Industry & University Collaboration

by

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Abstract
Through this paper the audience will see how a major tire manufacturer managed projects involving both employees and students for their mutual benefit, while providing university students hands-on experiential learning. Students are motivated by being exposed to a potential employer as well as being able to earn industry sought-after certifications in lean manufacturing and six-sigma. As technology becomes more complex in a highly competitive world market, there is an ever-increasing need in industry for personnel that have interpersonal, leadership, and technical skills that are necessary for solving quality, cost, and delivery problems. In recognition of this need, Bridgestone Firestone management established a collaborative training program with Middle Tennessee State University (MTSU) that supports the company's total corporate culture growth to a leaner organization. The administration of projects driven by the six-sigma "DMAIC Culture" that involves students, six-sigma yellow belts, green belts, black belts, Kaizen teams, maintenance and production personnel in many business and process areas is also illustrated in this paper including tangible results that directly effect the bottom line.

Introduction

Industry Technology Needs

Employers often hire graduates from accredited degree programs. The technical content of these programs is dictated by accreditation standards that provide evidence of a minimum set of qualifications for the potential employee. Employers then provide extensive additional training in topics such as six sigma and lean manufacturing to bring the new employee in-line with company requirements.

Accreditation is intended to ensure quality as evidenced by the U.S Department of Education's statement "The goal of accreditation is to ensure that education provided by institutions of higher education meets acceptable levels of quality" (Boles and Gore, 2004). Accreditation agencies, such as the National Association of Industrial Technology (NAIT), ensure the quality of technically-oriented programs in areas such as Industrial Technology with many technical disciplines represented. On the other hand, industrial employers often hire employees from technically-accredited programs, such as engineering, where there seems to be a mismatch between job duties and accreditation goals. Most accredited engineering programs do a fine job at preparing graduates for engineering design positions and to continue into a research-oriented graduate program. For example, ABET, Inc., states that accreditation ensures "Employers that graduates are prepared to begin professional practice." However, many engineering graduates are hired into positions that require little or no engineering design capability. In some cases, engineering graduates are preferred over technology graduates even when technology graduates are a better fit for actual job requirements. Industry-recognized certifications can serve as a powerful tool to persuade these employers to take serious look at technology graduates.

Industry-recognized certifications help industries seeking technology needs above and beyond the requirements of accredited programs and level the playing field between engineering graduates and technology graduates competing for industrial and manufacturing jobs. So, now the problem is how to provide these certifications within the time limitations imposed on hard-working technology students.

How then can students earn certifications through "industry involvement?" Student tours of industries both here and abroad certainly are useful for general knowledge, but does that accomplish the mission of a program designed to teach students interpersonal, leadership, and technical skills needed for their success in high technology industrial or business systems? Likewise, the use of industrial internships is not educational if the work assignments do not provide students experiences that allow development of skills required for high-value specialty knowledge positions. In order to be successful, experiential learning requires careful design and collaboration by both the university and industry involved.

Student Experiential Learning

Experiential learning can best be described as, "that learning process that takes place beyond the traditional classroom and that enhances the personal and intellectual growth of the student**.** This education can occur in a wide variety of settings, but it usually takes on a 'learn-by-doing' aspect that engages the student directly in the subject, work or service involved," as defined by the Experiential Education in the College of Arts and Sciences, Northeastern University, 1997.

Quality learning should be defined by what students do, not by what faculty do in the learning process (Cantor, 1995). Cantor also believes that experiential learning activities are natural motivators for students and this motivation leads to students being more involved in the learning experience. Two people credited with the experiential education movement are philosopher John Dewey and educator Ernest Boyer. Dewey thought that education should be reinforced by experience, and suggested that the "quality of the experience is as important as the experience itself" (Katula and Threnhauser, 1999). Boyer encouraged educators to develop the scholarship of engagement. He said that higher education must build collaborative partnerships, improve all forms of scholarship (Boyer, 1990a), and provide opportunities for students to contribute to the common good (Boyer, 1990b).

Some critics question whether experiential education really does enhance student learning and whether all experiential education programs provide valuable learning experiences. In their study, Katula and Threnhauser (1999) found that sometimes cooperative education experiences do not enhance student learning because they are not effectively integrated with the students' discipline. There is also some concern that study abroad experiences are no better than students' personal travels abroad (Katula and Threnhauser, 1999).

Alternatively, many researchers strongly believe that enhanced student learning results from experiential learning programs. Internship students have the opportunity to take responsibility for their own professional and intellectual development and they learn to connect their coursework with their work experience. An internship program generally encourages students to view themselves as more connected to their education and helps them to develop an understanding that education is essential to their future lives (Steffes, 2004). The internships that are the most useful for students are carefully planned and monitored to ensure that students are engaged in discipline-related work activities. Experiential learning helps students understand how theory is applied to real situations (Bucher and Patton, 2004).

