New Age, New Learners, New Skills: What Skills Do Agribusiness Graduates Need to Succeed in the Knowledge Economy?

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Abstract

In a rapidly changing economic environment, graduate skills required evolve in their relative importance. This raises the question: what set of skills do today's agribusiness graduates need to be successful in the tomorrow's economy? The goal of this study is to examine the emerging paradigm of skills perceived as essential in the knowledge economy by using a choice experiment. Results of the study point out towards a shift in the needs for skills of agribusiness graduates, with skills such as creativity and critical thinking becoming quite important in the labor market. These results have direct implications for agribusiness programs and managers in the food and fiber industry.

Keywords: Graduate Skills, Creativity, Critical Thinking, Choice Experiments, Hierarchical Bayesian

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Introduction

It is widely recognized that changes in the nature of work and the workplace in the modern economy are transforming the kinds of knowledge, skills, and attitudes needed for successful employment and work performance (OECD 2011). In recent decades, increasing specialization and trade have blurred the lines between the domestic and global economies (CEA 2009). Technology has shifted critical factor of production from capital to knowledge (Halal 1998) and has created the knowledge economy. Economists are now arguing the transformation of the knowledge economy and emergence of a new creative economy (Florida 2002; Florida 2006). The main premise of the creative economy that operates in the presence of borderless capital is that creativity and innovation are the crucial drivers of economic growth. Changes related to technology, management innovations, global competition and sustainability concerns are raising questions about the kind of skills and competencies that society and young people will need in order to succeed in this changing environment.

The perceived demand for different skills has prompted policymakers to develop frameworks to ensure that educational institutions deliver skills that will be able to meet labor market demand. Raising the skills of national workforces through education and training has thus become a primary objective of economic policies aimed at developing national competitiveness (OECD 2011). The Council of Economic Advisors notes that in today's economy there is an increased need for highly skilled workers who can perform complex, ever-changing tasks. Thus, educating the next generation with 21st century knowledge and skills and creating a world-class workforce is one of the four building blocks of American innovation (CEA 2009). Perhaps no institution is more pivotal to responding to the needs for new skills than higher education. As noted by the World Bank report (2002) the role of higher education in particular, is now more influential than ever in the construction of knowledge economies, in the creation of the intellectual capacity on which knowledge production and utilization depend and to the promotion of the lifelong-learning practices necessary for updating people's knowledge and skills.

In a rapidly changing environment, skills and attributes required may evolve and/or vary in their relative importance. This raises the question: what set of skills do today's graduates need to be successful in the tomorrow's economy? The answer to this question guides continually the curriculum design and revision in the institutions of higher education. Research points out that a successful alignment of higher education with workforce needs can be reached based on careful action by educational institutions to embed skills and attributes within instructional programs (Yorke and Harvey 2005).

The goal of this study is to examine the emerging paradigm of skills perceived as essential for the success of agribusiness graduates in the knowledge economy. This study contributes to the literature by bringing new evidence to the discussion of agribusiness graduate skills. The study hypothesis is that there have been changes in the top rated skills for agribusiness graduates as a result of the dynamics that are taking place in the food and fiber industry. A different paradigm of skills is emerging and new skills are becoming important to employers and the labor market. Central to this new paradigm are generic skills, such as creativity and innovation deemed critical for the successful future of the economy.

Results from this study should be of interest and offer useful insights to both agribusiness programs, as well as managers in the food and fiber industry. The administrators and the faculty are responsible for continually refocusing and restructuring agribusiness programs so that the relevant skills identified by employers are being taught effectively in the agribusiness programs. Findings from this study also highlight the changing role of the manager today with key implications for employee management. Forward thinking managers should adjust their activities to meet company's goals in the new age that requires new skills. It will be necessary that they develop and implement strategies based on different criteria to hire, evaluate, motivate and manage the new employees.

