AC 2012-5515: WHAT DO ENGINEERING LEADERS WANT?

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Cath Polito has been in leadership positions for more than 30 years in the capacity of Manager, Director, Executive Director, and Owner. As Director of marketing for start-ups Globeset and iBooks, she managed geographically dispersed teams (nationally and internationally). She was the Founder/Owner of Management by Design, an Austin-based advertising, design, and marketing firm. Throughout her career, she has taught courses on leadership, ethics, teamwork, marketing, and streamlining processes while improving quality and cutting costs. In Oct. of 2010, while in Singapore, Polito was elected to the International Association of Continuing Engineering Education (IACEE) board and serves as the SIG liaison. She is currently the Executive Director of the Center for Lifelong Engineering Education at the Cockrell School of Engineering at the University of Texas at Austin. Polito has a B.S. from the University of North Texas and an M.S. in science and technology commercialization from the University of Texas, Austin.

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What do Engineering leaders want?

Engineering and scientific leaders have traditionally moved into supervisory positions based on their exceptional technical skills, but have received little or no management training. Generally speaking, engineers prefer to approach the administration of projects by defining fixed parameters and methodically working to a viable solution – it is black and white – take a problem, find a solution, move on. In reality, this practice does not translate well when dealing with the successful supervision of people, as the "grey" area can expand and contract arbitrarily.

The American Society for Training & Development (ASTD) creates an annual report on United States and now the Global 500 corporate training trends and dollars spent. Their data - from more than 400 organizations across all major industries – clearly shows that learning and development is vital to a company's growth and subsequent competitive advantage in the marketplace.

> "The findings of ASTD's 2011 *State of the Industry Report*[1] show that organizations are just as committed as ever to learning and development (L&D). ASTD estimates that U.S. organizations spent about $171.5 billion on employee learning and development in 2010. This figure is a reflection of the per-employee spend, which increased by 13.5 percent in 2010, multiplied by the U.S. workforce size, which also increased overall in 2010, but **is still significantly lower than pre-recession**. This amount includes direct learning expenditures such as the learning function's staff salaries, administrative learning costs, and non-salary delivery costs. The survey reflected that 60 percent ($103 billion) of total expenditures were spent on internal expenses and the remaining 40 percent ($68.5 billion) contributed to external expenses."

[1] Green, Michael & McGill, Erin (2011). *State of the Industry Report, 2011*. Alexandria, VA: American Society for Training & Development Research.

In 2006, the authors conducted a focus group with multiple corporate attendees from the following industry areas (with emphasis on their engineers):

a. Architecture
b. Computer hardware
c. Computer software
d. Energy
e. Government
f. High tech
g. Manufacturing
h. Research institutes

After researching the requirements for possible education or training as defined by engineering leaders across these various engineering disciplines, the authors developed a systematic protocol for defining the scope and content of an education and training program for mid-level managers. This process serves to correctly assess company needs, develop a customized suite of topics, and track the ROI (on both an individual and corporate-wide basis).

Accurately assessing company needs: Through the use of private interviews, authors met with persons at the executive, mid-management, and individual contributor levels. The authors executed a gap analysis with the company – both in skills and in generational communication. The challenges among the generations in the workforce were supported by research from the Pew Research Center. See ***Figure 1*** below.