Mission and Vision

Through the hard work and diligence of a Middle Tennessee State University Industry Advisory Committee over the past three years, a new program was designed with the mission to "teach students interpersonal, leadership, and technical skills needed for their success in many various industry or high-technology business systems." The Engineering Technology and Industrial Studies (ETIS) Department Chair, Dr. Walter Boles led the way by defining the vision (Boles and Gore, 2004) which is best explained in Figures 1 and 2 that follow:

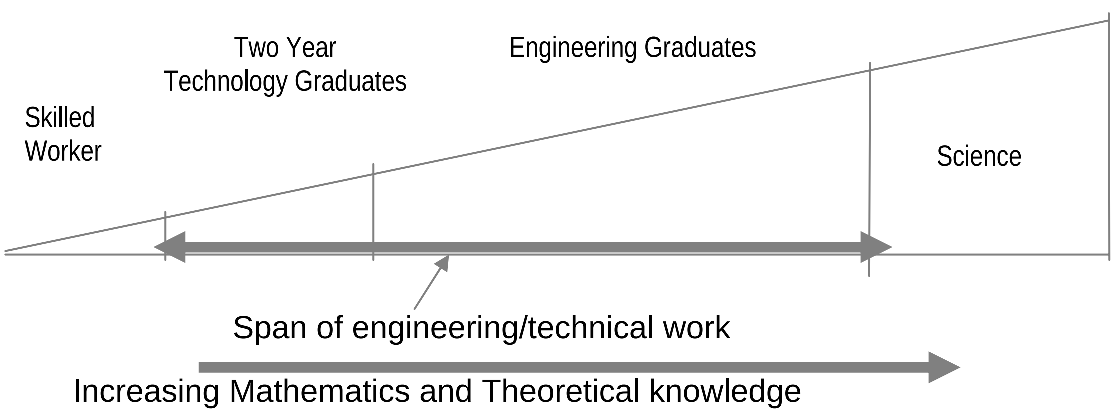

Figure 1. The "Old" Model of Technology versus Engineering

In Figure 1, this model of technology and engineering shows the situation 30 to 40 years ago when engineering graduates covered the span of technical work between the two-year technology graduate and the area of pure science. It illustrates that more mathematics and theoretical knowledge is required as the work content changes from "skilled" to "science." Engineers were expected to be "hands-on" as well as being prepared for R&D and applied sciences.

