagery	Judgments	Feelings	Resonance
RHS	50	3.4%	62.1%	13.8%	0.0%	6.9%	0.0%
UMR Freshmen	189	16.6%	67.4%	3.1%	1.6%	8.8%	0.5%
UMR EMGT Upperclassmen	135	18.2%	54.7%	4.4%	2.9%	18.2%	0.0%
Industry	23	43.5%	21.7%	4.3%	30.4%	0.0%	0.0%
Academia	35	31.4%	37.1%	0.0%	28.6%	0.0%	2.9%
Overall Student & Industry	433	17.9%	57.9%	4.7%	5.6%	10.3%	0.4%
Industry - Desired Response	23	43.5%	8.7%	0.0%	47.8%	0.0%	0.0%
Academia - Desired Response	33	21.2%	30.3%	6.1%	39.4%	0.0%	2.9%

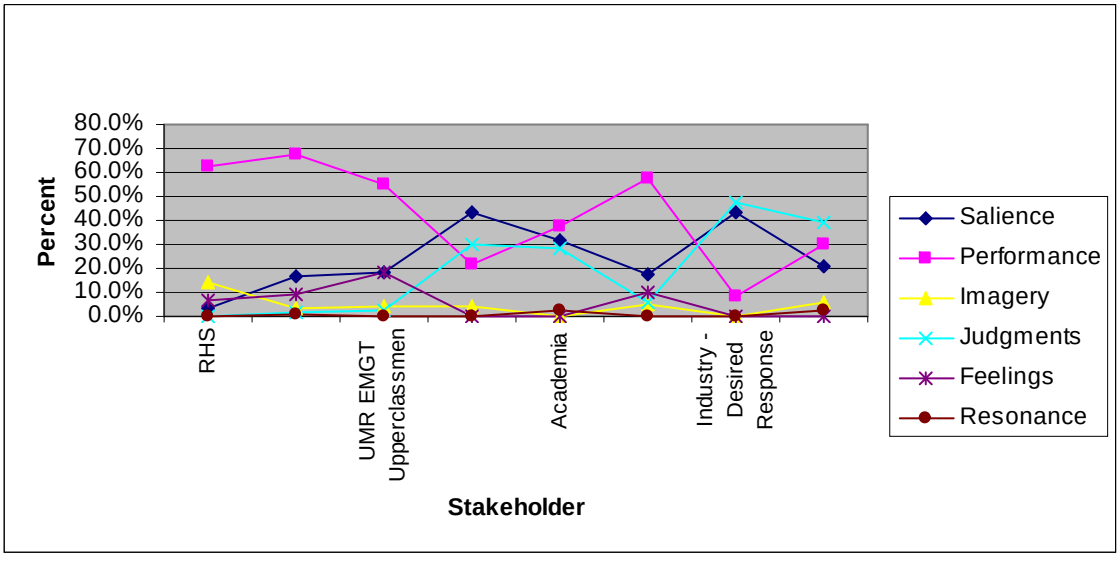

Figure 5.3: Brand Meaning Responses to EMGT via CBBE Model

The survey instrument item which the population members were asked to respond to was a question aimed at assessing "brand response." According to the CBBE Model [45], responses to brand meaning should fall into either the Performance or Imagery categories to be considered an "appropriate" response to brand meaning. Responses that fall into the other four categories will be considered inappropriate for measuring brand meaning since the respondent was specifically asked a question pertaining to brand meaning. If the response did not align with the categories that make up brand meaning (Imagery and Performance) then the respondent's brand meaning is referring to another level of the CBBE model and is not aligned with creating a strong brand.

As Figure 5.3 shows, performance is by far the most predominant brand meaning response by the entire population. Performance responses included responses regarding specific job functions of engineering management graduates such as "supervising," "manager," and "paperpusher." UMR freshmen give the most responses to brand meaning using a term that falls into the Performance factor (67.4%). Responses falling into the Imagery factor, the other factor appropriate for measuring brand meaning, are not as frequently reported however (RHS population reported 13.8%). This means that most of the responses to brand meaning are something other than those relative to brand meaning, thereby creating a disjoint in the alignment of the establishment of an ideal brand as outlined by the CBBE Model and reality for engineering management.

