

Quality Approaches in Education

Working together to create life-long learning and individual and organizational success

Vol. 8, No. 1 • March 2017

Editor
Elizabeth A. Cudney
qahe@asq.edu.org

Copy Editor
Janet Jacobsen
janetjake@msn.com

Production Administrator
Cathy Milquet
cmilquet@asq.org

Layout/Design
Julie Stroik
Sandra Wyss

Founding Editor
Deborah Hoppen

©2017 by ASQ

IN THIS ISSUE:

- | | |
|---|----|
| Note From the Editor
<i>Elizabeth A. Cudney</i> | 2 |
| Hoshin Kanri X-Matrix: Organizational Management Tool
Successfully Implemented in an Engineering
Leadership Development Program
<i>Bruce D. DeRuntz, Rhonda K. Kowalchuk,
Joseph D. Narusis, and John W. Nicklow</i> | 4 |
| Improving Quality in Academic Units:
The Important Role of Senior Surveys
<i>Thomas W. Gainey</i> | 12 |
| Hospitality Programs of Distinction That Meet
the Demand of a Growing Industry
<i>Iris W. Gersh</i> | 21 |
| Addressing the Consumer to Supplier Disconnect in MBA Curriculum
<i>Cassandra C. Elrod, Sarah M. Stanley,
Elizabeth A. Cudney, and Cui Zou</i> | 30 |

The Journal That Connects Quality and Education

Quality Approaches in Education (ISSN 2471-1462) is a peer-reviewed publication that is published by ASQ's Education Division, the Global Voice of Quality, and networks on quality in education. The purpose of the journal is to engage the education community in a discussion of significant topics related to improving quality and identifying best practices in education and workforce development; and expanding the literature specific to quality in education topics.

Quality Approaches in Education grants permission to requestors desiring to cite content and/or make copies of articles provided that the journal is cited; for example, Source: *Quality Approaches in Education*, Year, Vol. 8, (No. 1), <http://asq.org/edu/quality-information/journals/>

Questions about this publication should be directed to ASQ's Education Division, Dr. Elizabeth A. Cudney, qahe@asq.edu.org. Publication of any article should not be deemed as an endorsement by ASQ or the ASQ Education Division.

Quality Approaches in Education



Associate Editors

Theodore T. Allen, Ph.D.,
The Ohio State University

Jiju Antony, Ph.D.,
Heriot Watt University

Ardith Beitel,
The Boeing Company

Morgan C. Benton, Ph.D.,
James Madison University

Marianne Di Pierro, Ph.D.,
Western Michigan University

Jamison V. Kovach, Ph.D.,
University of Houston

J. Jay Marino, Ed.D.,
Antioch School District

David C. Markward, Ed.D.,
Iowa Instructional Rounds
Network

Henk Mulders, Expertis,
The Netherlands

Nicole M. Radziwill, Ph.D.,
James Madison University

William J. Schell, Ph.D.,
Montana State University

Note From the Editor

Elizabeth A. Cudney

A key task for educators is preparing students to meet ever-changing industry needs and technological advances while empowering them to become independent learners.

This issue highlights the intersection of industry and academia through innovative approaches and best practices to prepare students to meet the competencies and expectations for various industries and careers.

This issue is comprised of four articles that illustrate the breadth of quality applications to prepare students for the workforce. The first article, by Bruce DeRuntz, Rhonda Kowalchuk, Joseph Narusis, and John Nicklow, addresses the application of the Hoshin Kanri X-matrix to the management of a large-scale leadership development program to improve the efficacy and motivation of program participants. By engaging students in this approach, they are able to understand their responsibility within an organization and improve leadership, organizational management, and communication skills. The next article by Thomas Gainey analyzes the role of senior surveys in driving decisions for continuous improvement and advancing the quality of an academic unit. In particular, assessment and accreditation, student progression, student career success, and faculty motivation are addressed. The third article by Iris Gersh provides a methodology for curriculum assessment in hospital-ity management programs by benchmarking highly rated programs and conducting surveys and interviews of industry and academic professionals. The research highlights the need for academics and industry professionals to work together to determine the skill set and experiential activities necessary for students to achieve success in industry. The final article by Cassandra Elrod, Sarah Stanley, Elizabeth Cudney, and Cui Zou discusses a similar disconnect between industry and academia. Through an extensive survey of industry practitioners in all aspects of supply chain management, the research assesses the differences in perceptions and expectations of professionals, which provides a means for improving an MBA curriculum.