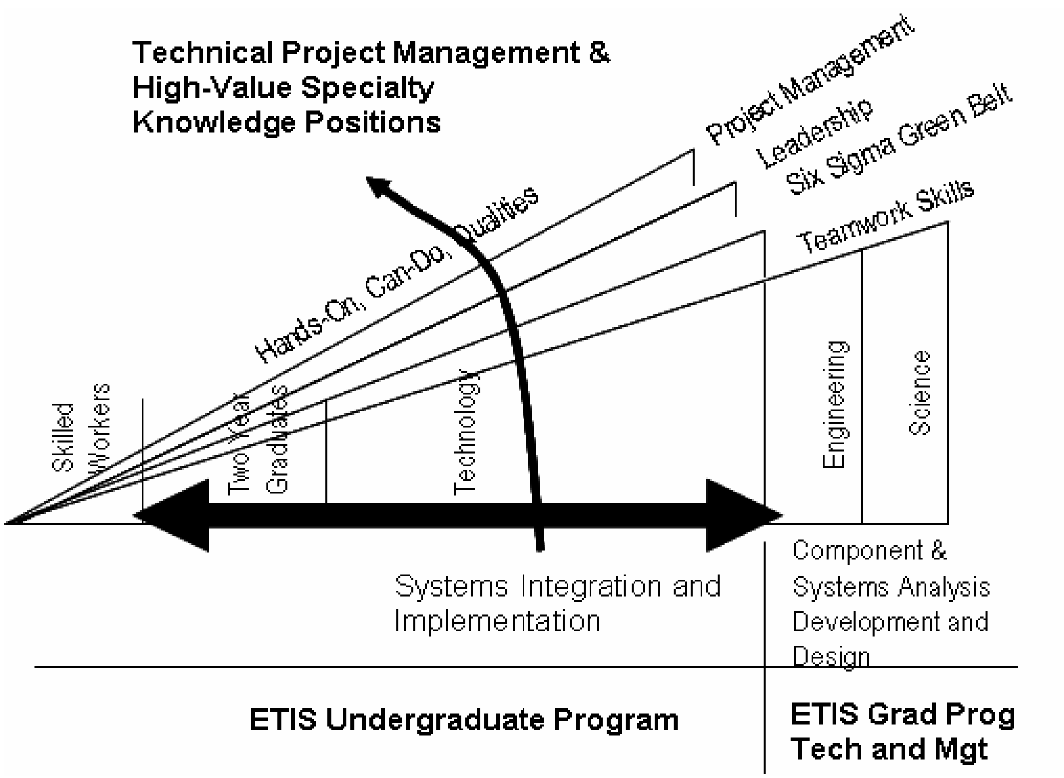

Figure 2. A "New" Model

As shown in Figure 2, today's engineers are pushing the envelope into the applied and theoretical sciences area and are expected to handle complex systems analyses as well as development and design. The "gap" between the skilled worker and pure engineering graduate is now covered by the Industrial or Engineering Technology under-graduate program that focuses on systems integration and implementation issues that require more "hands-on" problem-solving skills than theoretical knowledge. Graduates of technology programs are sometimes overlooked for positions for which they are highly qualified. "Providing these undergraduates with significant industry-recognized certifications will help overcome this phenomenon," according to Dr. Boles.

Competencies & Learning Goals

From this vision and mission, four applicable core competencies were established that requires the student to:

1. Communicate effectively, clearly and precisely.
2. Solve problems through thinking logically, critically and creatively.
3. Use teamwork to seek and share innovative knowledge and perform tasks effectively.
4. Develop leadership/soft skills to lead projects, subordinates and/or teams.

Coursework was developed that provides the tools and in-class simulations; however, it was clear that "real world, hand-on" experiences were required to reinforce classroom learning, develop the basic skills needed by industry, and achieve the core competencies at the same time. Several learning goals were established based on the "New" Model (refer to Figure 2). Each student must:

- Master "lean" techniques to improve productivity in any operational system such as manufacturing or healthcare.

- Understand and use the six-sigma methodology to define, measure, analyze, improve, and control quality in any operational system.
- Perform industrial engineering systems analyses involving work measurement, process layout & material handling.

To go beyond the classroom requires collaboration with industry partners to setup projects that can meet the needs of both the industry partner and the student. In the Appendix, Table 1 gives a listing of key MTSU corporate partners and Tables 2 and 3 summarize the types of student projects with a typical list of deliverables.

Assessment

As pointed out in a paper at the NAIT 2006 conference, assessment of experiential learning for technology students means something only "if the information is collected in a systematic, objective manner . . ." (Trautman 2006). Fortunately, information collection in the case of six sigma, is a relatively simple process, since certification requires the student candidate to complete a "Greenbelt-level" six sigma project with deliverables detailed during the "define" charter development phase. However, most Greenbelt-level projects require a minimum of 2 to 3 months to complete. Initial efforts at certification were not very successful due to the limited time that a student has during the semester for work outside the university. This limitation resulted in some projects being started but never completed, and others stretched out into the summer when students had more time available. The highest success rate came from the non-traditional student already working as a full-time employee in the company where the project was being conducted. Current certification efforts have been successful, primarily due to the use of Internships that allow time for students to focus on specific company projects.

Industry Collaboration

Background

Early in 2006 the Six Sigma Process Manager at Bridgestone Firestone North American Tire, LLC, La Vergne plant, contacted Middle Tennessee State University (MTSU) to propose collaboration between the two organizations. The Plant Manager at Bridgestone Firestone had decided that MTSU should be involved in the tire company's six-sigma programs as well as any other areas of mutual interest. After a joint meeting, Bridgestone Firestone saw several advantages to pursuing this relationship with MTSU:

- Utilize university resources to support corporate quality & lean initiatives.
- Obtain knowledgeable student labor (Six Sigma, Value Stream Mapping, Lean Mfg.)
- Obtain feedback from a different perspective (new set of eyes).
- Opportunities to strengthen employment base.
- Networking opportunities:
    - Manufacturing Excellence Program
    - Board of Engineering Development
    - Publish paper in recognized journal

Initial Effort

Several students taking the six sigma and lean manufacturing courses during the spring semester 2006 were provided the opportunity to work with Bridgestone Firestone on six sigma and value stream mapping projects. These projects were ongoing projects in various stages of completion (see Table 4 in the Appendix for the six-sigma projects and Table 5 for the tracking matrix), and were not completed during the spring semester. Due to other coursework, the students could spend very little time doing the project work on-site at the Bridgestone Firestone plant (an average of 2 to 3 hours per week); so, the work was carried over into the summer of 2006. Students and company Blackbelts co-presented their projects in mid-September 2006, and several projects were completed during the summer of 2007 that resulted in students being awarded a Greenbelt certification. Because of their desires to obtain certifications these students worked on their own time without any paid internships and the company was pleased with the results of their efforts. However, both Bridgestone Firestone and MTSU believed improvements in this program were necessary to provide additional time and motivation for students to complete projects and earn their certifications in a timelier manner.