In order to specifically analyze the alignment of market brand response between students and potential employers, the student population responses will be compared with that of the academic and industry responses. Analysis of these responses is outlined in Tables 5.13 and 5.14.

Table 5.13: Brand Meaning Responses Per CBBE Model

Population	Brand Identity	Brand Meaning	Brand Response	Brand Relationship
RHS	3.4%	75.9%	6.9%	0.0%
UMR Freshmen	16.6%	70.5%	10.4%	0.5%
UMR EMGT Upperclassmen	18.2%	59.1%	21.1%	0.0%
Industry	43.5%	26.0%	30.4%	0.0%
Academia	31.4%	37.1%	28.6%	2.9%
Overall Student & Industry	17.9%	62.6%	15.9%	0.4%
Industry - Desired Response	43.5%	8.7%	47.8%	0.0%
Academia - Desired Response	21.2%	36.4%	39.4%	2.9%

Table 5.14: Brand Meaning Responses Appropriateness and Implications

Population	Majority Reponse to Brand Meaning Question	Implications
RHS	Brand Meaning	Appropriate
UMR Freshmen	Brand Meaning	Appropriate
UMR EMGT Upperclassmen	Brand Meaning	Appropriate
Industry	Brand Identity	Inappropriate
Academia	Brand Meaning	Appropriate
Overall Student & Industry	Brand Meaning	Appropriate
Industry - Desired Response	Brand Response	Inappropriate
Academia - Desired Response	Brand Response	Inappropriate

The majority of the responses from the student and from the academic populations fall into the brand meaning category of the CBBE model. The academic stakeholder population yielded 37.1% while the student populations yielded 75.9% for RHS, 70.5% for UMR freshmen, and 59.1% for UMR upperclassmen While the brand meaning responses for this population are considered appropriate, the responses are not aligned with the industry stakeholder brand meaning responses. These responses are indicative of a brand identity response (See Table 5.13), thereby making the industry population responses inappropriate responses to brand meaning. Brand identity responses reflect a broad base of what engineering management fundamentally is seen as such as “business,” “management,” or “engineering.” This response indicates that industrial professionals respond to engineering management’s brand meaning as a difference of fields of practice

or study, whereas the student and academic stakeholder populations respond to engineering management's brand meaning as a matter of specific job function of graduates. This difference of the brand meaning to each of the stakeholder populations can be detrimental in the cyclical student recruitment to employer hiring process due to the misalignment across the student and potential employer market and within the potential employer population itself.

The potential employer population was also asked to give responses as to what they would like for engineering management's brand meaning to be. The majority of the responses for the academic portion of this stakeholder group fell into the brand response category making their responses inappropriate for desired brand meaning. The industry portion of this stakeholder group responded with a majority falling into the brand response category, making their responses to desired brand meaning in appropriate (See Table 5.14).

5.5. ENGINEERING MANAGEMENT CASE STUDY FINDINGS SUMMARY

The stakeholder market demographics are presented in Table 5.1. The stakeholder market evaluated was comprised of both potential and current students and also existing and potential employers of engineering management graduates to represent the employer stakeholder market.

Mean levels of understanding were accessed regarding the overall engineering field of study in which engineering management resides. The results are presented in Table 5.2 and Figure 5.1. An AVOVA analysis was conducted and presented in Table 5.3, Table 5.4, and Table 5.5. A significant difference in means was found (F-statistic of

67.632) between the student stakeholder groups, with high school level students showing the lowest level of understanding and UMR engineering management upperclassmen showing the highest level of self reported understanding of the engineering field of study.

Levels of understanding regarding engineering management and the fifteen other engineering departments that reside in the overall engineering field of study were also gathered and reported in Tables 5.6 and 5.7 and Figure 5.2. Engineering management ranked behind other engineering departments at UMR for the high school and UMR freshman groups, thereby identifying a potential point of marketing improvements at those levels.