These articles illustrate how quality approaches can be used in all facets of education to enhance curriculum and better prepare students for the critical skills needed in industry upon graduation while also improving student learning and engagement.



Elizabeth A. Cudney

Elizabeth Cudney, Ph.D. is an associate professor in the Engineering Management and Systems Engineering Department at Missouri University of Science and Technology. In 2014, Cudney was elected an ASEM Fellow. In 2013, Cudney was elected as an ASQ Fellow. She was inducted into the ASQ International Academy for Quality in 2010. She received the 2008 ASQ A.V. Feigenbaum Medal and the 2006 SME Outstanding Young Manufacturing Engineering Award. Cudney has published six books and more than 60 journal papers. She holds eight ASQ certifications, which include ASQ Certified Quality Engineer, Manager of Quality/Operational Excellence, and Certified Six Sigma Black Belt, amongst others. Contact her at cudney@mst.edu.



Improving the
efficacy and
motivation of
leadership
program
participants
through strategic
planning

Hoshin Kanri X-Matrix: Organizational Management Tool Successfully Implemented in an Engineering Leadership Development Program

Bruce D. DeRuntz, Rhonda K. Kowalchuk, Joseph D. Narusis, and John W. Nicklow

Abstract

The Hoshin Kanri X-matrix has been used in quality management systems in engineering to improve the efficiency of manufacturing and business processes. The X-matrix was adapted from this field and used to effectively manage a large-scale leadership development program. In this unique application, the X-matrix was applied to improve the efficacy as well as the motivation of leadership development program participants. The implications of integrating the X-matrix into a technical leadership development program are many as it becomes a motivational tool that helps participants relate their efforts to become a leader and its impact on their chosen student organization. It also expands participants' understanding of their responsibilities to the larger organization as well as leadership communication abilities. Finally, it develops their skills in using a valuable organizational management tool that can be applied throughout their professional careers.

Keywords

Leadership, Project Management, Strategic Management, Quality Tools, Change Management

Strategic Planning and Motivation

The use of Hoshin Kanri, a Japanese style of strategic planning or policy deployment, has increased in recent years (Docherty, 2013). The term “Hoshin Kanri” was first coined by a Japanese organization, Bridgestone Tire Company, in 1965. Hoshin literally translates to shining metal and Kanri literally translates to management. These words help to describe their system as a “vision compass” used to keep everyone working on the same objectives in the same direction (Docherty, 2013). Hoshin Kanri is a method of strategic management that focuses on a few key goals for success. The process also aligns organizational activities to these goals and utilizes two-way input from all employees when creating an organizational plan. Finally, key metrics are used to measure progress toward set objectives. The Hoshin Kanri process allows organizations to focus on continuous improvement that provides the ability to adapt to change.

Hoshin Kanri is just one of many strategic planning methods. The works of Juran (1964), Ansoff (1969), Mintzberg (1994), and Porter (1996), respectively discuss other similar methods relating to incremental process change, design/planning approach, non-formalized strategic planning, and linking strategy with operations to create sustainable competitive advantages. Conversely, more traditional planning structures such as strategic-assumption analysis and dialectic inquiry, issue-based planning, and formal strategic planning can be seen by some as naive, unnecessarily bureaucratic, short-term, and inflexible (Lee & Dale, 1998).

More current strategic planning programs, such as Process Excellence, Lean Six Sigma, and Business Excellence, tend to train and use exemplary employees to implement new programs to improve efficiency. In this process, top management makes decisions that are then, in turn, passed down through the organization. As a result, the middle managers

of these projects tend to feel uninvolved and less committed to these new programs due to their lack of input in the process. In order to have successful strategic planning, leaders need to be properly motivated, something that tends to be lacking in the aforementioned traditional models. Specifically, leaders have to believe that programs will reward and benefit them personally, will be more efficient than alternate approaches, and the cost of not implementing the new program will outweigh the cost of not performing normal business activities (Docherty, 2013).