Current Strategy

The company studied its vision of managing six-sigma projects and how resources were allocated to get the bottom-line results required. This concept is shown in Figure 3 with "MTSU Students" as one of its foundations.

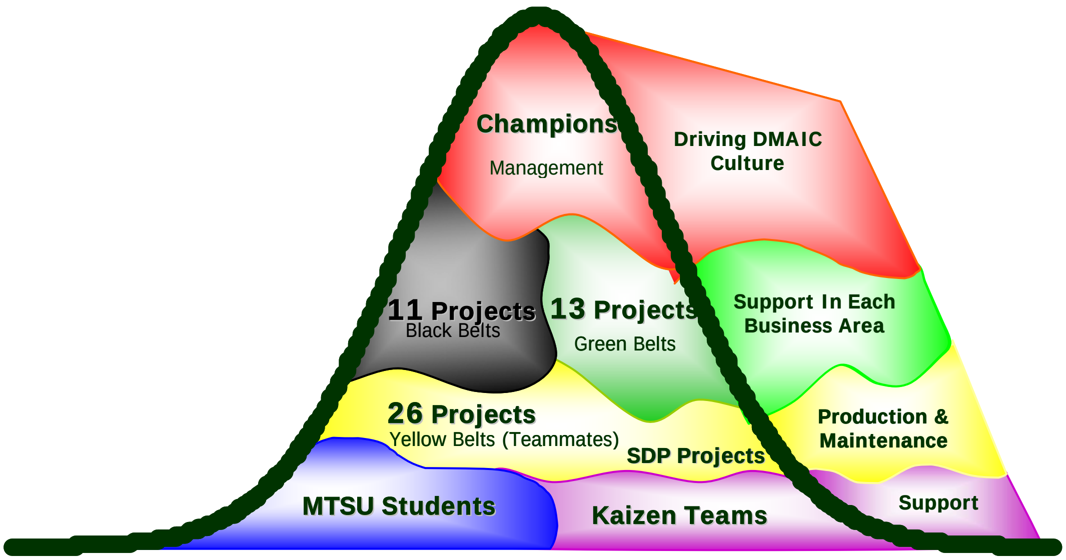

Figure 3. Six Sigma Vision – Define, Measure, Analyze, Improve and Control (DMAIC)

In order to improve the integration of MTSU students within this structure, Bridgestone Firestone funded internships to provide the motivation for students to be able to spend more "face" time on-site and become more a part of the project teams to which they were assigned. (As a result, the company funded an Internship program and the first student was hired in the summer of 2007). To support this strategy, MTSU changed the curriculum in fall 2007 to specifically require internships as part of the experiential courses in both lean and six sigma in order to achieve the learning goals discussed previously. Internships have now been set up with three companies and students have earned certifications in both six sigma and lean.

Administration

Projects are driven by the six-sigma "DMAIC Culture" (Define, Measure, Analyze, Improve, and Control) involving students; six sigma yellow belts, green belts, black belts; Kaizen teams; and maintenance and production personnel in many business and process areas. Administration of these project and personnel is the key to being able to achieve financial results projected at over $2 million dollars in 2007 (a more than a 26.5% increase over last year).

Organization

For example, the following elements are required to establish the organization to manage six-sigma projects:

- Leadership & support of top corporate management.
- Full-time dedicated site project Blackbelt manager.
- Six Sigma trained leaders.
  - Leaders responsible for reporting to the Six Sigma Manager bi-weekly and during the monthly plant management review.
- 30 minute bi-weekly standing meeting in each business area.
  - Involve yellow belts and students as appropriate in the bi-weekly meetings.
- Initiate activities and resources for projects to progress through the DMAIC roadmap (QE, IE, EE, ME, IT Support, Tech Eng, Maintenance).

Training

Training is required at all levels – from upper management down to the production technician. (See Appendix Table 6 for the Bridgestone Firestone ambitious training timeline). The company's support for internships and university training for students is part of the overall investment needed to assure success. (It is interesting to note that "success breeds success" as indicated by the number of calls from production technicians that desire to be part of the program).

Follow-up

Follow-up is necessary to manage successfully. Weekly meetings are held by the project leaders plus bi-weekly meetings with the Six Sigma Process Manager to review the following:

- Project status overview
- "Champion" informed and drive accountability
- Forum to mention and remove obstacles
- Kudos, share results
- Promote DMAIC culture all business areas

The Six Sigma Process Manager has quarterly reviews – first month with plant management staff, second month with "Belts" presenting to plant management staff, and third month with "Champions" presenting project accounts to plant manager.

