Competitiveness Reviews for Assessing Program Needs

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Dr. Ali Ahmad is Director of the Manufacturing Extension Partnership (MEP) of Louisiana, which operates under the Louisiana Community and Technical College System. Dr. Ahmad is a professional with over 18 years of experience in industrial engineering, research and management fields. He was previously an Associate Professor and Head of the Engineering Technology Department at Northwestern State University of Louisiana. He obtained his Ph.D. in Industrial Engineering from the University of Central Florida. Dr. Ahmad has diverse expertise in human-computer interaction, quality engineering, and simulating manufacturing systems. Ali worked on projects related to transfer of training, user-centered design, process improvement, and virtual environments. Dr. Ahmad is a Certified Simulation Analyst and a Certified Six Sigma Black Belt.

Dr. Willie Eugene Smith Sr., Louisiana Community and Technical College System

Dr. Willie E. Smith has been working in the Louisiana Community & Technical College System (LCTCS) and colleges for the past 18 years. He currently serves as Vice President for Training and Business Partnerships for LCTCS, and Acting Director for Baton Rouge Community College (BRCC). Most recently he was the Interim Director of South Central Louisiana Technical College (SCLTC) from June 2017-June 30, 2018. Dr. Smith also served as Vice President of Academics and Workforce Solutions at South Louisiana Community College (SLCC). Dr. Smith earned his Bachelor of Arts degree from Tulane University, where he attended on a full athletic scholarship. He earned his Master of Public Administration from Troy University in 2001. He earned his doctoral degree in Educational Leadership from Argosy University in 2014. Dr. Smith has a long and faithful career with the former Louisiana Technical College, which became Acadiana Technical College (ATC), and now South Louisiana Community College. At SLCC he served in many roles such as Vice Chancellor for Economic and Workforce Development, Vice Chancellor for Business and Industry, Acting Vice Chancellor of Student Services, and Dean of Students. At ATC he served as Associate Dean for the Acadian, C. B. Coreil, and T. H. Harris Campuses, Director of the Keeping Youth Trained & Educated (KYTE) program, and coordinator of LTC incumbent worker training program. He is a Certified Grant Writer and Certified Special Program Coordinator. Prior to these positions, Dr. Smith was a Program Director with the following organizations: Lafayette Parish School System, LTC- Sullivan Campus YouthBuild program, Washington Correctional Institute, and the TANF 3 program. Dr. Smith also served as a Social Worker Supervisor for the Mobile Police Department in Mobile, Alabama from 1998-2001, where he was awarded civilian employee of the month for addressing and combating high levels of juvenile crime.

Dr. Smith is extremely active in the community and received many awards for his service and dedication, such as the Men of Excellence award from KPC Ladies Auxiliary Immaculate Heart of Mary Court 76 for his work in Public Service in 2015. Dr. Smith was recognized by the Louisiana Community and Technical College System (LCTCS) and was the recipient of the Outstanding Professional Staff award in 2013. He is a graduate of the LCTCS Leadership Development Institute (LDI), Louisiana Technical Colleges (LTC) Leadership Series where he was a member of the inaugural class of 2009, and LED/LCTCS Certified WorkForce Development (CWD) program inaugural class of 2015. He has served as the inaugural and former educational Chair for 100 Black Men of Greater Southwest Louisiana.

Dr. Smith was honored as the Outstanding Professional Employee for SLCC in 2013. Dr. Smith was recognized by Community Policing News in Washington, D.C., for his hard work addressing juvenile delinquency in Mobile, Alabama in 2000. He was awarded Civilian Employee of the Month, from the City of Mobile in 2000.

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Abstract

The Competitiveness Review© (CR) is a nationally recognized assessment tool that provides a systematic evaluation of a business. It measures operational performance and compares against globally competitive criteria. The assessment has 3 components: Online questionnaire, on-site assessment through a facilitated discussion with the leadership team, and a report-out session based on the online and onsite assessment results. Each CR covers topics such as sales, competitors, suppliers, order entry, operations, quality, continuous improvement, and innovation. The assessment reviews systems, not individual performance. This paper describes the CR components, processes, and provide examples of results obtained in Louisiana through applying the CR tool. The paper concludes with a discussion on how the CR results can be used to drive program development in two and four-year institutions of higher education.

