



Knowledge Management and Six Sigma: Exploring the Potential of Two Powerful Disciplines

By Paige Leavitt

Both Six Sigma and knowledge management (KM) share a notable distinction in a corporate universe full of change initiatives and improvement philosophies. Like the embrace of team structures in the 1980s, these two approaches to business management, after proven successes, have been integrated into regular operations at leading companies, while most methods have been quickly exposed as ineffective trends. And the quality functions that often guide and maintain the learning cultures within organizations are challenged to create a synergistic relationship between the two established approaches.

"We have seen every fad come and go," said APQC President Carla O'Dell. "We believe that the power of Six Sigma and its systematic approach and the power of knowledge management are probably not ephemeral and will probably not come and go. What they will do is become part of the fabric of the way we work. And our job is to make sure that the best of both of those comes together."

In a recent teleconference with more than 100 participants representing all corners of the marketplace, KM thought leaders at APQC discussed how the principles of Six Sigma and KM support each other and create a strong foundation for a learning organization. "APQC believes there is a very powerful intersection and synergy between the discipline of Six Sigma and the discipline of KM," said O'Dell.

Comparing Best Practices

Six Sigma, at the technical/statistical level, is a measure of variation in defects in a system. "If you are operating at a Six Sigma level of quality, you have less than 3.4 defects per million opportunities to make a mistake in your system or your process," said O'Dell. "At the systematic or organizational level, when people talk about a Six Sigma initiative, they're talking about a broad and comprehensive approach to organizational change driven by data, measurement, projects, and an emphasis on results."

The approach involves a pyramid of Six Sigma specialists, called Belts, and two core processes: the Define-Measure-Analyze-Improve-Control (DMAIC) methodology and Design for Six Sigma (DFSS) process.

As the name denotes, the DMAIC methodology has five steps (Figure 1). At the definition step, a Black Belt identifies a problem and determines its scope. At the measurement step, Belts develop a baseline of how that system, process, or issue is functioning. And at the analysis step, Belts analyze the root causes of the problem. Step four is the improvement process. "For those of you in KM, one of the things that Six Sigma initiatives have in common is the desire to pilot before you implement," said O'Dell. "And piloting takes place at the improvement [step]. Then, control is the hand-off from the Black Belt team to the process owner who chartered the project."

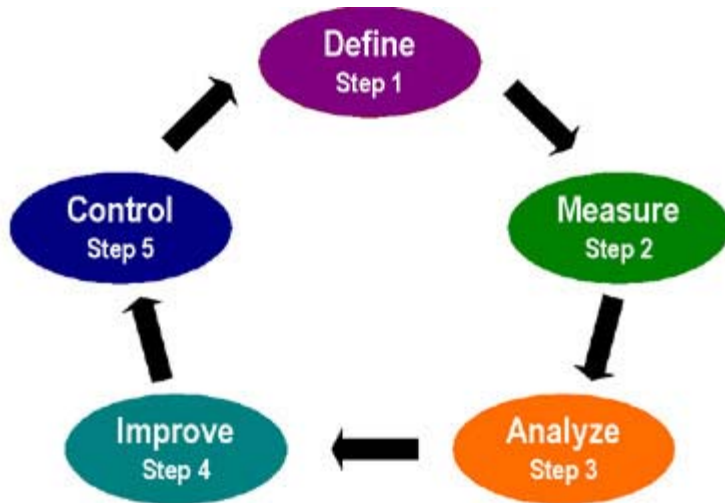


Figure 1

The DFSS process is used for new products or processes; instead of improving a process, an organization is creating one based on the voice of the customer.

Within these processes, some Six Sigma best practices are evident:

- the active involvement of senior management,
- a senior executive acting as full-time head of the Six Sigma function,
- a focus on measurement (i.e., data-driven results),
- accountability for financial results,
- rigorous project selection and a project management methodology,
- staffing of full-time and part-time Belts, and
- effective training for future leaders.

KM is quite similar in that it is a broad and systemic change process. APQC defines KM as the conscious strategy of putting tacit and explicit knowledge into action by creating context, an infrastructure, and learning cycles that enable people to find and use the collective knowledge of the enterprise.

Organizations use many of the steps from APQC's Road Map to Knowledge Management Results: Stages of Implementation™ (Figure 2) in their Six Sigma process as well (e.g., developing key strategies, designing and launching initiatives, and making sure pilots work to expand and institutionalize a process).