Semi-annually invitations go out to corporate executives to attend presentations by Yellow Belts who share the results of completed project with peers and management. Also, at these meetings, Green Belts are presented with their certifications and a Six Sigma Executive Presentation Award Ceremony is held at the same time to recognize superior projects and performance.

Summary & Conclusions

Training tomorrow's leaders requires a collaborative effort between industry and the university. The competencies and skills desired from university graduates by today's modern industries can be achieved through proper application of several factors:

- Use of internships that are directed toward projects utilizing initiatives such as six sigma and lean manufacturing in order to develop the skills desired by industry through true experiential learning as well as investing in potential future new hires.
- Curriculum design by the universities that support student competency development through direct application of classroom knowledge to the experiential-learning workplace.

- Administration of student interns within the corporation in a way that not only recognizes the importance of experiential learning and internships, but also understands how to organize, track and follow-up projects.

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Appendix

Company	Six Sigma	Lean	Layout	Other
Bridgestone Firestone	✓	✓	✓	✓
Middle TN Medical	✓	✓		
Johnson Controls	✓	✓	✓	✓
Cumberland Swann		✓	✓	✓
General Mills	✓			
MAHLE	✓	✓	✓	✓
Square D	✓	✓	✓	✓
Stinger Medical	✓	✓	✓	
Asurion		✓	✓	
Tridon	✓		✓	✓

TN Board of Regents	√

Table 1. Key Partners

Phase	Project Deliverables (examples)
Define	Project charter – team development CTQC “Tree” – voice of the customer
Measure	Gauge R&R – data collection Six Sigma Toolset – e.g. SPC Charts
Analyze	Correlation or Regression analysis; Hypothesis tests; Design of Experiments
Improve	FMEA & Prioritizing, Corrective Action Matrix, System Dynamics Mapping
Control	Control Plan, SPC, Visual Controls, Final Report/Presentation to Industry Partner