Introduction and Background

The National Academy of Engineering forecasts that engineers and technologists will continue to operate in a rapidly changing innovation environment[1]. This is compounded by globalization of economies, diversity of social and business groups, multidisciplinary research trends, and cultural and political forces. Engineering systems are of increasing complexity in energy, environment, food, product development, and communications[1]. Hence, it is imperative to introduce engineering and technology practices in undergraduate education, where students can experience the iterative process of designing, analyzing, building and testing. There is a growing importance for engineering practice, but the engineering profession seems to be held in low regard compared to other professions and industry tends to view engineers and technologists as disposable commodities[2].

The field of manufacturing is wide, and engineering/engineering technologists must understand the processes and materials involved in the creation of a useful product[3]. The emergence of non-traditional education providers (such as online and hybrid) poses challenges for US higher education institutions. To remain competitive, US colleges and universities should re-adapt the way education is delivered, and develop curricula that meets the core competencies required in the market place[4]. At a time when local, state, and national resources for education are becoming increasingly scarce, expectations for institutional accountability and student performance are becoming more demanding. There is a need for more educational innovations that have a significant impact on student learning and performance[5].

ABET requires institutions to establish an advisory board to provide input on educational programs and curricula[6]. One challenge that is typically faced by a higher-education institution is how to determine which new programs to develop and curriculum changes to implement among a diverse set of constituents[7]. This research takes a pragmatic approach to determine new academic program development needs. The paper proceeds by discussing the method used to carry out the research. After that it provides a summary of the results. The paper concludes with a discussion of the key findings and provide directions for future development.

Method

This paper uses a case-study approach. During workforce development meetings across multiple community and technical colleges in Louisiana, there was a discussion to determine what additional program offerings are needed; both on the credit side (i.e., degrees), and the non-credit side (i.e., industry-based certificates). To address this need, and through collaboration with a manufacturing-extension program, a set of Competitiveness Review© (CR) assessments[8] were performed. Figure 1 describes the assessment process. Each assessment involved:

- The company completing an online questionnaire
- Review documentation (e.g., website, facility layout, organizational structure, etc.)
- A facilitated on-site discussion
- A facility walk-through
- A detailed report that includes observations and recommendations

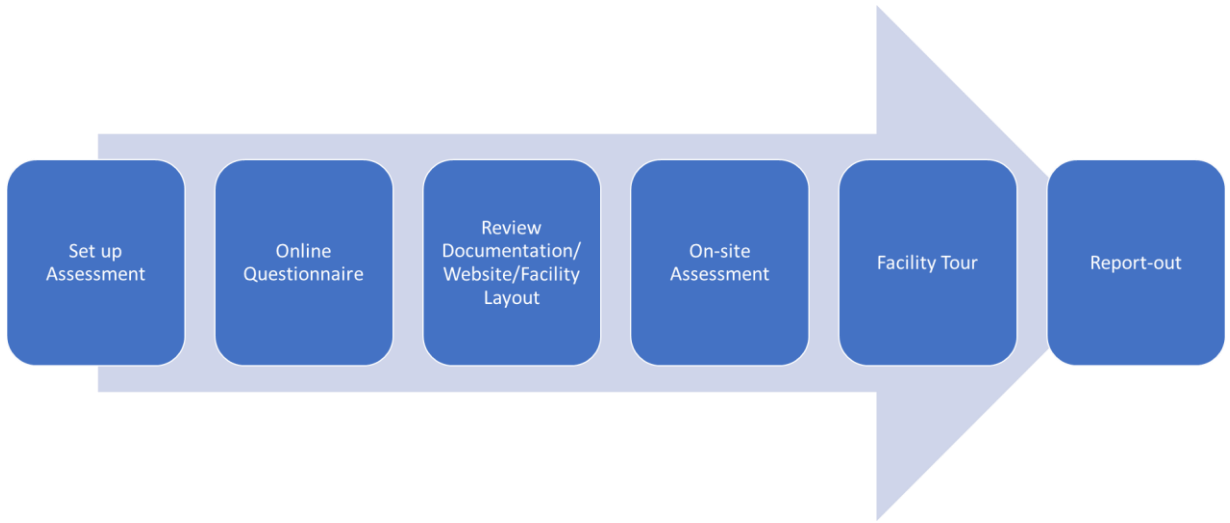

Figure 1. CR Assessment Process

During the on-site facilitated session, the following topic areas are discussed (abridged):