Human Capital, Skills and Education

OECD (2001) defines human capital as the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic wellbeing. A vast literature has shown the critical and direct impact of human capital and education on economic output, economic growth, productivity and progress of the society. A greater amount of educational attainment implies more skilled and productive workers, who in turn increase an economy's output of goods and services (Barro and Lee 2001). Understanding the skills and attributes that can help people contribute to innovation and advancement of society increasingly motivates the efforts to understand the types of skills needed that support innovation and the best ways to develop them (OECD 2011). Though there is no consensus on the definitions of skills, according to Esposto (2008, 100) skills are "those generalizable attributes of individuals that confer advantage in the labor market." For Tether et al. (2005, 5) skill is "an ability or proficiency at a task that is normally acquired through education, training and/or experience". A mixture of these definitions is useful because looking at skills that have returns in the labor market allows for easier measurement and comparison, while a focus on those acquired through education and training has clear policy relevance (OECD 2011). Stasz (2001) and OECD (2011) discuss the broadening meaning of skills in the workplace today. A frequent grouping of skills in four categories is used in literature: *cognitive skills* are usually acquired through formal education (skills such as such as problem solving, critical thinking, and creativity) and are transferable to work situations; *generic skills* that include things such as communication and team working are thought to be broadly transferable across work settings; *technical skills* refer to specific skills needed in a particular occupation or job; and work-related attitudes or *soft skills* that are hard to conceptualize and define and not easily measured. Often, these are considered and grouped as generic skills and include motivation, leadership, ethics, entrepreneurship, management, charisma, negotiation, coordination. A wider grouping of skills combines cognitive skills, generic skills and soft skills under the umbrella of *generic* skills (Biesma et al. 2007). This study follows the later grouping of skills that combine higher cognitive skills with interpersonal skills under the generic skills. From an economic perspective, skills are considered discrete attributes acquired overtime that improve one's labor market success. If skills demanded in the workplace are identified, then education should be able to design curricula to ensure that students acquire the proper building blocks (Stasz 2001).

Recently in the discussion of skills and desired attributes, one skill that is gaining importance is creativity. With the current pace of change, the workplace is constantly faced with new demands and situations that require creative abilities to provide new adequate solutions. Creativity is

perceived as a complex construct (Villalba 2010) and as such there is no general definition of creativity. However, there is agreement that *creativity* involves thinking that aims at producing ideas or products that are relatively novel and can add value to the firm and society. Further, creativity requires a foundation of specific (technical) knowledge without which it cannot develop, and more importantly, creativity can be advanced and promoted (Sternberg 2006). By linking creativity to technological innovation and economic prosperity, Florida (2002) argues that universities should cultivate and develop creativity in their graduates. Robinson (2006) maintains that creativity is as important in education as literacy and should be treated with the same status. However, he argues that educational systems are not equipping students with the right skills to function in the knowledge economy and have been criticized of damping creativity, and promoting conformity (Sternberg 2006; Robinson 2006; Gibson 2010).

Graduate Readiness and Agribusiness Graduate Skills

Over the years, the context of work for professionals in the food and fiber industry has changed dramatically due to processes like globalization and advances in technology. King et al (2010, 566) note that "agribusiness organizations are becoming more flexible and complex, more decentralized and yet reliant on collective action and cohesiveness." Boehlje et al. (2011) argue that development and implementation of technology and new innovations are becoming vitally critical to long-term success of the food and agribusiness industry.

Readiness to enter the workforce is one of the most prevalent problems seen by potential employers. The rapid pace of organizational and technological change has meant that employers are increasingly demanding of graduates than ever before. Policymakers express widespread concern that schools are failing to impart the kind of skills that employers need. The lack of skills among graduates today is a key concern for employers that blame the education system for not preparing graduates that can hit the ground running (WSJ 2011). Despite the growing global demand for new essential competencies, employers repeatedly report that many new graduates are not prepared to work as they lack important skills such as critical thinking, writing and problem-solving essential for today's workplace (USDE 2006). This raises the question of the effectiveness of education system in preparing graduates with the necessary core skills and attributes. Graduates need to exhibit more and more attributes and have the ability to respond to rapid change if they are going to be successful in the workplace. A direct implication for agribusiness programs is to find ways to provide their graduates with the right set of skills and attributes to meet these demands and hit the ground running.