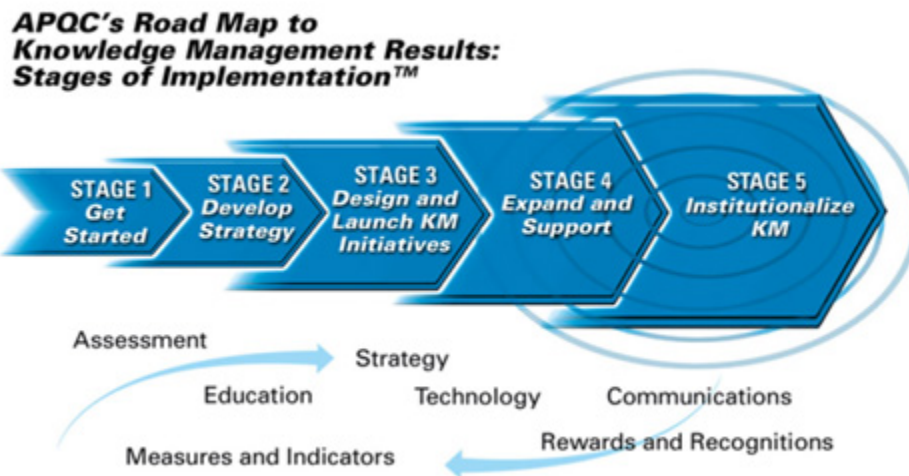


Figure 2

But the purpose of KM is different than Six Sigma. “The purpose of KM is to help the right information and knowledge flow to the right people at the right time so they can make decisions,” said O’Dell. “Some of those decisions are going to be about improving a process, but the objective of KM is not the same as process improvement.”

KM approaches include self-service, networks and communities of practice (CoPs), and the transfer of best practices. Self-service -- involving content management, portals, search functions, and expertise locators -- is highly technology-enabled and involves explicit knowledge. “In the self-service arena, KM approaches are about connecting people to information,” said O’Dell. “In Six Sigma initiatives, self-service involves project databases and dashboards so that the Black Belts can see what sort of projects have been done and what the results have been.”

Networks and CoPs are groups of a common interest that share and learn information, trade tools and best practices, and solve business problems. “Networks and communities of practice (CoPs) are probably the most vibrant and powerful KM approaches,” said O’Dell. “Some organizations have begun to use them in their Six Sigma initiatives, either with communities of their Black Belts or of people who may use the results of those projects. APQC thinks CoPs are not used significantly enough, and that could be one of the problems with the replication of findings from Black Belt projects.”

The transfer of best practices -- involving facilitated sharing and transfer of knowledge, as well as internal benchmarking -- is minimally technology-enabled and involves primarily tacit knowledge. “This is from unit to unit inside an organization,” said O’Dell. “If we fix a process in a plant in Iowa, how do we get that used in a plant in the state of Washington? The transfer of best practices.”

KM best practices include:

- creating systematic processes that enable knowledge to flow to the right people at the right time;
- focusing on core business issues in order to avoid redundant efforts, accelerate the time to competency, make individual knowledge available to the organization, and cross boundaries and functions;
- applying robust methodologies;
- enabling new knowledge to be created and new problems to be solved; and
- placing the management focus on communication, involvement, accountability, and knowledge-related behavior.

“A lot of what firms are trying to do when they do KM is save on the cost of not knowing: the duplication, waste, and mistakes of the past,” said O’Dell. “They’re trying to shorten their learning cycles, cross silos and boundaries (which is one of the things we think is going to be a value-added to Six Sigma), and apply robust methodologies. And it also focuses on knowledge creation, which you would expect from Design For Six Sigma.”

An Intersection of Approaches

Both KM and Six Sigma are quickly infiltrating business management systems with problem-solving and process-optimization methodologies. Six Sigma should not be viewed as a quality program that is commissioned to reduce defects but as a methodology that helps companies better meet the needs of their business. KM shares this goal.

“We believe that the transfer of best practices, the replication that is supposed to happen in Six Sigma in the control phase, could be enabled and huge gains could be made if the tools of KM were applied,” said O’Dell.

CoPs are an intersecting point for Six Sigma and KM. By introducing Six Sigma findings into a community, newly-stabilized processes can be adjusted as needed. “It’s going to move out of control if you don’t have a community to help sustain it,” said O’Dell.

Compaq (now HP) is one such example. Its warranty team used a Six Sigma approach to reduce defects. The result of its efforts over the first year was an \$18 million reduction in warranty costs. The company then had difficulty implementing these improvements across functions, so it created a CoP. By implementing lessons learned from Six Sigma across the company, Compaq achieved dramatic results.