- History
  - General information
  - Reasons for being successful
  - Strategic plan
- Marketing/Sales
  - Recent sales numbers
  - Weaknesses, threats, and opportunities
  - Strategic marketing plan
- Customers
  - Primary customers/profiles
  - International business
  - Seasonal business
- Competitors
  - Key competitors
  - Changes in regulations/compliance/standards

- Quoting process
    - Process details/lead time
    - Pricing
    - Tracking actuals vs. estimates
- Financials
    - Product costing
    - Big fluctuations
    - Cash flow
- Order scheduling
    - Entry process
    - IT and ERP systems
    - Production scheduling
    - Production metrics
- Inventory
    - Value of inventory on-hand
    - Inventory turns
    - Product mix/ part numbers
- Suppliers
    - Critical suppliers
    - Supplier issues
    - Relationship with suppliers
- Human resources
    - Organizational structure
    - Employee issues (e.g., turnover, retention, tardiness, absenteeism, etc.)
    - Professional development
- Operations
    - Process overview
    - Set up times/changeovers
    - Bottlenecks/constraints
    - Performance measures
- Maintenance
    - Types of programs (e.g., preventive or predictive)
    - Maintenance software
    - Tracking maintenance data
- Quality systems
    - Quality management system
    - Metrics
    - Common customer complaints
    - Regulatory entities
- Continuous improvement
    - Formal vs. informal processes/tools
    - Training
- Safety/environmental
    - Formal safety program/safety manual/safety committee
    - OSHA Compliance
    - Environmental impacts/programs

- New products/innovation
    - R&D

Several assessments were conducted, and the resulting recommendations were tallied to identify emerging business needs; which were discussed with various colleges to determine new program development and curriculum revision goals.

Results and Discussion

A completed CR assessment report includes a narrative summary of observations collected through document review, on-site interviews, and facility walk-through. It summarizes the data in sections such as History, Customers, Competitors, Order Entry, Operations, etc. In addition, it includes a set of bar charts that depict how competitive was the organization based on the online responses to the questionnaire; starting with an overall score (see Figure 2), and broken down to the dimensions of Organization, Systems, Workforce, and Sustainability (see Figure 3).