Various studies have explored the topic of essential skills and attributes of agribusiness graduates and their relative value in the workplace. A pioneer study came from Litzenberg and Schneider (1987). Through a wide survey with agribusiness companies, they explored the skills and characteristics of agribusiness graduates needed for three different positions: entry level, middle managers and top management. A total of 74 skills and characteristics were considered and measured through relative rankings. Skills were grouped in six categories as follows: business and economics, computer, quantitative, and management information, technical skills, communication skills, interpersonal qualities, and employment, work, and general experience. Regression results indicated that the category of interpersonal characteristics (such as self-motivation, positive work attitude, high morals/ethics, team player, self-confidence, etc.) had the

highest overall rank, with communication skills ranked slightly lower, followed by business and economic skills, technical skills, computer, quantitative and management information, and lastly, previous work experience. Further, their results indicated that the relative need for all skills increased with the level of importance of the employee. Litzenberg and Schneider concluded that though all agribusiness sectors look for good interpersonal traits and communications skills, each sector has its own "shopping list" for technical skills and capabilities of graduates and a better coordination between industry and academics is needed to develop required graduate skills. Siebert et al. (2002) explored the relationship between above average starting salaries and various characteristics using a survey with a diverse group of agribusiness firms. Results showed that work experience and leadership experience were attributes highly valued by agribusiness employers. An important study from Boland and Akridge (2004) explored how employers' expectations of skills, capabilities, and experiences of agribusiness graduates had evolved over time. Results showed that interpersonal and communication skills, teamwork capability, and critical thinking skills were rated as the most valued skills in future leaders of the industry. Knowledge of marketing, accounting and finance, macroeconomics and trade were rated lower. They conclude that critical thinking and communication skills were more important to employers than industry-specific knowledge. Norwood and Henneberry (2006) similarly to previous studies (see Barkley 1991 and Barkley, Stock, and Sylvius 1999) examined the relationship between starting salaries and agribusiness graduate attributes employing a choice-based conjoint experiment with two hypothetical job candidates. Candidate attributes included study major, service and academic awards received while in college, leadership positions held while in college, internship and work experience, language skills, communication skills candidate's character, interviewing skills, passion and dedication to career goals, GPA, and willingness to relocate. After the ranking of the desired attributes, the value of each attribute was measured in the context of willingness to pay, which is how much more employers were willing to pay for an attribute. Results showed that employers highly value candidate's character, passion and dedication towards career goals, and communication skills. GPA of the candidate had the largest impact on starting salaries. Another study by Gunderson et al. (2008) on the skills of financial agribusiness students found that employers highly value graduates' problem-solving skills.

To summarize, literature on the skills of the agribusiness graduates has focused both on the valuation and ratings of graduate skills by agricultural employers, as well as the role that various skills play on salaries of agribusiness graduates. This body of literature provides very important insights on the topic of graduate skills. However, concerns expressed continually by employers indicate a current interest to revisit this subject and obtain new evidence to continue the conversation on graduate skills.

Data

A Web-based survey was administered to employers of agribusiness college graduates. The employer database was compiled from three separate sources. The first source was a combined database of employers who hired graduates from California Polytechnic State University – San Luis Obispo, California, maintained by the University, and of employers who offered internships to agribusiness students maintained by the Agribusiness Department, Cal Poly San Luis Obispo. The second source was a directory of California, Florida, Oregon and Washington agricultural employers made available by the weekly publication *Red Book Credit Services*. A third source

included employer- members of the California League of Food Processors. The combined database cleared of double entries contained a total of 1,050 employers. The survey questions were developed, field tested and revised based on input from food and fiber employers, members of the Industry Advisory Board of Cal Poly's Agribusiness Department. Employers received an email link to the questionnaire. The survey was made available to them from December 2011 through April 2012. Employers had to identify the type of organization they represented such as input provider, food processor, retailer, financial institution, wholesaler, farm, durable goods manufacturer, broker- shipper or service provider, etc. The survey collected information also on the revenue, size of the company and title/role in the company of the survey respondent.

To solicit employers' opinion on the importance of key skills for agribusiness graduates, a discrete choice experiment was created. Based on the skill literature examined above and conversations with key industry representatives, a list of most valued skills and attributes was created. Although many skills were included as important in the list, only the top rated ones were used in developing hypothetical candidate profiles. Specifically, each profile included different level combinations of the following skills: *critical thinking, communication, teamwork, creativity* and *knowledge of marketing,* and *knowledge of finance*. An overview of these attributes and levels used to describe the candidate are presented in Table 1. As part of the choice experiment, employers were asked to imagine the situation of hiring for an entry-level position requiring an undergraduate degree at their firm. They were presented with three hypothetical profiles of job candidates at a time (a choice set), and each time they had to select the best candidate for the job. Though there is no consensus in the literature about the 'appropriate' number of choice sets per respondent, most studies ask respondents to evaluate up to sixteen choice sets (Louviere et al. 2000). A fractional factorial randomized design with main effects only that optimized the D-efficiency was used to select 16 choice sets for each respondent. A sample choice set from the survey is presented in Appendix 1.