This was the predicament for Ford as well, said Stan Kwiecien. "We had established communities of practice, so we built on them to support the transfer of best practices from Six Sigma initiatives. That's how it worked. And interestingly, we do not have a community of practice for Six Sigma. Not yet, anyway."

Halliburton also combined its Six Sigma and KM efforts. In an attempt to improve its perforating practices for oil wells, Halliburton created a CoP that uses many Six Sigma approaches. To track its progress, the community uses a balanced scorecard with metrics similar to Six Sigma. In a short period of time, Halliburton has experienced gains from the community. For instance, the number of hours lost due to root problems dropped from 153 to 50.

"And Halliburton has a community in place to continue the gains," said O'Dell. "So, the point of that is there is a lot that KM can learn from Six Sigma. And there is a lot that Six Sigma can learn from KM."

Voice of the customer in the DFSS process is also a potential area for a collaboration of ideas. "In Design For Six Sigma, knowledge of the customer-centric requirements is a key input ... to the design process," said O'Dell. "And if you could use knowledge management tools to better understand what the customer is saying to sales people and service people, that information comes back to the folks who can make a difference in the design process."

"The organizations that succeeded in TQM were those organizations that applied Six Sigma to the systemic structures for their process improvement," added NSA's Marianna Overman. "And I believe very strongly that knowledge management's success will be the same way."

Raytheon's Approach to Six Sigma and KM

Bill Baker, a knowledge transfer and benchmarking champion at Raytheon, discussed that company's Six Sigma process and how it intersects with KM. Its efforts began in 1997, when Dan Burnham of Allied Signal became Raytheon's chairman.

Burnham brought his experience with Six Sigma to Raytheon and then benchmarked best-practice examples such as GE. The resulting Raytheon Six Sigma, or R6s, process improvement strategy applied to the entire company (Figure 3). Involving Lean enterprise tools, the strategy is focused on the customer, tools, and culture through five principles:

1. Specify value in the eyes of the customer.
2. Identify value stream and eliminate waste and variation.
3. Make value flow at pull of the customer.
4. Involve and empower employees.
5. Continuously improve knowledge in pursuit of perfection.

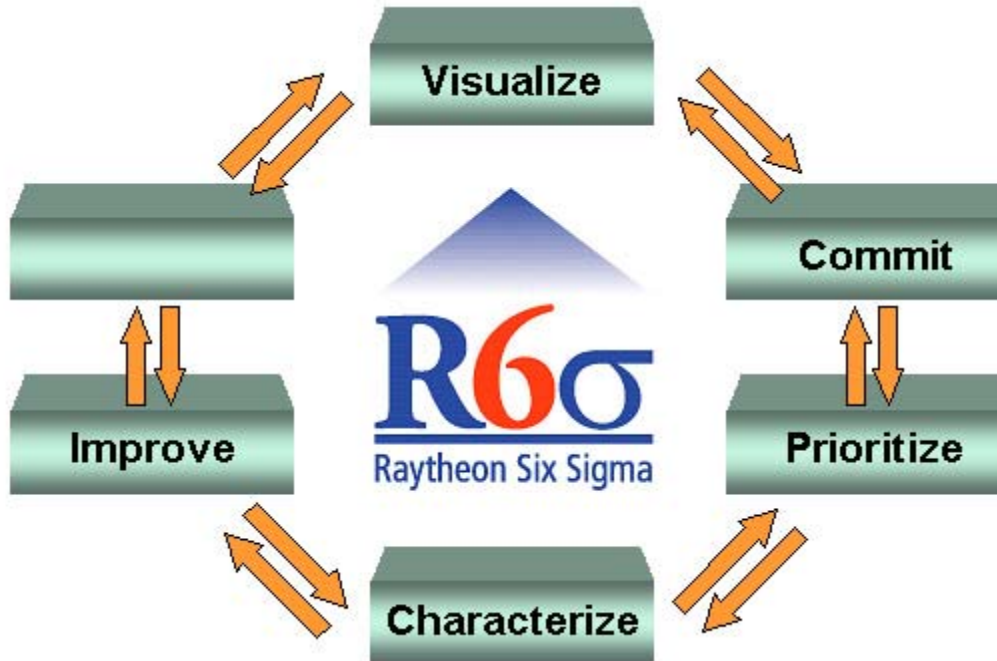


Figure 3

“Based on those overarching principles of Raytheon Six Sigma, our definition of it being a knowledge-based process, this was prime territory to develop a knowledge management strategy. We leveraged Raytheon Six Sigma into our knowledge management philosophy. Just like Carla talked about DMAIC, we added another step that simplistically says, ‘achieve and celebrate and share knowledge.’”