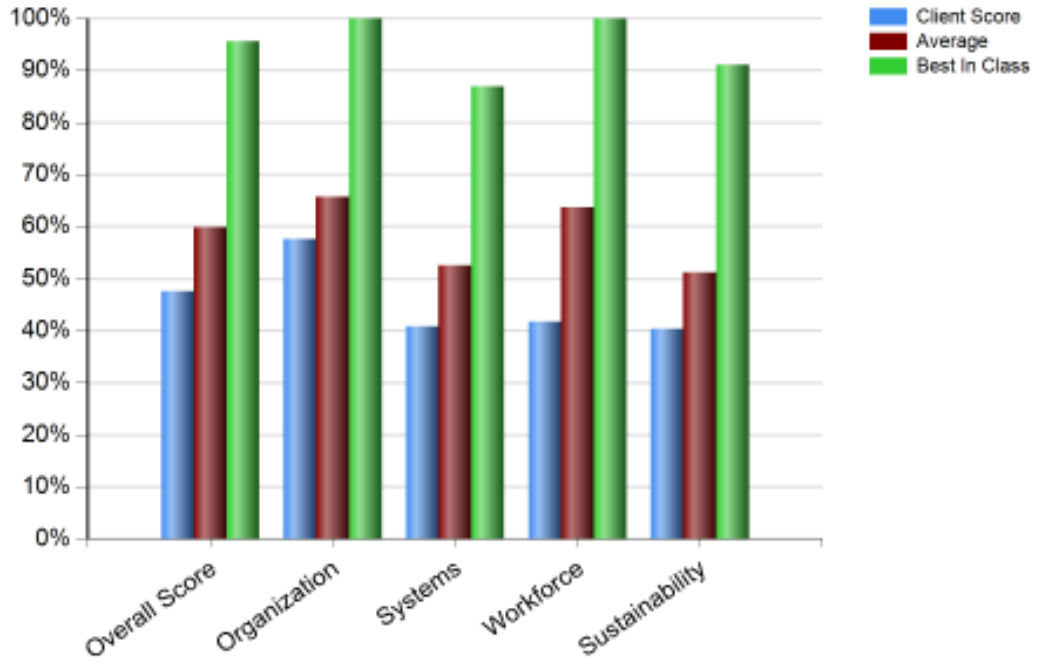

Figure 2. Company Competitiveness Results (Fictitious Data)