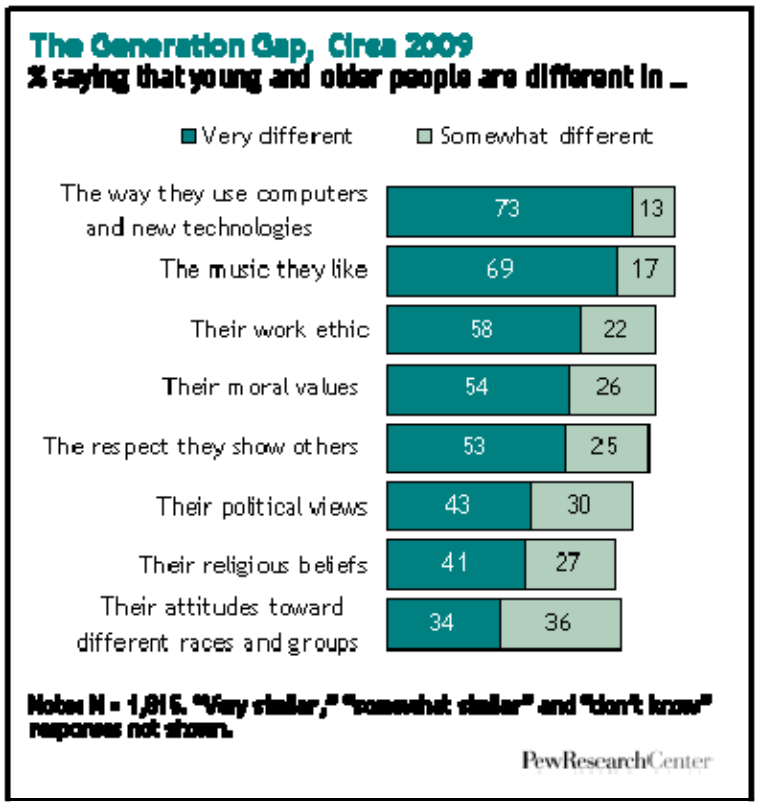

Figure 1: The Modern Generation Gap[2]

Most engineering firms in the original focus group expressed strong concerns about their "Baby Boomers" getting ready to retire, and leaving the company before their knowledge was captured and handed over to other employees. Their request: a "fast-track" method to transfer knowledge and move individual contributors quickly and successfully into management.

Customized suite of topics: Addressing the different styles of communication among the generations in the workforce was crucial to each of the companies. Most companies wanted to get their individual contributors to improve their ability to see the "big picture," and learn basic negotiation and risk management skills. In addition, they highlighted the need for these folks to

[2] Taylor, Paul & Morin, Rich. (2009, August 12). Forty Years After Woodstock, A Gentler Generation Gap. *The Pew Research Center*, from http://www.pewsocialtrends.org/2009/08/12/forty-years-after-woodstockbra-gentler-generation-gap/

be able to fully participate in strategic planning. For the case study (energy company) the following custom topics were taught in three sessions (two 8 hour days per session):

Session I:

Communication Skills

1. Know your Audience
2. Types of Communication
3. Directions of Communication
4. Virtual Teams
5. Multi-Cultural and Multi-Generational Teams
6. Managing Difficult Communications
7. Communication and Decision Making
8. Building a Communications Plan

Practical Negotiation Skills

1. Negotiation planning and preparation
2. During the negotiation
3. Concluding the negotiation

Session II:

Collaborative Relationships

1. Building collaborative relationships
2. Gaining trust
3. Team structure and collaboration
4. Social networking and collaboration

5. Collaboration with employees, peers, partner organizations and customers

Developing a Culture That Fosters Success

6. What is a culture that fosters success?
7. Building a shared sense of purpose
8. Aligning values and behaviors
9. Communicating to reinforce purpose
10. Meeting management to reinforce culture

Risk Management

11. Risk identification
12. Assessing and evaluating risks
13. Risk mitigation planning
14. Monitoring risks

Session III: *Strategic Planning*

1. A Strategy Framework
2. Forecasting
3. Mapping Your Environment
4. Situation Analysis
5. Strategy Formulation
6. Strategy Evaluation
7. Aligning Strategy and Structure

Managing Innovation

1. Why is innovation important to your organization?
2. Kinds of innovation: incremental, radical, product, process, market

3. Skills for innovation
4. Organizational structure for innovation
5. Evaluating the landscape (technological, competitive, regulatory)
6. Managing innovation processes, infrastructure and competencies

Case Study: *Lessons learned* (as captured in student evaluations):

What worked:

1. Exercises specifically tailored to the company's issues/needs.
2. Interacting with other employees in a different environment.
3. Dynamic and engaged instructor who was *very* responsive to students. She used a number of real world examples and developed a strong rapport with the students.
4. Interactive style of presenting material was much preferred (vs. lecture only).
5. Scheduling one month between sessions to allow students to use their newly acquired skills and come back to the instructor with questions.
6. The 4 hour follow-up meeting 2.5 months after the last session; this meeting solidified the key learnings and added a sense of importance and ceremony to the distribution of the certificates.
7. One of the biggest advantages was the interaction between the participants. They developed relationships, trust, and the ability to help one another.