The step to characterize, in Figure 3, also resonates with KM principles. At this step, Six Sigma specialists must answer the following questions:

- Can your team reuse any available knowledge to achieve commitment to change?
- Have you searched for Six Sigma projects relating to your process for improvements that can be reused?
- Have the project, solutions, and lessons learned been shared (or documented to encourage sharing and reuse by others)?

Throughout Six Sigma, KM addresses three issues: the competitive environment, leveraging knowledge in a one-company environment, and reducing duplication of efforts. “Our competitive environment is pretty tough, so we have to be better, faster, and less expensive,” said Baker. “We have to leverage knowledge, and we have to reduce the duplication of efforts. We’ve got about 87,000 people in the company, virtually in every state. So, it’s real easy to have redundant projects.”

To present the KM process in a straightforward manner, Raytheon developed a four-step process: create, capture, share, and reuse.

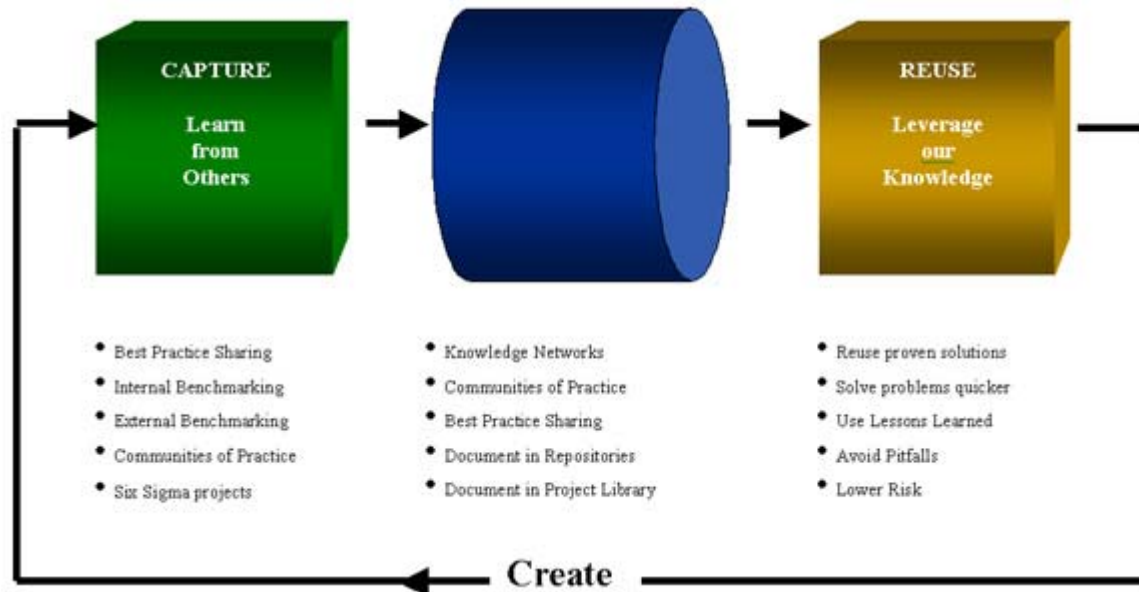


Figure 4

Baker said, “You can see that we’ve included benchmarking as part of that capture process and communities of practice as well. ... Certainly, we want to reuse knowledge, so that we have lower risk and we get proven solutions quicker and faster.”

Among other topics-oriented communities, Raytheon supports CoPs for both Six Sigma and KM. Efforts are under way to find additional communities, provide collaborative tools and resources to CoPs, and increase participation.

KM champions promote the four-step KM process in every business and function. “Our approach was to recruit knowledge management champions that were in the Six Sigma expert population,” said Baker. “So we wanted the change agents, if you will, that were already trained to be the knowledge management champions.”

Nominated by managers, knowledge champions publicize knowledge sharing and reuse to Raytheon’s 87,000 employees. Baker said, “All of the KM champions and their businesses are responsible for administering the standard rewards and recognition. ... We have bimonthly/biweekly/monthly phone calls to keep the knowledge management people involved and up to speed. What we’ve told them is that basically we’ll require 25 [percent] to 50 percent of their time to do this well. That’s the commitment we have.”

The training approach for Raytheon Six Sigma was top down, starting with Burnham’s leadership team. Raytheon has trained 7,500 leaders on the process, certified 37 Master Experts (the Raytheon equivalent of a Master Black Belt), trained almost 900 to be Experts (equivalent to Black Belts), and certified almost 300 of those Experts. Equally impressive is that almost 15,000 employees have been trained to be Specialists (equivalent to Green Belts) of which 6,300 have been certified. “So, it’s a very active program,” said Baker. “Wherever people are in the company, they are being touched by Raytheon Six Sigma. It has really been a big benefit.”