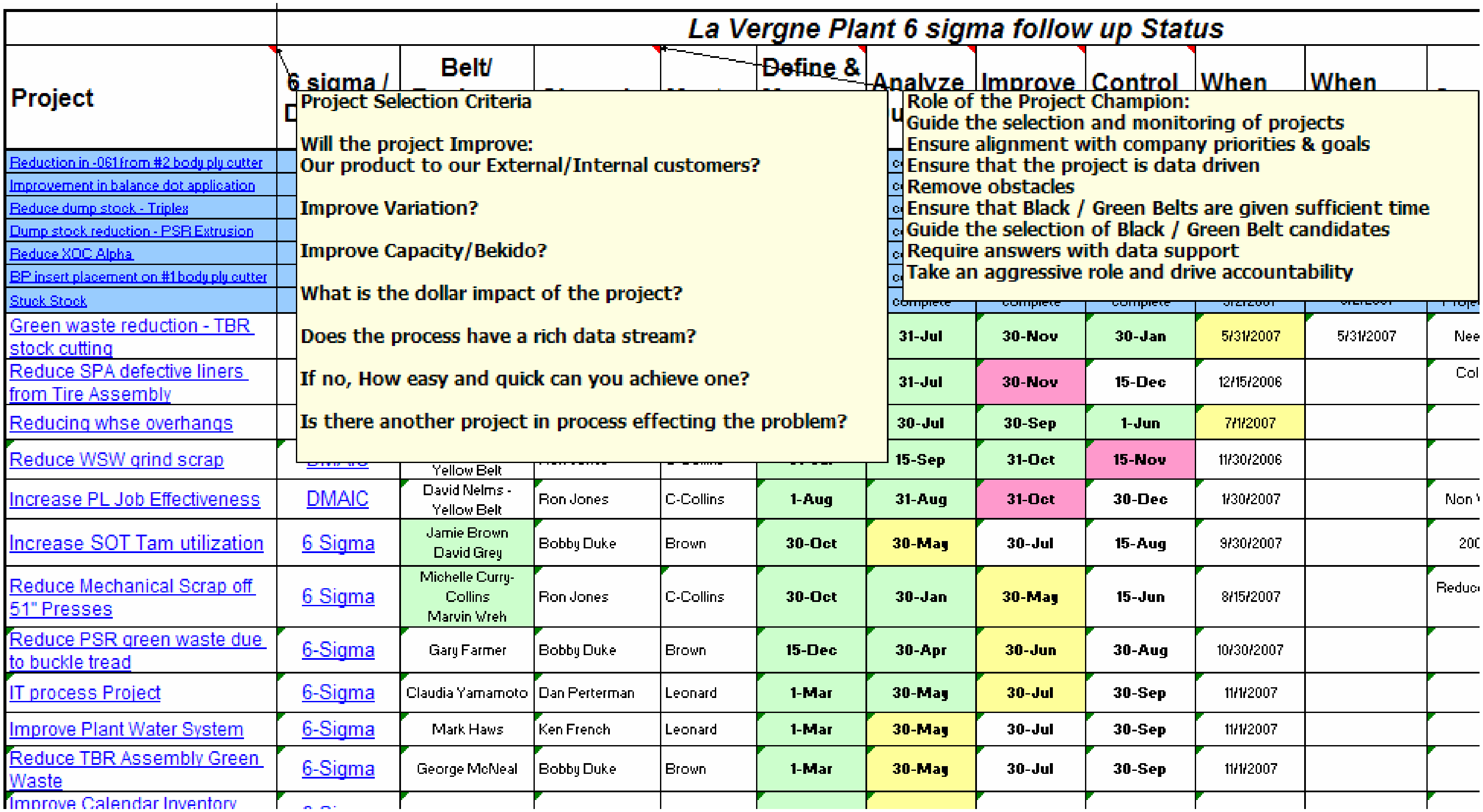
Table 2. SIX SIGMA Industry Project

Project	Project Deliverables (examples)
Lean	Value Stream Maps (Current & Future states); Factory Physics © Analyses (Little’s Law & Internal Benchmarking)
Layout	Design of process to improve flow – e.g. using Group Technology (cell design)
I.E. Systems	Time/Motion Work Measurement Study of process to improve efficiency and/or ergonomics
Project Mgmt	Development of Gantt, CPM, and project plans to support all other projects.