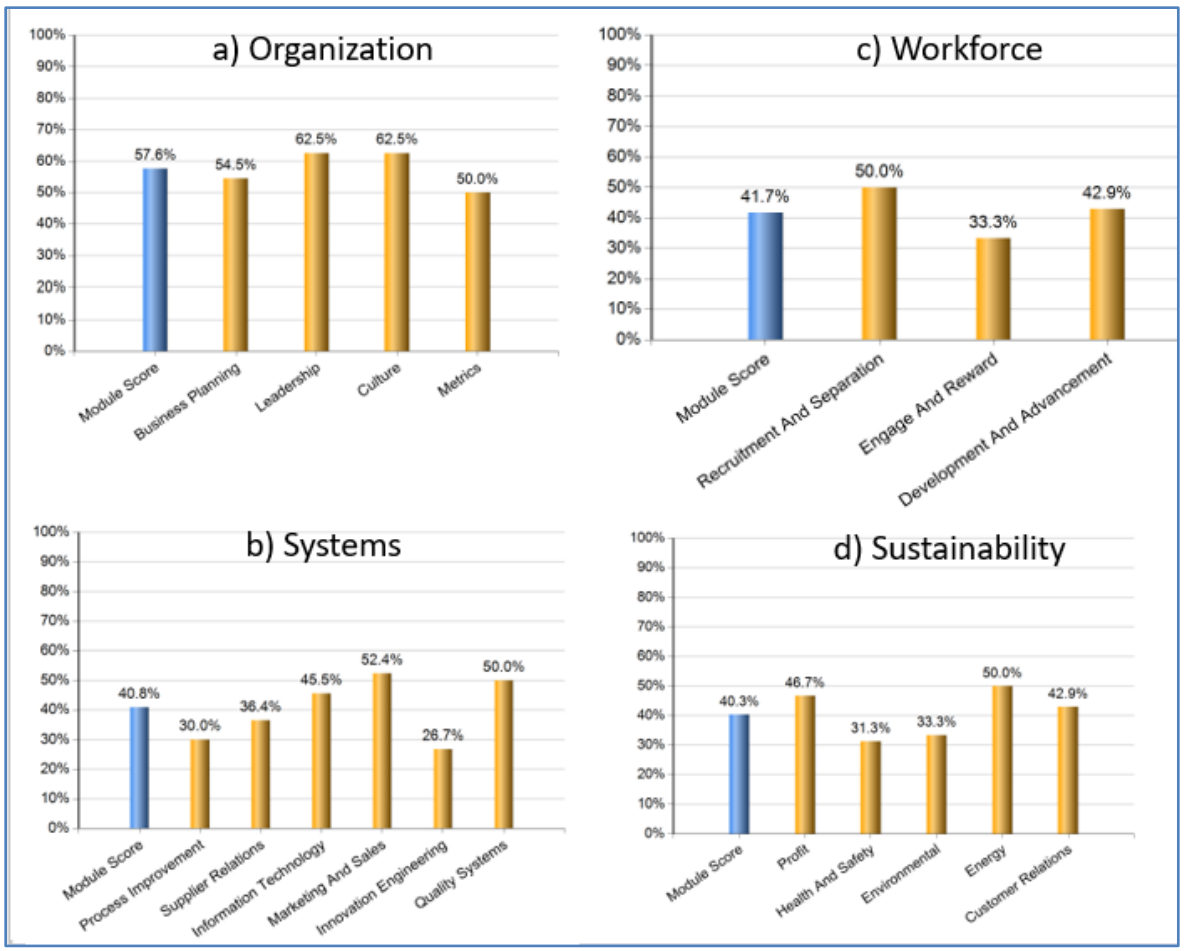

Figure 3. CR Module Scores (Fictitious Data)

For each section, a list of questions that were not answered favorably by the organization is compiled, for example (Fictitious Data):

- Organization
  - 1.1.2. Does this plan address the organization's strengths, weaknesses, opportunities and threats (SWOT)?
  - 1.1.4. Does the plan address core competencies and needs of stakeholders?
  - 1.1.7. Is there a structured process for aligning goals and strategic priorities that is simple and visible at all levels of the organization?
  - 1.1.9. Do company leaders revise and update the strategy every 6 months?
  - 1.1.11. Does the company have an emergency succession plan (1 day to 6 months) in place and understood by top management?
  - 1.2.1. Do senior leaders set and deploy the organization's vision and values?
  - 1.2.4. Do senior leaders communicate with and engage the workforce?
  - 1.2.6. Does the key leadership team create an environment for innovation?
  - Etc.
- Systems
  - 2.1.1. Does the company have a formalized and structured Continuous Improvement (CI) plan?
  - 2.1.2. Does the CI plan link to the company's strategic goals and business plan?

    - 2.1.3. Is the CI plan revised on a monthly basis?
    - 2.1.4. Are improvements made by following a scientific method such as PDCA, A3 or DMAIC?
    - 2.1.5. Have all employees been trained in lean manufacturing
    - 2.1.6. Does the company clearly understand the entire value stream?
    - 2.1.7. Does the company use Theory of Constraint (TOC) to find the constraint in the system?
    - Etc.
- Workforce
    - 3.1.2. Does the company have a formal process for employee separation?
    - 3.1.4. Do employees recommend the company as an employer to friends and family?
    - 3.1.6. Are the pay scales and benefits offered by the company sufficient to attract and retain competent people?
    - 3.1.8. Do the recruitment procedures enable the company to effectively identify, evaluate and check references on potential new employees?
    - 3.2.1. Does the company regularly engage and reward its workforce?
    - 3.2.2. Including temporary-to-permanent hires, is employee turnover 10% or more?
    - 3.2.3. Allowing for permitted time off such as vacation and professional development, is employee attendance 98% or higher?
    - Etc.
- Sustainability
    - 4.1.2. Are profits growing at least 20% per year?
    - 4.1.3. Are sales growing at least 20% per year?
    - 4.1.4. Is cash flow adequate and improving?
    - 4.1.6. Have key financial metrics been developed, and are they understood by the whole organization?
    - 4.1.9. Are measures used to drive improvements?
    - 4.1.11. Do performance metrics/measures drive the right behaviors?
    - Etc.

The assessment report concludes by providing a summary of recommendations for the business based on online and onsite evaluations, such as (Fictitious Data):

– Understand the Basics of Lean Manufacturing & Six Sigma
– Develop a Strategic Operational/Manufacturing Plan
– Create a Continuous Improvement Culture/Implement Lean Manufacturing
– Utilize Local Product Development/Innovation/Marketing Resources

Eight CR assessments were conducted in Louisiana between September 2017 and June 2018. Table 1 provides a description of the products made by each company. Company names were withheld to ensure confidentiality.