Overall, the engineering management field is not the best understood department at UMR by any of its potential student markets (high school and UMR freshmen). The understanding of engineering management at the high school level is particularly vague with a mean level of understanding of 1.6186 compared to the engineering management upperclassmen with a 4.2308 mean level of understanding, thereby identifying a potential for marketing and recruitment efforts to increase enrollment for engineering management. An ANOVA analysis was conducted to determine a statistically significant difference in means for the student stakeholder groups, with an F-statistic of 195.212.

Since the overall general understanding of engineering management across its stakeholder groups is misaligned, and ranked behind other engineering departments in the engineering field of study, it is not surprising to find that the brand responses to engineering management were also found not to be aligned between the student and employer stakeholder groups to complete a smooth cyclical process as illustrated in Figure 1.2. This could identify a potential barrier of student recruitment to the field of

engineering and also employment by employers. Ideally, when both the student and employer markets were asked to respond to a brand meaning question, all responses would have fallen into the "brand meaning" level of the CBBE model which consists of both Performance and Imagery factors. It was found that the academic stakeholder group placed more brand meaning on the Performance factor, the industry stakeholder group place more brand meaning on the Salience factor, and the student markets place more emphasis on the Performance factor. This suggests a difference in recognition of the brand with industry stakeholders recognizing engineering management at a broader level, such as the difference between business and engineering fields, and the academic and student stakeholders recognizing engineering management by specific job functions. The frequencies of responses for each stakeholder group and each CBBE factor are presented in Table 5.12 and Figure 5.3. Analysis and implications of these findings are presented in Tables 5.13 and 5.14.

Ideally, in order to ensure the smooth cyclical process of student recruitment to the field and then placement into employment, all stakeholder groups' brand meaning responses should have been aligned, with an appropriate brand meaning response (performance or imagery factor), when asked to respond to the brand via the "word association" method used in this study. Currently, the brand meaning responses for the industry stakeholder group are not appropriate brand meaning responses due to their reflection of the Salience factor (brand identity) of the CBBE model. The stakeholder markets are also not aligned due to the emphasis of the Salience factor by the industrial stakeholder group and the Performance factor of the CBBE model by the academic and student stakeholder group. The desired brand meaning responses by the employer

stakeholder groups were also found to be inappropriate due to the emphasis on brand responses. This could complicate the process of what engineering management "should be" to all stakeholders versus what it really is. This misalignment of brand meaning suggests evidence for the misunderstanding and confusion encountered by engineering management that anecdotal evidence has indicated in the past. It also suggests that engineering management may not be a "strong brand" as outlined by the CBBE model due to the inconsistency of brand meaning across its stakeholder groups. According to the CBBE model as discussed in Chapter 2, the hierarchical steps of building a strong brand must be followed to reach a "strong brand" with high brand resonance to its stakeholders. In this case, the results of brand meaning suggests that establishing an appropriate brand response and ultimately brand resonance between stakeholder groups will be difficult since a sound brand meaning is crucial to establishing brand response and brand resonance [3]. The results suggest that an appropriate brand meaning across stakeholder markets need to be established before engineering management can move up the hierarchical pyramid of the CBBE model and become a strong brand.

6. CONCLUSIONS AND DISCUSSION

6.1. GENERAL CONCLUSIONS

Overall, the Systematic Approach to Evaluating an Academic Brand was applied successfully to the engineering management department at UMR. Stakeholders were identified and chosen, initial research was conducted, survey instruments were developed to gather data regarding brand meaning responses from the stakeholders, and data was tabulated and compared to find a misalignment in the brand meaning of engineering management between its student and industrial markets. The success of this application suggests that the systematic approach, as outlined in Figure 4.1, can be repeated to evaluate the brand of other academic departments with perception or understanding problems from their markets who wish to better understand their markets, improve student recruitment, retention and placement into industry after graduation. This is important due to the lack of time that academic departments have to dedicate to developing a new process to understand their brand meaning, and then implement efforts to improve it.