Table 3. Other Industry Projects

Updated 8/10/06		Project Cost			Result	Comment	DMAIC/6-Sigma	Acc. Sign Off	Product,lbs or dollars saved	<3sigma	90%	
		Year	Soft Dollar	Hard Dollar						>3sigma	50%	SIGM
	Improve Plant Calendar Inventory accuracy	09	$30,000		Cost Avoidance	Averaging 3 rolls a year in scrap due to bloom .005% improvemen	DMAIC			3σ		Green
TIRE ASSEMBLY	**HOT Reduction on U-1 tome**	06			Cost Avoidance		DMAIC					
	Reduction of SPA defective Liners from T/A	06			Refinement	Needing help from Stock Cutting Kaizen Team $300	6-Sigma					
	Increase Tom Utilization on SOT construction	07	$108,000		Improve Bekida	Jamie Braun Black Belt Project	6-Sigma			<3σ		
	Reduce size change time TBR	13			Improve Bekida		6-Sigma					
	Increase Tom Cycle Tom - PSR	15			Improve Bekida		DMAIC					
	Increase Tom Cycle Tom - TBR	14			Improve Bekida		DMAIC					
	Reduce Unbalance scrap 4R93 - TBR	08	$38,090		Cost Avoidance	Highest balance scrap tire - 30 avg monthly	6-Sigma		180		0.011	Cure-
	Reduce Off Center conditions in PSR	11	$111,540		Cost Avoidance	High Scrap condition - 250 avg monthly	DMAIC		1500		0.051	Cure-
	RFV and Bal Reduction-Alignment		$236,088						1044			
	Reduce waste due to poor turn-up TBR	08	$38,090		Cost Avoidance	06 360 tire projection to be cured scrap, Avg 80 green scrap	DMAIC		180	3σ	0.005	Cure-
	Reduce GT scrap due to buckled tread PSR	13	$96,640		Cost Avoidance	High Green Waste scrap cause - 175 avg monthly	DMAIC		1243	3σ		Green
	Reduce $29 conditions due to abnormal coverage TBR	09	$65,337		Cost Avoidance	High abnormality 750 buff, 400 rework, 50 scrap monthly	6-Sigma		7200	2.63 ~ 2.86	0.52	BRS
	Reduce Barcode placement errors TBR	07	$28,438		Cost Avoidance	High Rework condition - 100 avg monthly	DMAIC		600	3.20 ~ 3.39	0.04	Rew
	Reduce Beadset scrap - TBR	09	$5,762		Cost Avoidance	Green scrap waste condition	DMAIC		50	3σ	0.001	Green
	Improve builder Splice accuracy 14's TBR	11	$10,413		Cost Avoidance	5th Highest rework - 160 avg monthly	DMAIC		960	3.13 ~ 3.32	0.055	Rew
	Improve builder Splice accuracy 14's & 78's PSR	08	$108,269		Cost Avoidance	Highest rework condition - 2032 avg monthly	6-Sigma		21492	2.67 ~ 2.90	0.42	Rew
	Reduce Occurrence for Missing Air Supply S	07	$6,555		Cost Avoidance	Body ply carts high, save 20 min a fix from Contracts standpoint	DMAIC		12144	1.79 ~ 2.67		NVA
	Reduce Lot Trace Barcode Errors	07	$7,902		Cost Avoidance	Average 22,000 per month in lost barcodes	DMAIC		105			
	Reduce T/R green waste PSR	13			Cost Avoidance							
	Reduce T/R green waste TBR Conveyor	12	$51,452		Cost Avoidance				224			
	Reduce Open and Cross Bldr conditions 60's TBR	14	$116,193		Cost Avoidance	4th Highest T/A scrap condition - 90 avg monthly	DMAIC		540	3.29 ~ 3.48	0.03	Cure-
	Reduce Open and Cross Bldr conditions 60's PSR	14	$158,046		Cost Avoidance	4th Highest T/A scrap condition - 350 avg monthly	DMAIC		2100	3.02 ~ 3.23	0.07	Cure-
CURING	**Reduction in 42's Pinched Bladder**	06	$252,783		Cost Avoidance	Scrap Tire Cost - 2nd Highest Abnormal condition	DMAIC		1179	3.04 ~ 3.35	0.06	Cure-
	Reduce Mechanical Related Scrap off 51" pro	07	$57,816		Cost Avoidance	Michelle Curry Collins Black Belt Project	6-Sigma		1266	?	0.4	Cure-
	Reduce O-C time on TBR presses	06	$169,342		Improve Bekida	Dana Davis Green Belt Project starting in Nov 06	6-Sigma					
	Reduce Mold Size change time TBR	08			Improve Bekida		DMAIC		0.06		0.06	
	Improve Maint response time	09			Improve Bekida		DMAIC		0.22		0.22	
	Reduce Bladder Size change time TBR	07	$50,000		Improve Bekida	Bladder change efficiency improvement	DMAIC					
	Reduce Molding condition 53's PSR	09	$60,697		Cost Avoidance	2nd Highest condition - 1400, B 275 R, 225 scrap avg monthly	DMAIC		1650	3.11 ~ 3.31	0.345	BRS
	Reduce Molding condition 48's PSR	09	$21,880		Cost Avoidance	Highest condition - 1050 rework, 225 scrap avg monthly	DMAIC		6215	2.67 ~ 2.89	0.25	RS
	Reduce Mold Lube buff condition 20's TBR	13	$14,510		Cost Avoidance	High buff condition - 325 avg monthly Scrap save 44 year	DMAIC		1950	2.90 ~ 3.11	0.107	Buff
	Reduce Green Waste Causes PSR	11			Cost Avoidance	06 ytd .045 in green waste,	6-Sigma			3σ	0.01	Green
	Increase Bladder life PSR	10	$50,000		Improve Bekida	Increase Bladder Retirement by 15%	DMAIC			<3σ		
	Increase Bladder life TBR	10	$120,000		Improve Bekida	Increase 20% over 270 cure 06 avg	6-Sigma			<3σ		
	Reduce chakatai PSR	07			Improve Bekida	Reduce Short time delays by 25%	DMAIC			3σ		
	Reduce Loading & Unloading related Scrap 50's PSR	12	$45,783		Cost Avoidance	PSR scrap item - 150 avg monthly	DMAIC		900	3.28 ~ 3.47	0.03	Cure-
	Improve Leak detect accuracy	11	$106,827		Cost Avoidance	Highest scrap condition - 350 avg monthly	6-Sigma		2100	3.03 ~ 3.23	0.07	Cure-
	Reduce Alarms scrap TBR	11	$245,296		Cost Avoidance	2nd highest scrap condition - 190 avg monthly	DMAIC		1140	3.08 ~ 3.28	0.06	Cure-
	Reduce Curing Ring Repairs - Both	08			Cost Avoidance		DMAIC					
FINAL	~~**Improve Balance Dot application 2006**~~	06	$130,900		Cost Avoidance	3 OE customer Concerns in 2005 - Customer Satisfaction	6-Sigma	√ Kellrooney				
	Reduction of S-#25 on TBR	06	$59,194		Cost Avoidance	Re-handling of Product from Whse and Added Labor	DMAIC		4582	1.89 ~ 2.76	2.61	
	Improve ASRS HOT do to overhangs	06	$59,775		Cost Avoidance	ASRS system improvement	6-Sigma		1287.6			
	~~**Reduce TOC Alpha Miss 2006**~~	07		$344,000	Refinement	Alpha miss running in the 90% Refinement comes out of QA	6-Sigma	√ J. Bryant	Refinement			
	Reduction Scrap abnormal 77's PSR	07	$211,212		Cost Avoidance	Highest scrap condition for Final Finish .18% to .018%	DMAIC		4152	2.60 ~ 3.31	0.162	Cure-
	Improve PL job effectiveness TBR	07	$4,348		Efficiency Improvement	Non-Value added activity - not meeting required job duties	DMAIC		437.5		0.5	
	Improve TUO machine efficiency	07			Efficiency Improvement	Staggering work assignments and 5x5 testing	DMAIC					
	Improve PL job effectiveness PSR	07	$1,988		Efficiency Improvement	Non-Value added activity - not meeting required job duties	DMAIC		200			
	Reduce Classification errors PSR	08	$35,405		Cost Avoidance	2 tire avg per day - out for entire year	DMAIC		696	3σ	0.008	Cure-
	Improve Balance Mark Accuracy PSR	08			Quality Improvement	Customer Satisfaction	DMAIC			3σ		
	Improve Inspection Accuracy TBR	12			Quality Improvement	Datastream from Sort and Returns from Whse	6-Sigma			3σ	Beta miss dat	
	Improve Inspection Accuracy PSR	13			Quality Improvement	Data Stream is at 2nd Inspection - Beta miss not acc	6-Sigma		22	2.65 ~ 2.88	Beta miss dat	
	Reduce Scrap Abnormality 70's PSR	08	$21,247		Cost Avoidance	2nd highest abnormal condition - 120 avg monthly	DMAIC		700	3.33 ~ 3.52	0.024	Cure-
	Reduce Buff Abnormality 70's TBR	10	$27,805		Cost Avoidance	[illegible]	DMAIC		7020	[illegible]	[illegible]	Buff