Table 1. Assessed Companies in Louisiana

Company	Products
A	Bulk bags
B	Multi-substrate solvent-based adhesives, wood putties, epoxies, water-based adhesives, water-based dimensional paints, and gel stain
C	Disposable items used in labor/delivery, and cardiology
D	Woven bags for various applications including food storage. Flexible Intermediate Bulk Containers
E	Make-to-Order (30,000+ different machined parts)
F	Printing and direct marketing company
G	Printed sports apparel
H	Steel fabrication, structural steel erection, precision CNC machining, forming, welding, etc.

The CR process resulted in the following recommendations for the assessed companies:

- Company A
  - Strategic Business Plan
  - Strategic Marketing Plan
  - Improve Product Cost and Consistency utilizing Statistical Process Control
  - Lean Manufacturing Foundation Tools
  - Kaizen Events
  - Human Resource Performance
- Company B
  - Optimization of Processes
  - Optimize Schedule Capacity
  - Reduce/Eliminate Part Shortages and Stock Outs Using Kanban
  - Formal Problem-Solving Methodology
  - Training Within Industry
- Company C
  - Safety Review
  - Energy Strategy
  - Manufacturing Flow Optimization
  - Lean Assessment, Principles of Lean, 5S System
  - Strategic Marketing Plan
  - Develop a Strategic Business Plan
- Company D
  - Strategic Marketing Plan
  - Manufacturing Flow (Warehouse Optimization)
  - Lean Manufacturing Training

    - Kaizen Leader Training
- Company E
    - Safety Review
    - Cash Flow and Product Pricing Optimization
    - Workflow Optimization
    - Lean Assessment, Principles of Lean, 5S System
    - Training Within Industry
    - Strategic Marketing Plan
    - Energy Strategy
- Company F
    - Strategic Business Plan
    - Strategic Marketing Plan
    - Pursue Funding
    - Policy Deployment
    - Lean Manufacturing Training
    - Kaizen Events
- Company G
    - Strategic Business Plan
    - Pursue Funding
    - Strategic Marketing Plan
    - Develop Standard Process Documentation
    - Policy Deployment
- Company H
    - Environmental Review
    - Cash Flow and Product Pricing Optimization
    - Workflow Optimization
    - Lean Assessment, Principles of Lean, 5S System
    - Training Within Industry
    - Strategic Marketing Plan
    - Energy Strategy

Table 2 provides a tally of recommendations for the assessed companies. The top recommendations were:

- Strategic Marketing
- Lean
- Energy Assessment/Strategies
- Kaizen
- Training Within Industry

Table 2. Tally of Assessed Companies' Recommendations

Recommendation	Frequency
Strategic Marketing Plan	7
Lean	6
Energy Strategy	3
Kaizen Events	3
Strategic Business Plan	3
Training Within Industry	3
Cash Flow and Product Pricing Optimization	2
Manufacturing Flow (Warehouse Optimizatio	2
Policy Deployment	2
Pursue Funding	2
Safety Review	2
Workflow Optimization	2
Develop a Strategic Business Plan	1
Develop Standard Process Documentation	1
Environmental Review	1
Formal Problem Solving Methodology	1
Human Resource Performance	1
Improve Product Cost	1
Optimization of Processes	1
Reduce/Eliminate Part Shortages	1

These recommendations were communicated to workforce and academic units at various community and technical colleges, and are being used to justify future credit and non-for-credit program offerings. For example, on the for-credit side, a new course or concentration can be added on strategic marketing under the business school. Or, a new AS or AAS degree in marketing can be developed. Lean and kaizen recommendation can be used to enhance existing technical course offerings by incorporating these concepts, or added to a new course or concentration. Alternatively, a new AS or AAS degree on lean can be developed. And, on the non-for-credit side, a series of short workshops on strategic partnership and lean/kaizen can be offered. Additionally, industry-based certificates (credentials) can be developed for these topic areas that have a certifying body and offered at the colleges.

Future work includes conducting additional CR assessments and compiling/weighting recommendations, updating the CR assessment tool to include questions related to emerging topics such as Industry 4.0 and Cybersecurity, and communicating assessment results to four-year universities to facilitate development of programs beyond what can be delivered via the two-year colleges, such as a BA degree in strategic marketing or a MA in business with a focus on marketing.

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