Hoshin Kanri addresses leadership and employee motivation by combining the Deming “Plan, Do, Check, Act” (PDCA) cycle with a management-by-objectives strategy (Docherty, 2013). Most importantly, Hoshin Kanri also uses a two-way input system. In this system, all company objectives and their implications are discussed at every level in the organization. This allows ideas from the top to flow down through the organization, and ideas from the bottom to flow up to the top of the organization. This input system helps to improve commitment of all employees to the program and organization. This process is known as “catchball” and helps to ensure that organizational plans and goals are both realistic and feasible at all levels (Docherty, 2013).

Hoshin Kanri Process

Hoshin Kanri has also been defined as “a system of management in which the annual policy set by a company is passed down through the organization and implemented across all departments and functions” (Kondo, 1997, p. 242) and as a “target-means deployment” (Watson, 1991). Yet these definitions fail to address the feedback and PDCA cycle that is crucial to successful Hoshin Kanri implementation. A more complete definition of the Hoshin Kanri process can be found in the work of Eureka and Ryan (1990):

“Deploy and share the direction, goals, and approaches of corporate management from top management to employees, and for each unit of the organization to conduct work according to the plan. Then, evaluate, investigate and feedback the results, or go through the cycle of PDCA continuously and attempt to continuously improve the performance of the organization.” (p. 154)

Unlike other strategies, Hoshin Kanri has received less attention from researchers despite its use by many well-known organizations during the 1990s, such as Hewlett-Packard (Whiting, 1990); NEC Japan (Smith, 1994); Procter and Gamble (Zairi, 1994); Xerox (Leo, 1996); as well as Toyota, Bank of America, and Danaher (Docherty, 2013). Throughout the past ten years, more organizations are beginning to implement the Hoshin Kanri approach due its profitability in other companies

and the need to cut costs in difficult financial times. Since 2010, more than 50 new organizations, including Pfizer and Bayer, began to adopt this style of strategic planning (Docherty, 2013).

Based on the observations of Japanese companies (Dale, 1990), Hoshin Kanri starts with a presidents’ meeting to determine a management policy plan. In this meeting, the presidents create a new plan to improve the organization based on the assessment of the previous year. This first stage is known as the Plan step in the PDCA cycle. The Check phase is also implemented at this stage when comparing the company’s actual status to previous projections. This plan is then debated at each level of the organization until a consensus is reached, also known as catchball. The new plan is carefully implemented during the next six to eight weeks. This is known as the Do stage of the cycle. During this time, all actions are carefully recorded (Check phase) and corrected if necessary (Act phase). But most importantly, these results are publically placed through the workplace in order to show employees the fruits of their efforts and the organization’s progress. Evaluating new policies and implementing future policies as part of the PDCA cycle continuously occurs depending on the needs of an organization and various employees.

This process has also been described by Akao (1991). Dr. Yoji Akao developed the X-matrix based on the Hoshin Kanri strategic planning process. First, the organizational mission and vision determined by upper management is known as the “what” of the X-matrix. The “how” is then negotiated between upper and middle management. Middle management then negotiates with implementation teams on how progress toward the “what” will be measured. Next, implementation teams receive the power to schedule and manage day-to-day activities. Finally, upper management reviews the progress made by the implementation teams.

Policy deployment helps provide a transition between the Plan and Do stages of the PCDA cycle. When studying this cycle at Harris Semiconductor (USA), Robinson (1994) stated the process “embraces the concept of empowerment as a balance between alignment of activities to the goals and the freedom people have to take action. The ultimate purpose of this process is to empower people to make meaningful improvements.” (p. 9)

The X-matrix is a main tool in Hoshin Kanri policy deployment. The X-matrix presents an immense amount of information in a concise and easily understandable way once employees are shown how to use it. This tool makes it clear to employees what they need to accomplish and how it relates to the organization’s overall vision and goals as well as their personal goals. The X-matrix also shows how the performance measures will be tracked and who is responsible for implementing programs and activities.