Table 1. Graduates' Attributes and Attribute-Levels Used in Choice-Based Conjoint Questions.

Attributes	Levels	Definitions
Critical Thinking Skills	Basic	Elementary or Base Level
	Good	Average or Satisfactory Level
	Advanced	Specialist or High Quality Level
Communication Skills	Basic	Elementary or Base Level
	Good	Average or Satisfactory Level
Teamwork Skills	Basic	Elementary or Base Level
	Good	Average or Satisfactory Level
Creativity	Yes	Creative
	No	Not Creative
Knowledge of Marketing	Basic	Elementary or Base Knowledge
	Good	Average or Satisfactory Knowledge
	Advanced	Specialist or High Quality Knowledge
Knowledge of Finance	Basic	Elementary or Base Knowledge
	Good	Average or Satisfactory Knowledge
	Advanced	Specialist or High Quality Knowledge

Methodology

McFadden (2001) observes that the interaction between economic choice analysis and market research through the use of experimental methods such as conjoint analysis has resulted in a better understanding of the decision-making process and the ability to predict decision making. Conjoint analysis is an attribute-based measure of utility or benefit that assumes that products can be described by their attributes and, that an individual's valuation depends upon the levels of these attributes (De Bekker-Grob et al. 2010). Lately, choice experiments have been increasingly used to study the relationship between key attributes and choices (Adamowicz et al. 1998, Lusk and Schroder 2005, Lusk and Norwood 2005, Lusk and Parker 2009). In the context of employability of graduates, Norwood and Henneberry (2006) used choice experiments to study salary increases associated with certain attributes. Biesma et al. (2007) used conjoint analysis to estimate the relative value employers place on generic skills and field specific skills in the graduates. The current study builds upon studies by Biesma et al. (2007) and Norwood and Henneberry (2006) and employs an experimental approach to estimate employers' preference on a range of college graduate attributes.

Data from the choice experiment were analyzed within a random utility framework. Each graduate candidate presented to the employer can be described by some vector of choice attribute values. Assume that employer i faces a choice among J alternatives in each of K choice situations. He chooses alternative j that will provide him with the highest utility. Utility function of employer i is given by:

$$(1) \qquad U_{ij} = \beta'_i X_{ij} + \varepsilon_{ij}$$

Where X_{ij} is a vector of non-stochastic independent variables, such as attributes of the alternative j in a given choice situation. β is a vector of parameters measuring individual marginal utilities to be estimated and ε represents the random element that includes all the unobservable factors that influence individual choices outside of the deterministic part. Both terms β_i and ε_{ij} are unobservable and considered stochastic. The utility of each alternative is the sum of the marginal utilities of its attribute levels.

A Hierarchical Bayesian logit model was used to analyze the survey data. Hierarchical Bayesian method has the ability to provide estimates of individual marginal utilities given only a few choices by each individual. This ability is quite valuable especially when data collection is done with online surveys where the effects of respondent fatigue are more prominent (Savage and Waldman 2008). The Bayes model is considered hierarchical as it models choices as a step function of an upper level (pooled across respondents, or across-unit) model and a lower individual-level (within respondents, or within-unit) model that allows for the combination of aggregate and individual level specification parameters (Rossi et al. 2005). At the lower level (within-unit), it is assumed that individual-level choices are described by a multinomial logit model. The probability of the individual employer i choosing the k alternative in a certain choice situation, conditional on the observed attributes for each of the alternatives is given by the following:

$$(2) \qquad Pr[k|X,\beta] = \exp(X_k'\beta_i) / \sum_j \exp(X_j'\beta_i)$$

Where: X_j is a vector of attributes describing the alternative j in that choice situation.