What could be improved:

1. Students would have preferred 6 hour days (vs. 8 hour days).
2. Additional topics: Conflict Management, Group leadership/group dynamics/handling unfriendly groups, employee management.

Return on Investment (ROI): Return on the training investment has become more critical to managers today. With constrained budgets at every level, there is a conundrum for decision-makers as they determine whether it is more cost effective to dedicate money to projects or to the people who run those projects. In our case study, the energy company invested in their people. The following advantages were realized by the end of the training:

1. Increased communication among different departments,
2. High level trust and stabilized relationships among the participants,
3. Amplified professionalism,
4. Improved company negotiations,
5. Peer coaching,
6. Communities of practice, and
7. Stronger, positive management of direct reports.

For the final paper presentation, we will implement the ROI Training Worksheet (see *Appendix A*) and present our findings.

Conclusion: Creating opportunities for employees to learn and excel in their job feeds a very basic need. Not only does it offer immediate (and sometimes long-term) individual rewards, it has been proven that employees who are more "engaged" in their workplace are more productive. According to ASTD, "… investing in creating a 'learning culture' seems to have a strong, positive association with a more engaged workforce. For example, in 2007, consulting firm PeopleMetrics surveyed more than 5,000 U.S. employees and examined engagement levels within Fortune 500 firms that performed well financially and those that performed poorly. PeopleMetrics concluded that levels of engagement in high-performing companies were double those of low performers. Among the Fortune 500 firms, the most-profitable companies had twice

the proportion of engaged workers than the least-profitable firms had. ”[3] In our case study of the energy company, we got immediate positive feedback as to the relevance of the course work for both engineers and other professionals. The gap analysis (based on feedback from upper level management, mid-management and individual contributors) focused on defined deficiencies with the express intent of creating core competencies. The company has whole-heartedly embraced this education and learning as part of their corporate culture, and has agreed to participate in ongoing evaluation of their skills.

[3] Vickers, Mark; Tompson, Holly, PhD; Morrison, Carol; Bear, Donna; Paradise, Andrew, PhD; Czarnowsky, Mike; & Estep, Tora (2008). *Learning's Role in Employee Engagement.* Alexandria, VA: American Society for Training & Development Research.

TRAINING ROI WORKSHEET

This worksheet is designed to help you calculate the estimated cost of any "off the job" training program and place a future hypothetical “value” on your performance in the portion of your job that uses the knowledge/skills that may be improved by the training. Using your own task related compensation as the basis for determining a reasonable “value” for your performance improvements along with a commonly used formula for estimating "real" training costs, the spreadsheet will calculate a Return on Investment for the training. The calculation can help you determine if it is worth your while to take the training. Each section is explained as you come to it. **ENTER YOUR DATA IN THE ORANGE SHADED CELLS. ALL OTHER CELLS ARE PROTECTED.**

Step 1: TASK COMPENSATION

This section calculates the weighted value of the portion of your base total "cash value" compensation (pay plus benefits) that is devoted to tasks involving the use of the knowledge/skills set(s) dealt with in the training program you are considering. Enter your base annual gross salary in line 1. In line 2, enter a percentage of your salary that represents the value of the employee benefits provided by your employer. This is typically in the 30-40% range. Simply enter the digits. (Example: for 35%, enter 35) The value of your employee benefits and your total base compensation will appear in lines 3 and 4, respectively. In line 5, estimate the % of time you spend using the knowledge and skills taught in this course. For example, for 50%, enter 50, not .50. In line 6, enter a value to represent average level of importance these skills have to the achievement of your work unit's performance goals. "Normal" importance is rated as a 1. The range is 0.1-2.0. The lowest possible value is 0.1. Line 7 will then display your weighted hypothetical compensation value for using this knowledge/skill set.