Table 4. Master Project List



La Vergne Plant 6 sigma follow up Status

Project	6 sigma / D	Belt/			Define & M	Analyze	Improve	Control	When	When	
Reduction in -061 from #2 body ply cutter											
Improvement in balance dot application											
Reduce dump stock - Triplex											
Dump stock reduction - PSR Extrusion											
Reduce XOC Alpha											
BP insert placement on #1 body ply cutter											
Stuck Stock											
Green waste reduction - TBR stock cutting						31-Jul	30-Nov	30-Jan	5/31/2007	5/31/2007	Nee
Reduce SPA defective liners from Tire Assembly						31-Jul	30-Nov	15-Dec	12/15/2006		Col
Reducing whse overhangs						30-Jul	30-Sep	1-Jun	7/1/2007		
Reduce WSW grind scrap		Yellow Belt				15-Sep	31-Oct	15-Nov	11/30/2006		
Increase PL Job Effectiveness	DMAIC	David Nelms - Yellow Belt	Ron Jones	C-Collins	1-Aug	31-Aug	31-Oct	30-Dec	1/30/2007		Non
Increase SOT Tam utilization	6 Sigma	Jamie Brown David Grey	Bobby Duke	Brown	30-Oct	30-May	30-Jul	15-Aug	9/30/2007		200
Reduce Mechanical Scrap off 51" Presses	6 Sigma	Michelle Curry-Collins Marvin Wreh	Ron Jones	C-Collins	30-Oct	30-Jan	30-May	15-Jun	8/15/2007		Reduc
Reduce PSR green waste due to buckle tread	6-Sigma	Gary Farmer	Bobby Duke	Brown	15-Dec	30-Apr	30-Jun	30-Aug	10/30/2007		
IT process Project	6-Sigma	Claudia Yamamoto	Dan Perterman	Leonard	1-Mar	30-May	30-Jul	30-Sep	11/1/2007		
Improve Plant Water System	6-Sigma	Mark Haws	Ken French	Leonard	1-Mar	30-May	30-Jul	30-Sep	11/1/2007		
Reduce TBR Assembly Green Waste	6-Sigma	George McNeal	Bobby Duke	Brown	1-Mar	30-May	30-Jul	30-Sep	11/1/2007		
Improve Calendar Inventory											

Project Selection Criteria

Will the project Improve:
Our product to our External/Internal customers?

Improve Variation?

Improve Capacity/Bekido?

What is the dollar impact of the project?

Does the process have a rich data stream?

If no, How easy and quick can you achieve one?

Is there another project in process effecting the problem?

Role of the Project Champion:
Guide the selection and monitoring of projects
Ensure alignment with company priorities & goals
Ensure that the project is data driven
Remove obstacles
Ensure that Black / Green Belts are given sufficient time
Guide the selection of Black / Green Belt candidates
Require answers with data support
Take an aggressive role and drive accountability

Table 5. Master Project Tracking Matrix

6σ Black/Green/Yellow Belt Training Timeline

Activities	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Black Belt Champion Training	TBD	Corporate Level									
Champion Training	As Needed During Monthly Mgmt Review										
Black Belt	2	5	7	9	12	14	16	18	18	18	18
Green Belt	1	6	9	12	15	18	21	24	27	30	33
Yellow Belt	6	20	40	60	80	100	120	140	160	180	200
IQS 21 Training	New Hire Orientation ~ 12 Hour DMAIC										

Table 6. Six-Sigma Training Timeline