6.2. CONTRIBUTIONS TO THE LITERATURE

The development of a systematic approach to evaluating an academic department's brand meaning alignment across its markets, via Keller's CBBE model, has been applied and documented for repeatability. Figure 4.1 shows the general approach to the evaluation, Chapter 4 discusses the general model approach, and Chapter 5 discusses the actual application and findings from an applied case study for the model at the engineering management department at the University of Missouri – Rolla. The

systematic approach will be adapted to suit the field of study associated with the academic department being evaluated.

The development of this systematic approach will give rise to areas of future research in which to speculate, apply, and evaluate its usefulness on other markets rather than just academic departments.

6.3. LIMITATIONS OF THE STUDY

Stakeholder populations were limited to the student and industrial markets as a cycle of recruitment of students and placement into industry, although other stakeholders of an academic department exist such as alumni, parents, and campus administration. These population pools used in this case study were also taken from a “best case” knowledge standpoint. For example, high school students were surveyed from Rolla High School that is in the closest proximity to UMR with the assumption that they would be the most familiar with UMR and thereby give “best case” results. For the purpose of this study, it was thought that the freshmen at UMR, which were the closest college freshmen to the UMR engineering academic departments, would give a ”best case” analysis of how well college freshmen understood engineering programs. UMR upperclassmen from the engineering management program were also chosen as a representation of the existing student stakeholder market. A limitation that this stakeholder market yields when analyzing the overall understanding of engineering in general is that the upperclassmen population is from one degree discipline, rather than from all sixteen degree disciplines offered on the UMR campus. Overall, limitations offered into the study by the UMR student stakeholder market could skew the overall understanding of the engineering field

of study since those student stakeholders are very familiar with UMR, and UMR is an engineering school.

The same assumption was made when employer representatives were chosen from either academia or companies that were familiar with the graduates or faculty from the UMR engineering management academic department. These "best case" populations were chosen to represent the data closest to ideal, which would suggest that like populations at other high schools, universities, and companies unfamiliar with engineering management and UMR would only yield worse results.

Due to the judgments being made by the researcher to establish a rubric by which to code the word association data for brand meaning analysis, the reliability of the rating system is another factor to consider when assessing the limitations of the study analysis methods. For this case study, the interrater reliability showed that the same code was assigned to the brand meaning responses 88.1% of the time with a Cohen's kappa value of .8 which yields a reliable coding method.

A priming effect may be realized on the employer survey instrument where respondents were asked to classify engineering management as "management," "engineering," or "neither." The respondents were then asked to provide responses to an open ended word association question regarding engineering management. The prior question may have prompted the respondents to providing answers in the broad categorical Salience factor of the CBBE model since classifying engineering management as "engineering," "management," or "neither" may have still been in their memory [55]. Members of the industry population did provide responses to brand meaning which were coded as the Salience factor of the CBBE model.

6.4. OPPORTUNITIES FOR FUTURE RESEARCH

The goal of this case study was to evaluate the application of a model of evaluating a brand for engineering management at UMR and ultimately conclude that the model approach used could be generalized to be applied to other academic departments. Since the goals of this case study were fulfilled, and a misalignment of brand meaning was found across engineering management's markets, this finding leads to areas of future research to be explored. As discussed in Chapter 4, a diagnosis of the problem was needed before any remedy could be applied to alleviate the symptoms experienced by engineering management at UMR. A particularly interesting area of study could be evaluating the faculty of an academic department, such as engineering management, to evaluate their brand meaning appropriateness and consistency to ensure efficient and effective marketing strategies.

Future research may include exploring possible options and remedies to realign the brand meaning of engineering management at UMR and to aid the department in strengthening their brand. Realigning the brand meaning of the student and industrial markets has the potential to help move the establishment of a strong brand up the hierarchy of the CBBE model of establishing a strong brand.