Leadership Development Program

The Leadership Development Program (LDP) was created in 2006 in the College of Engineering at Southern Illinois University (SIU) Carbondale with the support from Advanced Technology Services (ATS) and later, the National Science Foundation. The need for engineering and technology graduates with strong leadership skills is becoming more recognized and supported by industry (Gordon, 2012). Members of the LDP are primarily community college transfer students seeking a bachelor's of science degree in an engineering or technology discipline. The LDP is a rigorous two-year training program that teaches students character, interpersonal skills, team-building, and leadership skills. LDP participants have expressed an interest in developing technical leadership skills and were selected for the scholarship and training program through a competitive process that examined their leadership achievements. Twenty-five students have participated in the LDP since fall 2010. In 2013, the group had 12 members. The students represent a cross-section of two technology and five engineering majors in the College of Engineering.

The Hoshin Kanri X-matrix was adapted from quality management systems used in engineering to effectively manage a large-scale leadership program, teach students how to use this important tool, quantitatively demonstrate the efficacy and impact of a leadership development program, and improve graduation rates among participants. The X-matrix has already been shown to improve retention rates among engineering students (Veenstra, 2008). Unlike previous mostly system-based applications, the X-matrix was also used as a motivational tool. The X-matrix offers a visual plan for how participants' seemingly unrelated hard work all translates into achieving their shared vision. Use of a vision to motivate the actions of others was already a strong theme of the LDP through Kouzes and Posner's Leadership Challenge model (Kouzes & Posner, 2006).

Motivating Students

This article describes the fundamental process of using and constructing an X-matrix, and then explains how it is applied to achieve success in the LDP. Use of the X-matrix has several beneficial outcomes for LDP participants as it becomes a motivational tool that helps them relate their efforts to become a leader and its impact on their chosen student organization. Secondly, it advances their understanding regarding their responsibility to the larger organization, and it develops leadership communication abilities. Finally, the matrix helps cultivate participants' skills in using a valuable organizational management tool that can be applied throughout their professional careers. The

X-matrix achieves the first two outcomes by motivating students and relating relevant experience from participating in student organizations to the larger vision of the LDP.

When developing the LDP, the director recognized that it was difficult to motivate students to participate in the time-intensive program without a shared vision or goal. Many traditional college students are just learning how to manage their time and new lives. The X-matrix shows and measures how each activity in the program helps them reach the shared vision and improve their leadership skills as part of the LDP. This tool acts as a powerful motivator for participants. The X-matrix also provides needed guidance and feedback for students as they begin to better understand leadership and compare its actual practice to their preconceived notions. Beyond providing motivation and vision for each activity in the LDP, the X-matrix also teaches participants how to properly lead and manage an organization or project. Engineering and leadership education tends to be greatly improved when students apply their technical skills and knowledge to complicated real-life scenarios, such as participation in internships and student organizations (Cress, Astin, Zimmerman-Oster, & Burkhardt, 2001; Dugan & Komives, 2007; Lozano-Nieto, 1998).

Applying the X-Matrix to Leadership Development

This section of the article addresses the final two outcomes associated with using the engineering management tool. Many organizations create a vision and mission statement every one to five years to remind its members of the organization's purpose, direction, and values. In pursuit of the vision and mission, organizational leaders create strategic objectives in response to current economic and technological environments. Leaders then pass these objectives down through the organization as each division does its part to help reach the strategic goals. The use of this tool in the LDP helps leaders communicate and relate their vision to all activities. It also gives LDP participants the practice needed to successfully apply the X-matrix to organizations in their future careers.

Many organizations struggle to connect strategic goals to tactical execution in pursuit of the strategic plan and vision. The Hoshin Kanri X-matrix offers groups a methodical, visual, logical, and quantitative system to organize and assess immense strategic initiatives. Large organizations can also use it to plan projects that align with their vision and mission statements. It can be difficult for large groups to keep sight of its vision as it organizes the variety of actions needed to successfully orchestrate a large group, such as the LDP. The X-matrix breaks down the vision into incrementally smaller tasks and then assigns these

items to specific people or resources, similar to how project plans use a work breakdown structure. Microsoft Excel is typically used to record and compute all relevant data and activities in pursuit of attaining the organization's vision.

It is important to use SMART goals when instituting key strategic objectives. SMART is an acronym that stands for goals that are **S**pecific, **M**easurable, **A**ssignable, **R**ealistic, and **T**ime-specific. If the SMART format is not used, it becomes extremely difficult, if not impossible, to complete the following steps of the X-matrix. For example, if goals are not measurable or assignable, steps four and five of the matrix could not be completed.