At the upper level (across-unit), it is assumed that respondents are drawn from a multivariate normal distribution, with marginal utilities β_i distributed with a mean vector μ and covariance matrix V:

$$(3) \qquad \beta_i \sim Normal(\mu, V_\beta)$$

Individual parameters were estimated using Monte Carlo chain simulation, which proceeds iteratively and recursively to generate draws of model parameters.

Results

A total of 159 completed surveys were returned. The sample size was further reduced to 137 observations based on the number of respondents who answered all choice-based conjoint questions. Excluding partial and incomplete responses resulted in 13% response rate, not unusual given the lengthy nature of the conjoint experiment used in the study[1]. As mentioned above, to minimize sampling errors, each respondent answered 16 customized choice sets providing 2,192 choice tasks available for analysis.

Respondents to the survey represented a broad cross-section of employers in the food and fiber industry. All participating firms had an average combined total of $15.25 billion sales per year[2]. Companies differ in size as measured by number of employees and average sales, and location. The respondents also represented various positions in the firm including CEO, manager or supervisor, HR administrator or other responsible for making hiring decisions in the firm. Though the majority of employers were located in California, the sample included several firms with operations in Florida, Oregon and Washington. Summary statistics of the sample of respondents are reported in Table 2.

Individual marginal utility estimates using the Hierarchical Bayesian model are reported in Table 3. Alongside are presented marginal utilities at the aggregate level estimated using a multinomial logit model.

The estimated marginal utilities reported in Table 3 are scaled in a way that they add up to zero, with a negative number implying that this level of attribute is on average less preferred than a level with an estimated utility that is positive. All estimated coefficients are statistically significant in affecting the respondent choice.

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[1] See for example, Norwood and Henneberry (2004) collected data using a choice experiment survey and had a 13% response rate.

[2] The value of agricultural products in California was $43.5 billion in year 2011.

Table 2. Description of Survey Respondents (***n= 137***).

Company	Absolute Number	Percentage (%)
Company Type		
Input Provider	3	2%
Food Processor	11	8%
Retailer and Wineries	14	10%
Financial Institution	16	12%
Wholesaler	4	3%
Broker-Shipper-Packer	24	18%
Service Provider	13	9%
Farm	26	19%
Durable Goods Manufacturer	8	6%
Other (NonProfit, Government, Biotech Manufacturing, Consulting)	18	12%
Revenue		
Up to $1 million	24	18%
$1 million - $50 million	62	45%
$51 million - $100 million	10	7%
$100 million - $300 million	16	12%
More than $300 million	25	18%
Number of Employees		
Up to 10 employees	33	24%
11-100 employees	46	34%
101-500 employees	40	29%
More than 500 employees	17	13%
Role of respondent in the Company		
CEO	44	33%
Manager/Supervisor	56	42%
HR Administrator	10	6%
Other, responsible of making hiring decisions	27	20%

Table 3. Marginal Utility Estimates for the Food and Agribusiness Employers Using the Hierarchical Bayesian Model and the Multinomial Logit Model.

Attributes	Marginal Utilities Using the HB Model	Marginal Utilities Using the Multinomial Logit Model and Standard Deviations
Critical Thinking Skills		
Basic	-1.389*	-0.588* (0.046)
Good	0.357*	0.160* (0.041)
Advanced	1.032*	0.428* (0.041)
Communication Skills		
Basic	-1.225*	-0.540* (0.031)
Good	1.225*	0.540* (0.031)
Teamwork Skills		
Basic	-0.854*	-0.390* (0.030)
Good	0.854*	-0.390* (0.030)
Creativity		
Yes	1.549*	0.609* (0.031)
No	-1.549*	-0.609* (0.031)
Knowledge of Marketing		
Basic	-0.408*	-0.157* (0.042)
Good	0.104*	0.085* (0.041)
Advanced	0.304*	0.072* (0.041)
Knowledge of Finance		
Basic	-0.264*	-0.105* (0.042)
Good	0.156*	0.094* (0.042)
Advanced	0.108**	0.012* (0.041)
		-0.588* (0.046)

Note. Standard errors are in parentheses. * and ** denote statistically significant variables at 5% and 1% levels respectively.
Log-likelihood for this model = -1,580.18
Consistent Akaike Info Criterion = 3,237.39
Chi Square Statistic = 1,053.91