The systematic approach to evaluating a brand meaning for an academic department may also prove useful to evaluating an overall field of study. For example, it may be useful in a broad sense for each engineering management department if the overall field of engineering management had a strong and aligned brand meaning to both its student and industrial markets. This would potentially help students in understanding what the field of study entails and may speed the process of finding the "right fit" to their

study, and ultimately career, needs. It may also help employers that hire students both nationally and internationally understand what they are "getting" when they hire a student from the engineering management field.

It can be speculated that the more a new systematic approach is applied to similar and also new scenarios; it will be refined and ultimately improved to add more value to the literature regarding its subject matter.

Since branding is appropriate for both goods and services [4], and the literature debates whether higher education as a whole is a good or service [6, 7, 9-15], the opportunity exists to determine whether or not the systematic approach developed in this study can be applied to both the tangible goods markets and the intangible services markets.

Appendix A
Survey Instruments

This study is being conducted by Cassie Elrod, a graduate student at the University of Missouri-Rolla. The purpose of this study is to evaluate student perceptions and knowledge of varying engineering disciplines. Your responses to this survey will remain anonymous and will be used in future studies and publication. If you do not wish to have your responses used for this purpose, please do not fill out the survey. Your participation in this study is greatly appreciated.

1. What is your gender? Male Female

2. How would you rate your overall understanding/knowledge of engineering?

None Extremely Knowledgeable
1 2 3 4 5

3. Does any member of your immediate family or a friend have an engineering degree?

Yes No

If so, what is your relationship with that person (ie-father, friend of the family, etc)?
_____

What type of engineering degree does that person hold? If you're not sure, please write "not sure." _____

Please rate your familiarity with the following fields of engineering:

		Not Familiar				Extremely Familiar
4.	Aerospace Engineering	1	2	3	4	5
5.	Architectural Engineering	1	2	3	4	5
6.	Ceramic Engineering	1	2	3	4	5
7.	Chemical Engineering	1	2	3	4	5
8.	Civil Engineering	1	2	3	4	5
9.	Computer Engineering	1	2	3	4	5
10.	Electrical Engineering	1	2	3	4	5
11.	Engineering Management	1	2	3	4	5
12.	Environmental Engineering	1	2	3	4	5
13.	Geological Engineering	1	2	3	4	5
14.	Mechanical Engineering	1	2	3	4	5
15.	Metallurgical Engineering	1	2	3	4	5
16.	Mining Engineering	1	2	3	4	5
17.	Nuclear Engineering	1	2	3	4	5

18.	Petroleum Engineering	1	2	3	4	5
19.	Interdisciplinary Engineering	1	2	3	4	5

After you read the following phrases, one at a time, please respond with the first terms that come to mind and record them on the following lines:

20. "Civil Engineering"
_____
_____

21. "Aerospace Engineering"
_____
_____

22. "Computer Engineering"
_____
_____

23. "Mining Engineering"
_____
_____

24. "Mechanical Engineering"
_____
_____

25. "Architecture Engineering"
_____
_____

26. "Environmental Engineering"
_____
_____

27. "Nuclear Engineering"
_____
_____

28. "Electrical Engineering"
_____
_____

29. "Ceramic Engineering"
_____
_____

30. "Geological Engineering"
_____
_____

31. "Petroleum Engineering"
_____
_____

32. “Engineering Management”
_____
_____

33. “Chemical Engineering”
_____
_____

34. “Metallurgical Engineering”
_____
_____

35. “Interdisciplinary Engineering”
_____
_____

This study is being conducted by Cassie Elrod, a graduate student at the University of Missouri-Rolla. The purpose of this study is to evaluate industry and academia perceptions and knowledge of varying engineering disciplines. Your responses to this survey will remain anonymous and will be used in future studies and publication. If you do not wish to have your responses used for this purpose, please do not fill out the survey. Your participation in this study is greatly appreciated.

