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Professor Shoji Shiba is an internationally renowned student and teacher of management and business improvement. He has worked with organizations around the world facilitating their development of skill with methods of business improvement and breakthrough. Among his academic positions, Professor Shiba is a Professor Emeritus of Tsukuba University, was for 10 years a visiting professor at the MIT Sloan School of Business (and remains occasionally involved with Sloan School), and was founding Dean of the School of Applied International Studies of Tokiwa University. Among many other honors, Professor Shiba was awarded the individual Deming Prize. He has written and published extensively, and the original Japanese edition of his *Breakthrough Management* book was awarded the prestigious Nikkei QC Literature Prize.

Mr. David Walden's career has had four distinct phases. His first decade was spent doing high tech computer systems development, including participating in development of the ARPANET which evolved into being the Internet. In his second and third decades, Mr. Walden was a manager of high tech projects and groups and then a general manager of high tech business units. During those first three decades, Mr. Walden frequently published papers on technology. In his fourth decade and beyond Mr. Walden has taught and written about management and business improvement.

Since they first met in 1989, Professor Shiba and Mr. Walden have co-authored a number of papers and three books: *A New American TQM* (1993), *Four Practical Revolutions*

in Management (2001), and the updated and expanded English edition of *Breakthrough Management* (2006). Mr. Walden is also listed as the sole author of the book *Visionary Leaders of Manufacturing* (2009) to which Professor Shiba contributed significantly. More about these books may be found at <http://www.walden-family.com>.

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Abstract

We first introduce breakthrough as a repeating process of application of the scientific method. Next, we sketch five quality organizations, the breakthroughs each made, and how each organization built on the prior state-of-the-art. We conclude with the suggestion that more quality organizations explicitly attempt to advance the state-of-the-art of methods for improving quality and management.

This note is dedicated to the memory of Russell Ackoff (1919-2009). We learned much from time spent with Professor Ackoff and from studying his writings.

1 Process of breakthrough

There is much discussion these days in the academic and business worlds about the need for breakthrough. But breakthrough seldom happens completely serendipitously or in a vacuum. Typically successful breakthrough builds upon what has gone before, even when the breakthrough is a major change in direction. Successful breakthrough also is most likely to happen as a result of careful study and analysis.

In his book *Innovation and Entrepreneurship*, the great management thinker Peter Drucker, who probably had more influence on the practice of management from 1940-1990 than any other single person, noted that the technology or social basis for most innovations has already happened. According to Drucker, the successful innovator typically is the company that *first* understands that a technology or social change has happened and takes advantage of the change. Drucker's book outlines methods of analysis for discovering changes that have happened which can be exploited.

We ourselves have described the context and methods for analysis leading to breakthrough in a series of papers and books.

The scientific method is at the heart of all improvement whether incremental or breakthrough. The scientific method is essentially about deciding what needs to be improved based on evidence (rather than prejudice); thinking about how the situation might be improved (again based on evidence); trying the improvement; evaluating the evidence to understand what worked and what didn't work; and repeating the cycle. One needs to always keep an open mind in case the environment changes or there is a new way to re-evaluate past results. The same person or group may repeat the cycle, or some other person or group may take the next step. An important way to facilitate the scientific method is to make results public so that others can confirm a result, and perhaps take the next step.

The scientific method goes by many names. Some call it just that, for example, Russell Ackoff in his book *Scientific Method*. W. Edwards Deming called it the Plan-Do-

Check-Act cycle. Shoji Shiba and our books often describe the scientific method in terms of the WV cycle which alternates repeatedly between the levels of theory and practice (down-up-down-up-down-up, like drawing the letter W and then the letter V). In the social sciences and in sports, it is sometimes called reflective practice — doing something, thinking about what worked and didn't work, and then doing it again. Whatever the name, the most effective approach to develop a successful improvement or breakthrough is *appropriate* application of the scientific method, building on what has gone before and contributing to what will be discovered in the future.

2 Breakthrough via societal learning organization

While company breakthrough skill has often been discussed (as has individual breakthrough skill that is crucial to company breakthrough skill), *how breakthrough skill has developed over time* has less often been the specific focus of discussion. In this section, we sketch the history of the evolution of breakthrough in a series of five of what we will call “societal learning systems.”