Results are consistent with *a priori* expectations. Employers prefer graduates that possess advanced critical thinking skills, have good communication and good teamwork skills and are creative thinkers. They value advanced knowledge of marketing, but prefer a good grasp of finance in the graduates rather than advanced knowledge in the field of finance. The availability of individual-level marginal utility estimates allows the accurate calculation of importance scores of any attribute considered in the employer's choices. The quantification of attribute importance using the Hierarchical Bayesian marginal utility estimates provides interesting and useful insights into employer's decision making process. Attribute importance scores were computed using the following method:

Attribute importance scores were computed using the following method:

$$(4) \quad I_i = \frac{Uhigh_i - Ulow_i}{\sum_{j=1}^{n} Uhigh_j - Ulow_j}$$

Where: $Uhigh$ and $Ulow$ represent respectively the highest and lowest utility level within a given attribute i. The importance of attribute I_i is interpreted as the percent decision weight of this attribute in the overall choice process. The importance scores are reported in Table 4.

Table 4. Importance Scores for Agribusiness College Graduate Attributes*.

Attributes of Graduates	Attribute Importance Sores (0-100%)	Rank of Importance
Creativity	**29%**	**1**
Communication Skills	**23%**	**2**
Critical Thinking Skills	**22%**	**3**
Teamwork Skills	16%	4
Knowledge of Marketing	7%	5
Knowledge of Finance	4%	6

*The estimated relative importance of attributes depends critically on the experimental design of the study, as well as the sample of the respondents. In particular, if the distance between the most extreme levels of any given attribute is increased, the overall importance of that attribute will most certainly increase as well. Due to the aggregate nature of the estimates, importance's from the logit model can be misleading and were not computed.

Interestingly, estimated results indicate that creativity is the most important attribute with the strongest impact on employer's choices. What make creativity increasingly important to the future are the unlimited horizons it may open through multidisciplinary creative processes and innovation (Dasgupta 2003). Communication skills and critical thinking skills compete closely as the second and third most valued attributes by employers. Ability to work in teams skills came across as the next important attribute for employers. Specialized technical knowledge in marketing and finance were ranked relatively lower by employers. Boland and Akridge (2004) also found communication skills, teamwork, and critical thinking skills rated as the most relevant skills, while specialized knowledge or agricultural science courses were not as important.

Clearly, labor market places a higher value on generic skills, like creativity, interpersonal communication, critical thinking, and ability to work in teams compared to technical skills. Globalization and the quest to find new sources of growth for the future may affect these skill requirements. The new economic trends seem to place greater emphasis on skills that add value and facilitate communication, collaboration and team work. Tether et al. (2005) suggest that as production becomes increasingly globalized, employees must have skills that allow them to adapt, be willing to engage in innovation and redeployment. Such skills may be best obtained through a generalist education. Mastery of a highly specialized discipline alone will no longer be sufficient to ensure success and meet the needs of the market. More general abilities and worker flexibility are required and must be nurtured as they are critical given the dynamic nature of the labor market and ongoing technological change (Gardner 2006; CEA 2009). These results are similar to findings from Biesma et al. (2007). Biesma et al. found problem solving and creativity skills combined to be the most important attribute for employers. This was followed by teamwork, communication, and flexibility. Similarly, field-specific knowledge was rated as the least important attribute considered in the study.

In this study, creativity was treated as a separate attribute and was found to be the most significant skill that influences employers' hiring decisions. All together these findings, point out to the fast changing nature of the food and agribusiness industry and a different set of skills needed to meet the future needs. It is clear that the ability to be creative, to think critically and to communicate effectively, are all attributes of paramount importance today to society and labor market.

Choice Modeling

To better understand labor market preferences for worker attributes, the estimated marginal utilities were included in various choice modeling scenarios. Simulations provide an intuitive tool to predict decision making behavior. Both individual estimates from the Hierarchical Bayesian method and aggregate estimates from the multinomial logit model were used in the choice modeling to convert respondent preferences into simulated shares of choice. Hierarchical Bayesian results were used in the Randomized First Choice model, while aggregate multinomial estimates were used in the Share of Preference model. Results from a choice modeling scenario with three competing job candidates are displayed in Table 5. Candidates differ specifically in the level of critical thinking skills, creativity and communication abilities.

Table 5. Choice Modeling Base Case Scenario.

