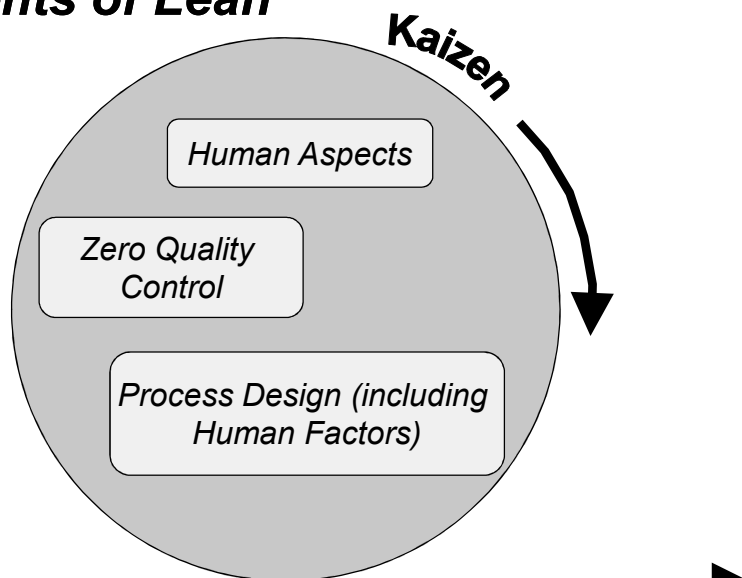


Lean-Six Sigma, Evolutionary Change, and the Twenty-First Century Business Environment

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Elements of Lean



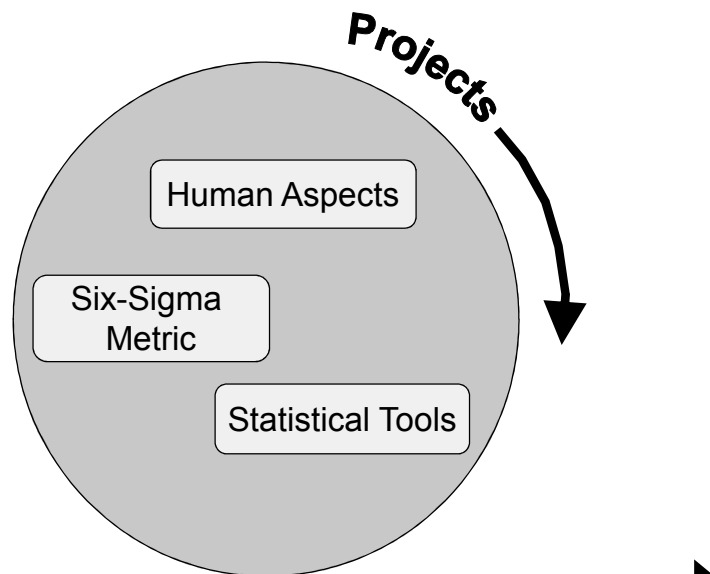
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Human Aspects of Lean

- Fear-free environment
- Respect for People
- Blameless culture
- Training
- Discipline
- Flattened hierarchy & “bottom-round” management

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Six-Sigma Elements



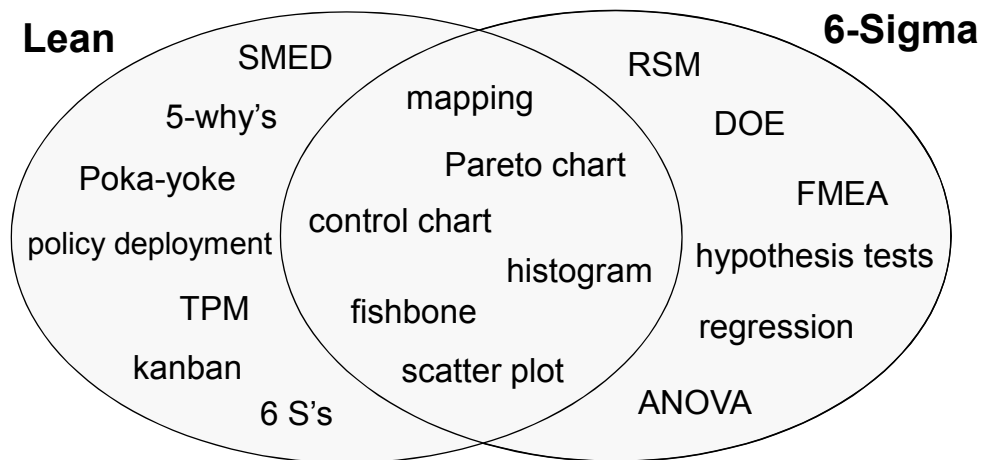
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Human Elements of Six-Sigma