Constructing the X-matrix: (see Figure 1)

1. Use the SMART goal strategy to determine key strategic objectives. (Doran, 1981)
2. Create main initiatives to accomplish the key strategic objectives.
3. Develop tactical actions to execute the main initiatives.
4. Identify or create the key metrics used to assess tactical actions.
5. Identify the resource who will have responsibility for the tactical actions.

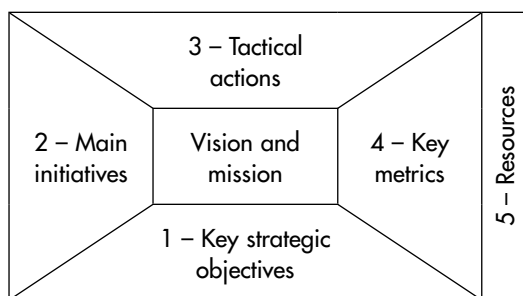


Figure 1: X-Matrix Format

The X-matrix is a powerful tool due to its ability to concisely organize all of an organization's activities into a simple visual display. Individuals can start in any section and follow how activities are related at all hierarchies of the organization. All members of the organization can see how each activity specifically relates to the organization's vision and mission. This makes it easier for leaders to communicate this vision and motivate members to work in the same direction.

Applying the X-Matrix to the Leadership Development Program

Finally, the authors discuss how the X-matrix was implemented in the LDP in order to improve engineering leadership and exhibit

the efficacy of the program. In the following sections, each step of constructing the X-matrix as part of the LDP is explained. Due to the size of the LDP X-matrix graph, not all of the main initiatives, tactical actions, key metrics and resources are shown in Figure 2. A complete copy of the X-matrix can be found in the Appendix of DeRuntz, Kowalchuk, and Nicklow (2014).

The first step in creating the LDP's X-matrix was to alter and/or reinforce the vision and mission of the LDP for current students participating in the program. In this step, participants decide and discuss why they are involved in the LDP and where they want to go together as members of the group. This allows all participants to get on the same page and create buy-in among the members. Participants are much more likely to have a commitment to the program if there is buy-in and they have a say in its direction. The LDP's vision and mission statements have been developed throughout the past seven years.

Vision statement: To become the premier university program that develops the United States of America's future technical leaders.

Mission statement: Through teamwork, we push harder, faster, and further than anyone thought possible, achieving world-class results.

Key Strategic Objectives

Key strategic objectives are then created to reflect the LDP's proficiency in achieving its vision and mission. If needed, students have the ability to adjust key objectives, but currently the participants feel the established objectives, as illustrated in Table 1, are still timely and relevant.

Main Initiatives

Main initiatives are also known as programs or top-level improvement priorities. Multiple main initiatives are used to achieve larger key strategic objectives. In relation to the LDP, main initiatives are the programs needed to meet the key objectives in Table 1.

Due to space limitations, this article focuses on the key strategic objective of leadership and follows it through the entire X-matrix process. The main initiatives for leadership are as follows:

- Leading Registered Student Organizations (RSO)
- Indirect leadership training
- Leading projects
- Leadership training
- Team training

	•		ASME concrete canoe								•
	•		SAE Baja car								•
			• Orientation to tutoring and the peer mentoring program						•		
			• Mid- and end-of-semester evaluations					•			
Leadership training	Leading Registered Student Organizations	Implement an assessment program	Tactical actions (Projects) LDP Vision To become the premier university program that develops the United States of America’s future technical leaders. LDP Mission Through teamwork, we push harder, faster and further than anyone thought possible; achieving world-class results. Key metrics Key strategic objectives				Academic evaluation	Tutoring and mentoring form	Baja evaluation form	ASME evaluation form	
		•	1. Graduation rate: Achieve 100% graduation rate for all LDP transfer students within 2.5 years.				•	•			
•	•		2. Leadership: Achieve a minimum individual score of 27 out of 30 on Student Leadership Practices Inventory.							•	•
			3. Social responsibility: Conduct a minimum of four service team projects per academic year.								
			4. Impact: Have a measurable positive impact on our stakeholders								
			5. Recruitment: Increase the number of applicants from 30 to 40.								
			6. Health: Have 90% of the team within the normal BMI range or its equivalent.								