Of course there are more than five quality organizations which have been responsible for breakthroughs. However, we think we can best tell our story here using examples taken from a few of the organizations we know well.

2.1 Toyota

Founded in 1867 to make looms for weaving, Toyota is the oldest of the organizations we sketch. By the time Toyota moved into making vehicles in the 1930s, the company had a long tradition of innovative thinking based on hands-on, shop-floor

experimentation (*Gemba* spirit). Over the years, members of the founding Toyota family (e.g., Kiichiro and Eiji Toyoda) and lead engineer Taiichi Ohno studied the prior methods of Henry Ford and the Piggly Wiggly grocery store; studied the process control methods of Walter Shewhart, et al.; and, using their hands-on, experimental approach, developed a production system appropriate to Toyota's relatively small scale manufacturing situation.

The Toyota production system has been summarized as a set of principles. We will not enumerate the principles here except to note that they cover application of the scientific method; specific tools such as "pull," *Heijunka*, and visual signs to maximize the flow of correctly manufactured products; and productive use of people and improvement of their skills.

In time Toyota became more explicit about having a company-wide learning system, and eventually became supportive of the publication of its methods in the world at large. Taiichi Ohno himself wrote several well known books on Toyota's methods.

The Toyota production system contains many innovative elements. Two key conceptual breakthroughs were moving to concern with flow rather than mass production, and making experimentation a *continuous* part of the way the whole organizations functions.

2.2 JUSE

The Union of Japanese Scientists and Engineers (JUSE) was founded in 1946. JUSE was founded on high level principles (to promote the importance of science and engineering) with more specific activities targeted for five industrial areas. However, the factory management component soon

became the biggest activity of JUSE. Over the years, it developed:

- The renowned English-language journal *Quality Control*
- A quality control research group with members from industry, academia and government
- An SQC seminar aimed at industry participants
- A connection through Dr. Deming to researchers in the United States
- The Deming Prize system named in honor of Dr. Deming
- The QC Circle approach to societal learning with its own Japanese-language journal (*Shop Floor and Quality Control*); involving a leadership group from industry, academia, and government; a QC Circle registration system that created relationships outside the division and company; and prefecture-based promotional organizations
- A twice-a-year Quality Control Symposium attended by a select group of senior people from industry, academia, and government to anticipate business needs

More generally, by 1990, Japan had developed an explicit and highly effective system for societal networking in which JUSE played a significant role. This system involved a six-element infrastructure for networking, openness with real case studies, and use of change agents with noble rather than commercial intent.⁸

JUSE also created many innovations. A key pair of breakthroughs were developing systems for creating involvement in quality and then for moving from quality control to TQM.

2.3 MIT LFM

In the late 1980s, people at MIT became concerned about the U.S. industry and its competition from Japan. A study was done and the famous *Made in America* book was published. In 1988, closely connected to the Made-in-America activity, MIT started its Leaders for Manufacturing (LFM) program. Well-known U.S. manufacturing companies joined with MIT to sponsor the program. The program takes about 50 engineering graduates a year who have a few years of work behind them, and graduates them two years later (after 24 months essentially without a break) with a pair of degrees, Masters degrees in Business Administration and in Engineering. The coursework involves both management school and engineering school courses, teaching the start-of-the-art in both areas. The 24 months also includes a multi-month internship in industry.

LFM participants seek different things out of the program. Some are trying to move from being individual contributors in an engineering area to become manufacturing managers. Some who are already in manufacturing want to move up in management. Some people coming out of the military use LFM as a step to civilian life. Some participants have been sent to the program by their companies, but most attend it as individuals. Admission to the program is widely sought and highly selective.

The intensity and quality of the LFM program has led to certain social bonding among classmates in the program and from class-

to-class of the program. This has produced an on-going social network valuable to alumni of the program.

The LFM program has been copied by other major universities. MIT itself became involved in implementing a China LFM program at Shanghai Jiao Tong University. More recently, in response to changing times and adjustment of mission, LFM's name has changed to Leaders for Global Operations (LGO).

A pair of key breakthroughs from LFM were the moving from little-m manufacturing (seeing manufacturing as what goes on within the walls of the manufacturing plant) to big-M manufacturing (seeing manufacturing as part of the extended enterprise, supplier value chain etc.) and doing this in the context of a university-industry partnership.