Line 1	Your current base salary		
2	Employee benefits cost expressed as percentage (do NOT use a decimal to indicate percent)		
3	Cash value of your benefits - (line 1 X line 2)		$0
4	Your total base compensation (line 2 + line 3)		$0
5	% of work time you spend on tasks that use training related knowledge/skills	(the % will be filled in for you)	
6	Importance of tasks using this knowledge/skill set (1=normal or typical; 2=critical; 0.1=minimal)		
7	Weighted hypothetical training related task compensation (line 4 X line 5 X line 6)		**$0**

Step 2: EFFECTIVENESS

In this section, estimate your present and desired effectiveness at using the knowledge/skill set taught in the training. Think in terms of percentage effectiveness. For example, "I am 60% effective and need to be 90% effective," meaning that 60% of the time I get the desired result the first time, but I need to do that 90% of the time. Many people tend to overestimate their present effectiveness, so you might want to consider reducing your initial present effectiveness estimate by about 5%. Enter values in lines 8 and 9. As before, the percent sign will be entered for you. Your desired increase will be calculated for you in line 10 as a percentage improvement. In the example above, the desired increase would be 50%.

Line 8	Your current effectiveness at tasks related to knowledge/skills covered by this training expressed as a percentage **(optional ego factor:** subtract 5% from what were	

	going to say)	
9	What level of effectiveness do you need to reach?	
10	Desired increase in effectiveness (line 9 - line 8/line 8)	#DIV/0!

Step 3: FUTURE VALUE OF TASK COMPENSATION

Using the data you have provided, line 11 displays the hypothetical "value" that would be added to your task compensation if you indeed accomplished the gain in effectiveness you specified in Step 2 by applying what you learn in the training. Line 12 is simply your potential total task compensation "value" adjusted for that gain.

Line 11	Value added to post-training task-related compensation (line 7 X line 10)	#DIV/0!
12	Value of post-training task-related compensation (line 7 + line 11)	#DIV/0!

Step 4: COST OF TRAINING

The calculation for the cost of training is based on research models developed over the years by a variety of researchers, which have shown that the total costs of training, including your salary, benefits, trainer costs, materials, space, tuition, travel, etc., and your lost production costs can be reasonably expressed as a per diem percentage of your base salary. (Your salary has already been copied for you in line 13.) The per diem range for most people is from about 1.5 to 4.5%. 2.2% seems to be a "norm" for many people, but you may enter whatever percentage seems right for you in line 14. Generally speaking, the more dependent other people are on your work output to do their work effectively, the higher this number should be. Again, enter (as an example) 2.2% as 2.2, not .022. The percent sign will be inserted for you. In line 16, enter the number days of training you will be taking that will keep you away from your normal work routine. If there is a fraction, say a half day, use a decimal, ex.: 1.5 Your estimated cost for this program will appear in line 17.

Line 13	Base salary (same as line 1)	$0
14	Per diem cost of training as a % of base salary (Range: 1.5%-4.5%)	
15	Per diem cost of training (line 12 X line 13)	$0
16	Days of training (use decimal for fraction of day)	
17	Cost of training you in this program (line 14 X line 15)	**$0**

Step 5: POTENTIAL ROI OF TRAINING

The final section calculates the net potential Return on Investment (ROI) of this training for you (line 18) by subtracting the cost of the training (line 17) from the "value" added to your task compensation (line 11). Line 19 displays that number as a % ROI. If this number is no larger than 100% (break even), you might want to consider not taking the training, at least until one or more of the parameters you entered changes to make the training more worth the investment. ROI numbers in excess of 2000% are very reasonable if you spend a lot of time using the skills taught in the training and/or if you have a large potential gain in effectiveness.

Line 18	Net potential ROI of this training (line 11 - line 17)	#DIV/0!
19	Net potential ROI of this training as a percent (line 11 - line 17/line 17)	#DIV/0!