Raytheon attributes its rise in customer satisfaction to Six Sigma and KM. “In our case, KM will help us do Six Sigma projects better,” said Baker. “That’s the focus right now, but we’ve got our sights set larger than that. We want to do KM across the entire organization: all projects, all people, and all areas.”

In 2001 operating profits rose \$150 million as a direct consequence of Raytheon Six Sigma, and cash flow rose \$300 million. “And that will be significantly improved in the doubling range for this year,” said Baker. “In effect, we’re making Raytheon Six Sigma and knowledge management an expectation and a

way of life at Raytheon."

APQC's Lessons Learned

"The problems, issues, and opportunities in organizations are not about reducing defects; they are about responding to new opportunities, using the voice of the customer knowledge," said O'Dell. "With both Six Sigma and KM, I'm telling you that you're going to get more of what you want - if you begin to open the conversation to a different way of thinking about solving some of these problems over the long term. Because both Six Sigma and KM have tremendous power, they also have some issues that they need help with."

Professionals in both arenas can learn from each other. Six Sigma can learn from KM how to recognize knowledge, as well as processes. Joseph Hofer-Alfeis from Siemens said, "Six Sigma is oriented to the quality of products and processes. If you think of a knowledge-intensive business, 'Six Sigma for knowledge quality' -- the quality of the proficiency, the quality of knowledge flows, and the quality of description knowledge -- should also be a very interesting thing. And exactly what we do with our business owners, when you make a knowledge strategy, is a Six Sigma process; and it ends up in business improvement actions [by] improving the knowledge."

Six Sigma professionals also can learn from KM strategies that sustain change. For instance, communities of practice are more effective than handing off or turning over a project. Larry Handler from Capital One said, "All of the people in their day-to-day business, you're kind of converting everything into a Six Sigma way of doing it. And it's not really a turnover to some functional group; they are direct members of the given functional group." And with the potential duplication of projects across the enterprise, Six Sigma does not fall victim to corporate amnesia.

KM can also be used as a model for the transfer of best practices. How do you capture knowledge so it will be reused? How do you transfer improved processes to other sites? "Part of the dilemma with Six Sigma without KM is what happens when the members on the team you need are outside your normal managerial sphere of influence," said Gia Preston of Sprint. And what the KM community of practice and tools like the charter do is allow us to have that ongoing Six Sigma, where it breaches divisional or departmental ... boundaries. And that's where it has really helped us."

Conversely, the KM arena can learn from Six Sigma the value of a rigorous project approach, how to use analytical and quality tools, and the benefits of maintaining a full-time staff on key projects and communities. Baker said, "Our experts are members of the business and functional groups. So, they don't go away. They're there. They help the teams that operate day-to-day, and they work out the plan to continue the improvements. But they don't disappear; they are still in the business unit or in the function."

Also, Six Sigma is a model for measurement and results focus. Gain the fast financial return on easier projects in order to fund long-term capacity building. "The Six Sigma people don't need to hear this, but the KM people do - that you need to focus on a key business issue to get quick results, because as Bill said, you want to leverage KM as a long-term capability of the organization," O'Dell said. "But to do that, you've got to prove its value."

Trading such lessons learned is made possible by what KM and Six Sigma have in common. "The systems thinking is what actually drives really good implementations in Six Sigma and KM," said O'Dell. "It is probably the defining feature. Understanding all of the stakeholders involved, understanding the intended and unintended consequences of change, and having mechanisms in place that allow the system to adjust as a result of what it's learning - that's where we believe the key is in having people who are in a position to be able to detect and to adjust to the change."

For more information about Six Sigma and knowledge management, visit APQC's Knowledge Sharing Network (KSN). This resource contains more than 8,500 documents, including:

- Knowledge Transfer in Raytheon Six Sigma
- Six Sigma Going Beyond Manufacturing

- Deploying Knowledge Management Into a Process Enterprise Framework
- Ford's Best Practice Replication
- Six Sigma Project Scope
- Deploying Six Sigma to Bolster Business Processes and the Bottom Line - Implementation
- Innovative Approaches to Organizational Success in the New Economy - Six Sigma
- Mastering Six Sigma
- Six Sigma Resource Center
- A Road Map to Six Sigma Quality
- Organizational Excellence Through Six Sigma Discipline
- Dealing With the Achilles' Heel Of Six Sigma Initiatives