From your perspective in industry/academia, please respond to the following:

1. I am in (please circle one): Industry Academia

2. With what company/university are you currently employed? _____

3. Are you currently familiar with Engineering Management as a degree granting field?

   Yes No

4. Do you currently hire Engineering Management graduates?

   Yes No

5. When you think of Engineering Management as a degree, do you initially react to it as a management emphasis degree or an engineering emphasis degree (please circle one)?

   Management Engineering Neither

6. After you read the following phrases, please respond with the first terms that come to mind and record them on the following lines:

   Engineering Management: _____

   Industrial Engineering: _____

7. What impressions would you like others to have about Engineering Management?

   _____

8. What do you perceive to be the main differences between Engineering Management and Industrial Engineering?

   _____

   _____

Appendix B
Inter-rater Reliability Calculations

Approach to Calculate Cohen's Kappa [2]

Cohen's Kappa — **Index of Inter-rater Reliability**

Application: This statistic is used to assess inter-rater reliability when observing or otherwise coding qualitative/ categorical variables. Kappa is considered to be an improvement over using % agreement to evaluate this type of reliability.

H0: Kappa is not an inferential statistical test, and so there is no H0:

Interpreting Kappa: Kappa has a range from 0-1.00, with larger values indicating better reliability. Generally, a Kappa > .70 is considered satisfactory.

The data: The research required that the species of each juvenile turtle that was being observed be identified. It can be difficult to correctly discriminate between juvenile Florida Yellow-bellied turtles, Florida Red-bellied turtles, and River Cooters. Working with videotapes of the target behaviors, two raters identified the species of each turtle. Kappa will be used to assess the inter-rater reliability of this identification process. The species will be abbreviated Yellow-bellied = "y", Red-bellied = "r", and Cooters = "c".

Turtle #	1	2	3	4	5	6	7	8	9	. . . . .	34	35	36
Rater #1	y	y	c	c	y	r	c	y	r	. . . . .	y	r	c
Rater #2	y	c	y	c	y	c	c	y	r	. . . . .	y	c	c

Step 1 Organize the scores into a contingency table. Since the variable being rated has three categories, the contingency table will be a 3x3 table.

Rater #2 \ Rater #1	"y"	"r"	"c"
"y"			
"r"			
"c"			

The ratings of each of the 36 turtles will be entered in this contingency table. Agreements between the two raters will be placed in one of the diagonal cells. For example, both raters identified turtle #1 as a yellow-belly, so we would tally one into the upper-left diagonal cell. As another example, turtle #4 was identified as a river cooter by both raters, and so we would tally one into the lower-right diagonal cell.

Disagreements between the raters will be placed in one of the off-diagonal cells. For example, Rater #1 thought turtle #2 was a yellow-belly but rater #2 thought it was a cooter, so we would tally one into the middle cell of the left-hand column. Contrast that with turtle #3, which rater #1 thought was a cooter, but rater #2 thought was a yellow-belly, so it was tallied into the right-hand column of the top row.

Below is the result of tallying the ratings of each turtle by each rater.

Rater #2 \ Rater #1	"y"	"r"	"c"
"y"	9	3	1
"r"	4	8	2
"c"	2	1	6

Step 2 Compute the row totals (sum across the values on the same row) and column totals (sum across the values on the same column) of the observed frequencies.

Rater #2	Rater #1 "y"	"r"	"c"	row totals
"y"	9	3	1	13
"r"	4	8	2	14
"c"	2	1	6	9
				overall total
column totals	15	12	9	36

Step 3 Compute the overall total (shown in the table above). As a computational check, be sure that the row totals and the column totals sum to the same value for the overall total, and that the overall total matches the number of cases in the original data set.

Step 4 Compute the total number of agreements by summing the values in the diagonal cells of the table.

$$\Sigma a = 9 + 8 + 6 = 23$$

Based on this, the % agreement would be 23/36 = 64%. However, this value is an inflated index of agreement, because it does not take into account the agreements that would have agreed by chance.