Obviously, a university-based program draws on the original research of its faculty as well as on practical methods developed outside the university. For instance, MIT was instrumental in helping spread ideas from non-MIT sources such as W. Edwards Deming, Genichi Taguchi, and Toyota.

2.4 CQM

In 1990, the Center for Quality of Management was formed by seven Boston-area companies. The CQM was formed on the basis of a three-element model for societal diffusion, as expressed in its mission statement:

The mission of the Center for Quality Management is to accelerate understanding and implementation of quality management concepts and methods by creating a network of like-minded organizations to share

knowledge and experience. This will require a common language and a shared understanding of the basic methodologies to define problems and design solutions. In the broadest sense, the long-term objective of the Center is to promote organizational and societal learning about how to improve the performance of human systems.

CQM was an organization of member companies, not a professional society of individuals. Membership required the CEO or CEO equivalent of the member organization to commit to: (a) personal participation in the CQM; (b) a desire to change the way his or her organization operated; and (c) openness in sharing real case studies with other member organizations. Over the next few years, the CQM grew to over 100 members in half a dozen geographic locations (each facilitating regional sharing among members).

Activities of the CQM were broadly divided into three categories: education, networking, and research. The categorization was a little vague, however, and included a seminar series; development or adaptation and documentation of many management tools and methods; creation and teaching of over two dozen one to six day courses; publication of several books, a number of step-by-step tools manuals, and the *Journal of the Center for Quality of Management*. While a few of these products and services came from outside sources, most were developed on a volunteer basis by people from member companies working together.

After 15 years of independent operation, CQM was merged into GOAL/QPC in 2006.

Naturally, participation in the CQM was valuable to many member companies and

individuals in its years of operation. Perhaps CQM's most lasting contributions were its extensive research and publication activities which survive the organization.

A key breakthrough from the CQM was moving from companies competing to companies collaborating and using that collaboration to develop more new methods, advancing the state of the art faster than any of its member companies could do alone keeping their management methods secret. The CQM also made the idea explicit that a company must select from among all available methods (and new methods that can be developed) the components most relevant to a given company's business and cultural needs. There is no one single appropriate method, no matter how much current emphasis is being given to the method in the business press and how many companies are on the bandwagon for the method. Don't follow the current fad; build the integrated management system appropriate to your company.

2.5 VLFM

The Confederation of Indian Industry (CII) was formed in 1897 and today, is perhaps the largest industry organization in the world. In 2006, CII created its Visionary Leaders for Manufacturing (VLFM) program as a collaboration of academia (Indian Institute of Technology Kanpur, Indian Institute of Technology Madras, and Indian Institute of Management Calcutta); government (the Indian National Manufacturing Competitiveness Council and Ministry of Human Resource Development); and industry (CII and other industrial leaders).

VLFM was formulated as an innovative learning system that advances several

important concepts to improve capabilities for achieving tangible results:

- Learning as a collaborative process of sharing among individuals and companies rather than receiving a set curriculum from traditional teachers.
- Explicitly developing future leaders who can integrate from shop-floor details to top-level strategy (and across disciplines) rather than the traditional focus on improving professionalism within a discipline.
- Focusing on process as the way to achieve results rather than only measuring progress toward results with metrics.
- How to initiate a national diffusion program (including the value of participation from industry, academia, and government).
- Importance of a learning community utilizing its historical and cultural heritage and current circumstances to initiate and mobilize change.

VLFM derived its name and some of its structure from MIT's LFM program, but it also took ideas from JUSE and CQM and moved all these historical ideas in new directions, in particular giving increased attention to a collaborative model of learning and creating a give-give culture. VLFM also draws in one way or another on various Toyota principles and tools for managing a production system.

For VLFM, CII augmented what it learned from Toyota, JUSE, MIT LFM, and CQM, evolving it to meet the specific needs of Indian industry and culture. The result is a four-part

learning system that is among the broadest we have seen to date.

Opportunity A:

In this activity, the focus is on developing breakthrough skill in *future* leaders for Indian industry. The program involves 35 days of intense working together in six one-week modules spread out over much of a year. Between modules, the participants (typically middle- and senior-level managers) apply what they have learned within their companies.