Figure 2: Portion of the LDP's X-Matrix

Table 1: Key Strategic Objectives With SMART Description

Key Objective	SMART Description
Graduation rate	Achieve 100% graduation rate of all LDP transfer students within 2.5 years.
Leadership	Achieve a minimum individual score of 27 out of 30 on Student Leadership Practices Inventory.
Social responsibility	Conduct a minimum of four service team projects per academic year.
Impact	Have a measurable positive impact on our stakeholders, SIUC, Carbondale community, ATS, and the student body.
Recruitment	Increase the number of applicants from 30 to 40.
Health	Have 90% of the team within the normal BMI range or its equivalent.

Tactical Actions

The next step in the process creates separate tactical actions to achieve each main initiative. Main initiatives are comparable to programs, where tactical actions are comparable to projects within those programs. Specific projects for each program are reported in this section of the LDP X-matrix. The following is a partial list of the tactical actions that are linked to the main initiative of leading RSOs.

- Society of Automotive Engineers (SAE) Baja car
- American Society of Mechanical Engineers (ASME) concrete canoe
- ASME steel bridge
- Association of Technology, Management and Applied Engineering (ATMAE) robot
- Leadership Development Program
- Engineering Student Council

Key Metrics

The fourth step in creating the X-matrix requires the use of key metrics to quantitatively evaluate each of the tactical actions (e.g., projects). In the current LDP X-matrix, the key metrics assess each project’s success. Specifically, each participating team member in the project rates the project leader’s performance using an evaluation questionnaire. The assessment questionnaires use a standard set of questions. But, if required, the questionnaires can be adapted to better assess certain projects. In the 2010-11 academic year, a six-point scale with the following labels was used: (5) Perfect, (4) Almost perfect, (3) Some improvements needed, (2) Many improvements needed, (1) Failed but completed, and (0) Failed and did not complete. The response scale was then changed to include 11 points to increase response variability and acquire more accurate information from participants. The following standard rating scale was used for most assessments after the first year to maintain consistent metrics.

- Questionnaire rating scale:
- 10. Perfect
 - 9. Almost perfect
 - 8. Few improvements needed
 - 7. Some improvements needed
 - 6. Above average
 - 5. Average
 - 4. Below average
 - 3. Many improvements needed
 - 2. Very many improvements needed
 - 1. Failed but completed
 - 0. Failed and did not complete

The academic evaluation used a different, more construct-specific, six-point scale for the first two years of the project (2010-11 and 2011-12): (5) No worries—Class is going good with no major problems, (4) Could be doing better—Class is going ok but your understanding is not where you would like it to be, (3) Concerned—Class understanding and grades are low, (2) In trouble—Falling far behind in course work and need serious help, (1) Panicked—Class is going poorly and failure is a possibility, and (0) Failure—Failing or having to withdraw from a class due to performance.

Project team membership varied (e.g., raters) between 15-50 members; both in terms of group affiliation and attendance at the time data was collected. Data was originally gathered by showing the group each evaluation question and asking them for their individual rating. A median score for

each question was then derived from their personal responses. Recognizing the potential for peer-induced bias by publicly revealing the ratings; evaluation questionnaire sheets (see Table 2) are now distributed anonymously to collect individual team member scores. All team member scores are then averaged to create a composite score for each area of the evaluation, such as leadership or preparation. The scores from each section are then averaged to create a total composite for the project. This composite is then the number recorded in the key metrics section of the X-matrix. When taking input from a large number of students to evaluate projects and leaders, it helps to create a less subjective and more complete assessment.

Table 2 shows how the key metric associated with the ASCE steel bridge competition from the 2013-14 school year was recorded. Value was assessed to have a perfect score of 10 since the team was able to learn valuable skills that will benefit them now and in the future. Quality had the lowest rating in this evaluation with a score of eight (e.g., Few improvements needed), indicating that the team felt the quality of the work was close to what they expected, yet they still could have done better.