Attributes	Candidate A	Candidate B	Candidate C
Critical Thinking	Basic	Good	Basic
Communication	Good	Good	Good
Team Work	Good	Basic	Good
Creativity	No	Yes	Yes
Marketing	Good	Basic	Basic
Finance	Good	Basic	Basic
Preference Share (Hierarchical Bayes)	**24%**	**40%**	**36%**
Preference Share (Aggregate Logit)	**21%**	**42%**	**36%**

Results show that candidate B which is creative and displays good thinking and good communication skills is the preferred candidate. Candidate C that is creative and has good communication and teamwork skills is the second preferred worker. Candidate A with good technical and communication skills but with no creativity and basic problem solving abilities is the least preferred employee. Results from both randomized first-choice and share of preference models provide consistent ranking of the candidates, though differences are observed in terms of respective share of preference for each candidate. Simulation results again point out to the importance of generic skills, specifically creativity and communication in the labor market.

Discussion and Conclusions

While the links between higher levels of human capital and skills as the foundation of increased productivity and improved performance are well known (OECD 2011), what specific set of skills are required and what this implies for higher education are questions that still need to be

addressed. The goal of this study was to increase the current understanding of labor market demands for various skills and attributes of agribusiness college graduates. As a result of changes taking place in the food and fiber industry, agribusiness programs are continuously redesigning their curriculum. The identification and the effective response to these changes requires that agribusiness higher education revisits the issue of relevant skills and labor market, and finds the best ways to transfer them to agribusiness college graduates. A choice-based conjoint experiment was used to identify labor market preferences for agribusiness college graduate attributes. A web survey with employers in the food and fiber industry was carried out. Using an experimental design, hypothetical candidate profiles were created and used in the interactive conjoint survey. Hierarchical Bayesian method was used to estimate individual-level marginal utility estimates for college graduate attributes.

Results of the study point out towards a shift in the needs for skills of agribusiness graduates, with new skills emerging as important to the knowledge economy. These results provide evidence that supports the initial hypothesis that there have been changes in the top rated skills for agribusiness graduates. Employers value most workers who can think creatively. The quest for creative ideas and solutions in the today's economy is becoming more and more pervasive.

Creativity is considered the new source of economic growth, a key to solving some of the today's social challenges (OECD 2011, Florida 2002, Pink 2005, Villalba 2010), and at the firm level an extremely important skill in creating competitive advantages. Although it is a talent-oriented process, yet, creativity can be taught and learned in schools (Livingston 2010).
Recent results from the Critical Skills Survey conducted by the American Management Association (AMA, 2013) are in full agreement with the findings of this study, indicating that employers need a workforce that is well equipped with the "four Cs": critical thinking, creativity, communication, and collaboration skills. Employers believe that these skills will become even more important in the near future, given the fast pace changes in the business environment and globalization. Further, they indicate that it is easier to develop vital skills such as critical thinking in students while in college, rather than in experienced workers in the workplace.

The shift in labor market needs for graduate attributes presents new challenges and implications for agribusiness higher education and food and fiber employers. On one hand, findings point out to the need for agribusiness programs to acknowledge the critical role that new skills, such as creativity will play in the knowledge economy and start to address the needs for these skills. Results also show that food and fiber employers seek individuals with strong critical thinking, good communication skills, with the right attitudes, who can work and collaborate in teams. Specialized knowledge in narrow fields is not as highly valued. According to WSJ (2012) the biggest complain of employers for academic programs was the extra focus on technical skills (such as finance and accounting) rather than development of deeper critical thinking and problem solving skills.

It seems that labor market demands workers that possess generic skills, who can think creatively and critically, solve problems and are flexible enough to work in ever changing conditions. Soft skills, such as interpersonal communication, ability to collaborate and work in teams are gaining value and importance in the new economy. These findings concur with the recommendations of CEA (2009). CEA pointed out that today's graduates will be better prepared for ever-changing

opportunities and for the jobs of tomorrow if they have strong analytical and interpersonal skills and the best way to prepare them is via a quality education. Academia is responsible to provide an environment conducive to a graduate equipped with a new and more sophisticated set of skills ready to respond to the needs of the economy. The timely identification and the effective response to these changes require that the issue of the set of skills essential to the food and fiber sector is reexamined, and the best ways to transfer them to agribusiness college graduates are identified and implemented. An efficient coordination of efforts of agribusiness programs to labor market needs will strengthen and enhance the value of the program, while boosting agribusiness graduates' employability.