Opportunity B:

This component is more like MIT's LFM program. It is a full year program during which individuals attend university classes, go on visits to industry, and bond with classmates to create a future network of alumni.

Opportunity C:

This component is for CEOs, and it is just getting underway for the first time (starting in October 2009).

Opportunity D:

This component is for the owners and managers of small- and medium-size business. It has structural similarities to Opportunity A, but the timing is a bit different. Over a one-year period, classroom sessions are held two days per month and on-site work is done three days per month. The program also involves more executive coaching from experts and widely experienced managers.

Over a two-year period prior to 2006, Shoji Shiba worked with several companies to develop what they called "learning communities," and this also influenced the structure of VLFM, in particular

Opportunities A, C, and D. It also provided a cadre of senior people from Indian industry who were enthusiastic about the need for VLFM and who could help facilitate its activities. Graduates of Opportunity A have helped teach and mentor participants in later sessions of Opportunity A. And the session of Opportunity D that started in December 2009 involves 15 graduates of Opportunity A from five first-tier companies collaborating to train people in their second-tier companies.

A major breakthrough from VLFM is its provision of opportunities to a broad spectrum of participants to enable a new kind of development for how to conduct a business in a new way.

3 Implications for your quality organization

Many quality organizations focus on three areas of activity: (1) generating awareness of the need for improvement and breakthrough, (2) teaching methods of quality and breakthrough, and (3) recognizing successful company efforts with quality and breakthrough. Often there is a networking and publication support structure of greater or lesser magnitude.

While quality organizations often draw implicitly or explicitly on the methods of prior quality organizations and may seek new or unique ways of facilitating improvement in their participating organizations, we suspect that most quality organizations do not explicitly see part of their role as advancing the state-of-art of how quality organizations function so that future organization may build on their methods — they do not themselves *specifically focus* on being a part of an on-going application of the scientific method to advance the state of art.

Suggestions

Our underlying message in this article is that we hope you and your quality organization will move beyond meeting the immediate awareness, training, and recognition needs of your member companies. We hope you will begin to simultaneously think about developing new methods to contribute to the on-going series of societal experiments that has been going on for 100 years, since people began to write extensively about management as a separate discipline. The more you and your company contribute new methods to your quality organization or collaborate within your quality organization to develop new methods, the more you and your company will benefit from your participation in the quality organization.

References

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John Wiley & Sons, Inc., 1962.

Much of the content of this section is described in greater detail in *Visionary Leaders for Manufacturing: A Learning Community History*, David Walden, Confederation of Indian Industry, 2009.

The Toyota Way: Fourteen Principles from the World’s Greatest Manufacturer, Jeffrey K. Liker, McGraw-Hill, 2004.

For a detailed discussion of Toyota’s non-stop application of the scientific method, see “Decoding the DNA of the Toyota

Production System,” Steven Spear and H. Kent Bowen, *Harvard Business Review*, volume 7, number 5, September-October 1999, pp. 97-106.

This was about the same time after WWII that Toyota was using its culture of hands-on learning to reinvigorate its vehicle business. The Toyota and JUSE systems developed in parallel over the decades and undoubtedly influenced each other. Both also drew on methods developed outside of Japan.

This system is described in chapter 16 of *A New American TQM: Four Practical Revolutions in Management*, Shoji Shiba, Alan Graham, and David Walden, Productivity Press, 1993.

Dertouzos et al., MIT Press, 1989

The industry sponsors also support plant tours and provide guest speakers to the program.

The industry sponsors of LFM seem to have an inside track in assessing and trying to recruit LFM graduates.

The CQM journal is still available on the Internet via the Wayback Machine (<http://tinyurl.com/ybb8w9a>); the Shiba, Graham and Walden, and Shiba and Walden books mentioned earlier are available from Amazon.com; the CQM step-by-step manuals (<http://tinyurl.com/ybpl9no>) are available from <http://www.goalqpc.com>; the CQM’s Concept Engineering process (see documentation at <http://tinyurl.com/ycnpu4j>) is widely known and has been widely copied; the CQM’s Mastering Business Complexity tool set is ripe for wider use (<http://www.walden-family.com/public/cqm-journal/11.1-whole-issue.pdf>); the CQM’s definitive discussion of Kanō’s Method is

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