Step 5 Compute the expected frequency for the number of agreements that would have been expected by chance for each coding category. This is done using the same formula as for computing expected frequencies for Pearson's X^2, but now the formula is applied only to the diagonal cells. Computation of the expected frequency of agreements by chance for the yellow-bellies is shown. Below that is the contingency table with the expected frequencies in each of the diagonal cells shown in parentheses.

$$ef = \frac{\text{row total} * \text{col total}}{\text{overall total}} = \frac{13 * 15}{36} = 5.42$$

Rater #2	Rater #1 "y"	"r"	"c"
"y"	9 (5.42)	3	1
"r"	4	8 (4.67)	2
"c"	2	1	6 (2.25)

Step 6 Compute the sum of the expected frequencies of agreement by chance.

$$\Sigma ef = 5.42 + 4.67 + 2.25 = 12.34$$

Step 7 Compute Kappa

$$K = \frac{\Sigma a - \Sigma ef}{N - \Sigma ef} = \frac{23 - 12.34}{36 - 12.34} = .45$$

Step 8 Evaluate Kappa

-- If the obtained K is less than .70 -- conclude that the inter-rater reliability is not satisfactory.

-- If the obtained K is greater than .70 -- conclude that the inter-rater reliability is satisfactory

For the example data, we would conclude that the inter-rater reliability is not satisfactory, because the obtained Kappa of .45 is less than the commonly applied criteria of .70.

Step 9 Consider the pattern of disagreements for possible ways to focus efforts to improve either the operational definitions upon which the ratings or based, or the training and accuracy of the raters.

For these data, notice that there are more disagreements between red-bellies and yellow-bellies than between either of these species and the river cooters. Thus, we might suggest that re-training would focus on correctly discriminating between these two types of turtles, in order to improve inter-rater reliability.

Application of Cohen's Kappa to Engineering Management Case

		Rater 1							
		NR	1	2	3	4	5	6	Row Totals
Rater 2	NR	8				1			9
	1								0
	2								0
	3	3			1				4
	4			1		33	2		36
	5						8		8
	6							2	2
	Column Totals	11	0	1	1	34	10	2	59

# Agreements by Summing Diagonal =			8+0+0+1+33+8+2 =		52			
ef (NR) =	9*11/59 =	1.677966102						
ef (1) =	0*0/59 =	0						
ef (2) =	0*1/59 =	0						
ef (3) =	4*1/59 =	0.06779661						
ef (4) =	36*34*59 =	20.74576271						
ef (5) =	8*10/59 =	1.355932203						
ef (6) =	2*2/59 =	0.06779661						
Sum =		23.91525424						
Cohen's kappa =	(52-23.915)/(59-23.915) =	0.800483092						

Appendix C
Coding Brand Meaning – Rubric

Brand Meaning Coding Rubric for Engineering Management Case Study

Four Questions of CBBE	Six Factors of CBBE Model	Sub-Dimensions of Six Factors	Example Responses to EMGT	Code
Brand Identity	Salience	Category Identification; Needs Satisfied	Engineering; Business; Management; Business Degree for Someone at Rolla	6
Brand Meaning	Performance	Primary characteristics & secondary features; Product reliability, durability, & serviceability; Service effectiveness, efficiency, & empathy; Style & design; Price	Managing; Project Manager; Boss; Cross Functional; Diverse Engineers; Connections between Engineers and Management; Operations Supervisor	4
	Imagery	User profiles; Purchase & usage situations; Personality & values; History, heritage, & experiences	Desk job; Paperwork; People	5
Brand Response	Judgments	Quality; Credibility; Consideration; Superiority	Long on Pay Short on Work; Not a Real Engineering Degree	2
	Feelings	Warmth; Fun; Excitement; Security; Social approval; Self-respect	Boring; Awesome; Exciting; Interesting; Doesn't Take Thermo; Slacker; Know It All; No Fun; Worthless Degree	3
Brand Relationships	Resonance	Loyalty; Attachment; Community; Engagement	Dad's Degree; Uncle's Degree; My Roommate; Specific Person's Name	1

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VITA

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