Table 2: Example of the Evaluation Questionnaire for ASCE Steel Bridge Competition

Area	Definition	Assessment Rating
Timely	Were all meetings attended (on time) by members or proxy?	9
Engagement	Did the members engage others?	9
Value	Were the lessons worthwhile?	10
Preparation	Were the members prepared for the meetings?	9
Leadership	How well was the Engineering Student Council (ESC) influenced by our members?	10
Quality	Did we exceed the quality of work expected?	8
Mean		9.17

Efficacy of the Leadership Development Program

In order to measure the overall efficacy of the LDP, the means from each key metric were first aligned with their corresponding key objectives to create cumulative means. Then the cumulative means for each key objective were averaged to create an overall

mean for each year. The overall mean represents the LDP's progress in achieving its mission and vision. The decision to change from a six-point scale to an 11-point scale was done to increase response variability to provide a more valid and accurate assessment of the efficacy of the LDP throughout the years.

The progressive improvement of the overall means across the years of implementation indicates a general increase in the efficacy of the program. Prior to implementing the X-matrix, the assessment of the program's students was highly subjective. Use of cumulative evaluation of a project team leader by the team members greatly improved the assessment of the program. This type of evaluation is more objective and provides more accurate results. The program director also instructed all raters to be critical and objective when assessing leaders in order to prevent biased and/or inflated assessment ratings.

The key metrics (e.g., rating scale and evaluation items) can be easily modified and adapted to quantitatively evaluate any tactical actions (e.g., projects) when using the X-matrix to evaluate the efficacy of a program. We chose to examine an overall mean rating across key objectives throughout the years of implementation to judge the effectiveness of the LDP. However, examining mean ratings for each key objective throughout the years may be an alternate way of evaluating efficacy.

Conclusion

The Hoshin Kanri X-matrix for strategic planning is an incredibly powerful tool for organizing, communicating, and executing the mission, vision, goals, and strategic actions of a large organizational initiative. There are many benefits of integrating the X-matrix into a technical leadership development program as it becomes a motivational tool that helps participants relate their efforts to become a leader and its impact on their chosen student organization. It also develops participants' understanding of their responsibility to the larger organization and expands leadership communication abilities. Finally, the X-matrix helps develop skills in using a valuable organizational management tool that can be applied throughout a professional career.

In the future, LDP students can apply the successful practices of the X-matrix to other student organizations, ranging from student project teams to the undergraduate student government. Not only do students benefit from learning such a valuable organizational tool, but they also genuinely appreciate the enhanced communication and planning it brings to their organizations. Additionally, the authors plan to implement the X-matrix in the creation of a university-wide leadership development center. By using the X-matrix, the students, their organizations, and the leadership center will be able to effectively evaluate and achieve their stated goals.

Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant No. DUE 0966274 and Advanced Technology Services. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

References:

- Akao, Y. (1991). *Hoshin Kanri: Policy deployment for successful TQM*. Cambridge, MA: Productivity Press.
- Ansoff, I. (1969). *Corporate strategy*. Baltimore, MD: Penguin Books.
- Cress, C. M., Astin, H. S., Zimmerman-Oster, K., & Burkhardt, J. C. (2001). Developmental outcomes of college students' involvement in leadership activities. *Journal of College Student Development*, 42(1), 15-27.
- Dale, B. G. (1990). Policy deployment. *The TQM Magazine*, 2(6), 321-324.
- DeRuntz, B. D., Kowalchuk, R. K., & Nicklow, J. W. (2014, June). *Hoshin Kanri X-Matrix drives engineering leadership program success*. Proceedings of the 2014 American Society for Engineering Education (ASEE) Conference, Indianapolis, IN.
- Docherty, P. (2013). How do we create leadership pull for operational excellence? In T. Friedli, P. Basu, D. Bellm, & J. Werani (Eds.), *Leading Pharmaceutical Operational Excellence*, (pp. 385-397). Heidelberg, Germany: Springer.
- Doran, G. T. (1981). There's a SMART way to write management's goals and objectives. *Management Review*, 70(11), 35-36.
- Dugan, J. P., & Komives, S. R. (2007). *Developing leadership capacity in college students*. College Park, MD: National Clearinghouse for Leadership Programs.
- Eureka, W. E., & Ryan, N. E. (1990). *The process-driven business: Managerial perspectives on policy management*. Dearborn, MI: ASI Press.
- Gordon, B. (2012). *Toward a new engineering education consensus: Ideas from industry and academia for inculcating and fostering leadership skills*. Franklin, MA: Appia Press.
- Juran, J. M. (1964). *Managerial breakthrough: A new concept of the manager's job*. New York, NY: McGraw-Hill.
- Kondo, Y. (1997). Hoshin Kanri-Japanese way of strategic quality management. *Proceedings of the Annual European Organization for Quality Conference, Norway*, 41, 241-250.
- Kouzes, J. M., & Posner, B. Z. (2006). *Student leadership practices inventory: Facilitators' guide* (2nd ed). San Francisco, CA: Wiley.
- Lee, R. G., & Dale, B. G. (1998). Policy deployment: An examination of the theory. *International Journal of Quality & Reliability Management*, 15(5), 520-540.