On the other hand, results have implications for employers and managers in the food and fiber industry. A more complicated and difficult role for managers emerges. This new role requires managers to find effective ways to enable creative employees to be productive and motivated in the workplace. Managing for creativity and innovation requires a management style different from the typical, traditional style used in many companies. Findings emphasize the importance of the attribute of creativity as a competitive tool for employers. It can be argued that without creative employees, it will be difficult for food and fiber firms to maintain or gain competitive advantage. Literature has shown that creativity is influenced primarily by intrinsic motivators, such as interesting, exciting and satisfying work. A balanced approach between intrinsic motivators and common extrinsic motivators such as compensation and rewards can stimulate and increase significantly creativity among employees. Speaking of this new role, Amabile and Kramer (2012, a) suggest that to properly motivate creativity among employees, managers need to communicate clear, strategic and meaningful goals, while allowing employees real autonomy to apply their skills and talents to achieve these specific goals. Managers need to create an environment where ideas are freely an openly exchanged, where continuous, informative and constructive feedback is present and potential failures are considered a necessary part of doing creative work and carry in themselves useful lessons and opportunities for the future. In summary, managers have the responsibility to adopt what Amabile and Kramer (2012, b) call a mindset of "*checking in*" with employees rather than "*checking up*" on them, so they can be successful in managing for creativity in the knowledge economy.

Critical thinking skills were ranked as another very important employee skill. In a fast changing business environment, employees who have critical thinking skills become a very valuable resource for companies. Critical thinking employees are able to analyze situations, make decisions and solve problems on their own. Those companies that can attract, retain, motivate and develop critical thinkers have a significant and measurable competitive advantage in the business world. Managers need to have a very good understanding of these skills in order to find the best ways to hire, to motivate and manage the independent critical thinker. Behaving more like a facilitator of synergetic processes, that hires and brings together the right employees, engages them continuously in planning stages, and allows them to make decisions and solve problems might prove to be a successful new role for the 21st century manager.

Study Limitations and Implications for Future Studies

Results of this study are based on the preferences of a cross-sectional of California food and fiber employers. While the estimation technique employed minimizes measurement bias, one could

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argue that sample bias might still affect results obtained in this study, thus limiting somewhat their general applicability. Although how the sample of employers considered in this study compares to the population of food and fiber employers is not quite known, if the midpoint intervals of sales and number of employees are used, one finds that the sample represents a significant share of California food and fiber employers. Further, given the size, importance, the level of technology development and the adoption history of California's food and fiber industry evidence gained from California agribusiness firms should provide helpful insights about the direction of the US food and fiber industry and the evolving skills needed in the knowledge economy. Future studies using a larger and geographically diverse employer sample, however should explore whether similar results hold true and if they can be generalized for US companies. Also, research that takes into consideration the complex, international and dynamic interactions brought by globalization is needed to bring fresh and important insights in the skill discussion. Studies that explicitly take into consideration factors such as culture, economic indicators and food security, trade issues, sustainability etc., can shed light on the global applicability of the results of this study.

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Appendix 1

Sample of Choice Question Presented to Employers

We will present you various profiles of potential candidates for your next hire for an entry level position and ask you to choose which one you would hire.

Each profile represents a specific combination of various attributes that the candidate possesses. Please note that even though more characteristics might be important to you during hiring process, do assume that candidates possess satisfactory levels of the omitted characteristics.

Each attribute is associated with several levels as following:

Basic = Elementary or Base Knowledge
Good = Average or Satisfactory Knowledge
Advanced = Specialist or High Quality Knowledge
Yes = Attribute is Present
No = Attribute is Not Present

Attributes	Candidate A	Candidate B	Candidate C
Critical Thinking	Advanced	Basic	Good
Communication	Basic	Good	Good
Teamwork	Basic	Good	Basic
Creativity	No	No	Yes
Knowledge of Marketing	Advanced	Basic	Good
Knowledge of Finance	Basic	Advanced	Good

Please Indicate Your Preferred Candidate　　　O　　　　　　　O　　　　　　　O