- “Belt” training structure & hierarchy
- Employees evaluated based on commitment to Six-Sigma values
- Promotions linked to Six-Sigma activities
- Personal financial incentive to improve performance

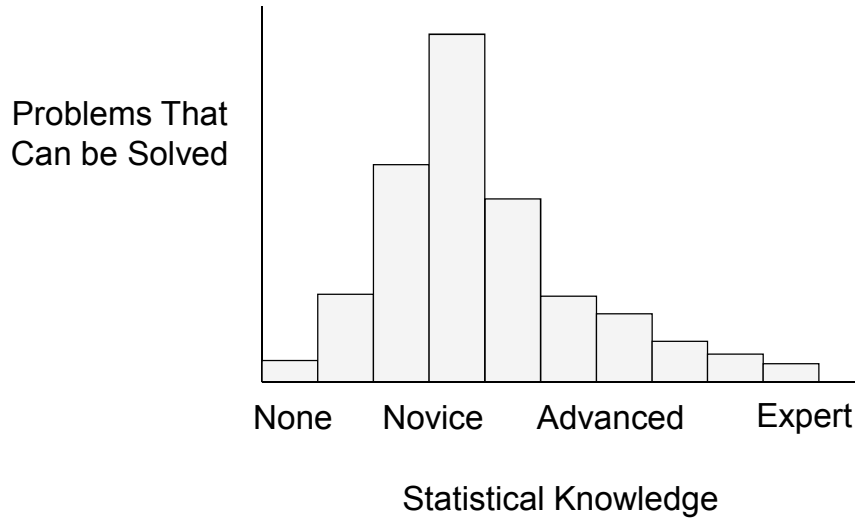
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How are Lean & Six Sigma Related? Main Methodologies Overlap



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Six-Sigma Tools are More Advanced, but are they Needed?



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Financial Claims of Six-Sigma

*“Companies can expect to reap at least
\$150,000 to \$175,000 per Black Belt project...*

*...a black belt can complete five projects in a
year...”*

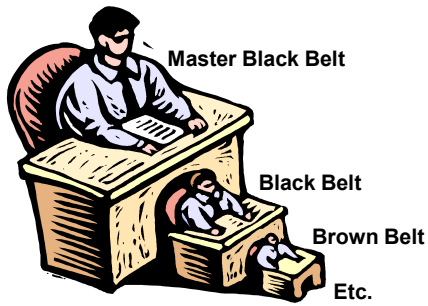
*“Each sigma shift provides a 10 percent net
income improvement”*

Source: Harry, M., & R. Schroeder, Six Sigma, Doubleday, New York, 2000.

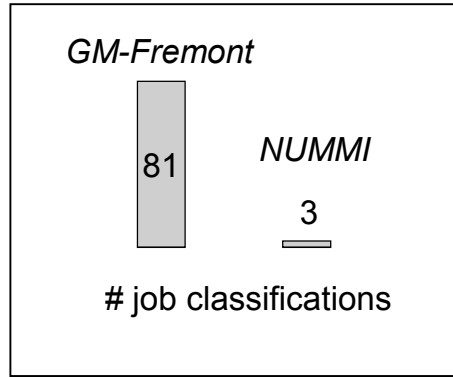
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Six-Sigma Can Increase Managerial Hierarchy

“Belt” layers



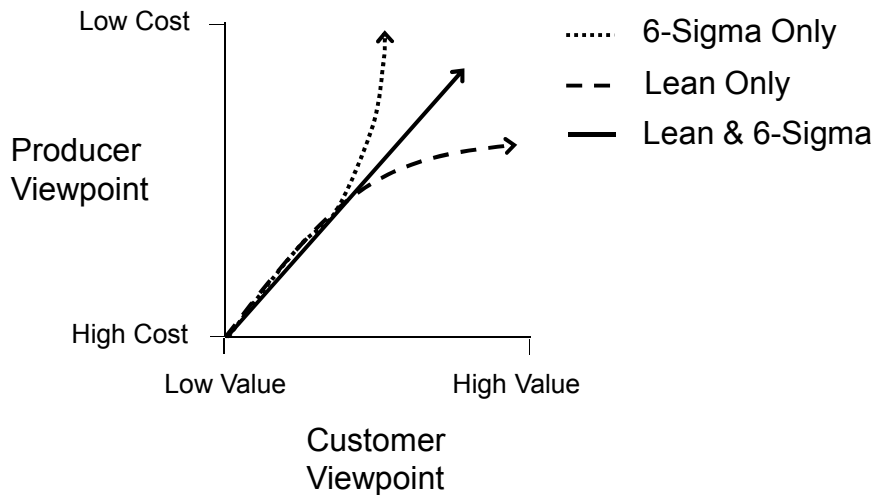
Six-Sigma



Lean

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Nature of Competitive Advantage