Leo, R. J. (1996). Xerox 2000: From survival to opportunity. *Quality Progress*, 29(3), 65-71.

Lozano-Nieto, A. (1998). *Internship experiences in biomedical engineering technology: An overview of students and prospective employers perceptions*. Paper presented at the American Society of Engineering Education Conference, USA.

Mintzberg, H. (1994). Rethinking strategic planning part I: Pitfalls and fallacies. *Long Range Planning*, 27(3), 12-21.

Porter, M. (1996). What is strategy? *Harvard Business Review*, 74(6), 61-78.

Robinson, R. (1994). Goal deployment: Getting everyone aiming at the same target, *Tapping the Network Journal*, 5(3), 8-11.

Smith, S. (1994). *The quality revolution*. Didcot, UK: Management Books 2000 Ltd.

Veenstra, C. P. (2008, October). *Using critical thinking to improve engineering student retention*. Poster session presented at the meeting of the Third Annual Research and Scholarship in Engineering Education Poster Session, Ann Arbor, MI.

Watson, G. (1991). Understanding Hoshin Kanri. In Y. Akao (Ed.) *Hoshin Kanri: Policy deployment for successful TQM*. Cambridge, MA: Productivity Press.

Whiting, R. (1990). Commitment to quality: Hewlett-Packard educates from within. *Electronic Business*, 16(19), 113-114.

Zairi, M. (1994). *Measuring Performance for Business Results*. London, UK: Chapman & Hall.



Bruce D. DeRuntz

Bruce D. DeRuntz, Ph.D. is a professor in the College of Engineering at Southern Illinois University (SIU) Carbondale where he teaches classes on project management, leadership, and advanced leadership in the MBA program. He consults with universities and companies on their leadership development of human resources for Six Sigma and project management teams. He is the director of SIU's Leadership Development Program and the former editor of the ASQ's Quality Management Forum. He is an ASQ Fellow and is an ASQ certified Six Sigma Black Belt, Quality Engineer, and Manager of Quality and Organizational Excellence. Contact DeRuntz via email at bruce@siu.edu.



Rhonda K. Kowalchuk

Rhonda K. Kowalchuk, Ph.D. is an associate professor of quantitative methods at Southern Illinois University (SIU) Carbondale. Before joining SIU in 2004 she worked at the University of Wisconsin Milwaukee. Her research interest focuses on the performance of statistical procedures when applied to data that do not satisfy the assumptions underlying these procedures. Kowalchuk teaches classes in applied statistics, experimental design, survey methods, and program evaluation. Other research-related activities involve working as a statistical consultant. Her email address is rkowal@siu.edu.



Joseph D. Narusis

Joseph D. Narusis, M.A. is a doctoral candidate in the Applied Psychology Program and instructor for Organizational Psychology at Southern Illinois University (SIU) Carbondale. He joined SIU in 2013, and has since worked as a teaching assistant for various psychology courses and as a research assistant for both the Leadership Development Program and university housing. His research interests focus on the impact of culture and virtual tools on leadership styles and groups. His email address is narusis@siu.edu.



John W. Nicklow

John W. Nicklow, Ph.D. serves as the president of the University of New Orleans (UNO). He previously served as provost and vice president for academic affairs at UNO and as provost and vice chancellor for academic affairs at Southern Illinois University Carbondale. His research interests are focused on STEM education and on environmental and water resources systems optimization. He is a registered professional engineer, a certified professional hydrologist, a Fellow of the American Society of Civil Engineers, and a Diplomate of the American Academy of Water Resources Engineers. Contact Nicklow at jnicklow@uno.edu.