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The Lean, Six Sigma (LSS) Organization

Include Three Primary Principles of Lean:

- Incorporate overriding philosophy that seeks to maximize value-added content of all operations
- Constantly evaluate all incentive systems to ensure they result in global optimization
- Incorporate management decision making process that bases every decision on relative impact on the customer

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The Lean, Six Sigma (LSS) Organization

Include Three Primary Principles of Six Sigma:

- Stress data-driven methodologies in all decision-making (scientific)
- Promote methodologies that strive to minimize variation of quality characteristics
- Design & implement company-wide & highly structured education & training regimen

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Five Primary Elements of Six-Sigma Body of Knowledge

1. Enterprise-wide deployment
2. Organizational process management and measures
3. Team management
4. Define Measure, Analyze, Improve, Control (DMAIC)
5. Design for Six Sigma (DFSS)

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How is Lean Six Sigma Being Impacted by Changes in Business Landscape?

1. Sustainable business development
2. Global marketplace
3. Global operations
4. Rapidly evolving technology
5. Changing regulatory environment
6. Managing in a volatile environment

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Table 1: Enterprise-Wide Deployment

	How LSS Elements Mesh	What Needs to Change in LSS
SBD	Change management skills & knowledge of LSS principles will continue to be crucial in meeting goal of sustainability.	Better & systematic way to define value of long term sustainability will be necessary, including cap & trade issues.
Global Marketplace	Strong focus on understanding customer needs will be important as diversity in customer types increases.	Defining value in various economic & cultural systems will complicate project selection, including effects of tariffs.
Global Operations	Leadership & knowledge in areas of Lean & Kaizen will remain important skills for global operations managers.	Motivation for change will vary across economic & cultural systems - complicates new processes.
Rapidly Evolving Technologies	Ability to understand & how to integrate technology within business processes will take on increased importance.	Integration of technology is critical. Success depends upon learning from others.
Changing Regulatory Environment	Change management skills & solid leadership are critical when regulatory environment is volatile.	Improvement project implementation complicated by limitations based on governmental laws & regulations.
Rise of Knowledge Workers	Ability to understand why & how LSS works will facilitate better understanding of its implementation.	Improvement efforts may move from process improvement to creation of effective working environments.
Managing in Volatile Environment	Change management skills are critical when business conditions & supply chains are unstable & volatile.	Project durations short but thorough; many interconnected projects undertaken simultaneously.

Table 2: Organizational Process, Management, & Measures

	How LSS Elements Mesh	What Needs to Change in LSS
SBD	Many traditional business performance & financial measures do not address sustainability.	Financial measures need to change to create emphasis on how improvements impact societal & environmental goals.
Global Marketplace	Emphasis on critical-to-quality & related measurements will assist with integration of performance metrics.	Decisions must take into account different market perspectives & how services are managed in diverse cultures.
Global Operations	LSS is applied & will impact all operations, including domestic & overseas facilities.	Terminology of performance measures may not be similar & how they motivate action across counties will vary.
Rapidly Evolving Technologies	Rapidly evolving technologies might require new critical-to-quality & other performance measures.	Financial measures need to focus more directly on impact of technology & management must adapt fast to changes.
Changing Regulatory Environment	Current efforts to implement LSS include critical stakeholders, so adding another stakeholder should be easy.	More key stakeholders will exist & intellectual property issues will increase in complexity.
Rise of Knowledge Workers	Business measures & metrics are important tools for knowledge workers, but emphasis must be on worker satisfaction.	Improvements needed in how performance of knowledge workers is measured & used to develop allegiance.
Managing in Volatile Environment	Balancing need for longer-term financial measures with rapidly changing business environment will be challenging.	Cause & effect will be more difficult to determine & certain risks (political, legal, etc.) will increase.

Table 3: Team Management

	How LSS Elements Mesh	What Needs to Change in LSS
SBD	Teams might require retraining to focus their efforts on long-term issues & projects that contribute to sustainability.	Requires involvement of green-certified member & more stakeholders (e.g., energy providers, community, or government).
Global Marketplace	Diverse, international team members can enable company to stay in tune with market.	Need to include members on teams that understand cross-region markets & mores, perhaps using localized sub-teams.
Global Operations	Team skill sets required & developed in black belt system allow people to work well on "virtual teams" across globe.	Challenges need to be overcome with multi-functional teams in disperse locations, w/different languages & cultures.
Rapidly Evolving Technologies	Traditional team process will likely work well, because it capitalizes on knowledge power of group versus individual.	Need to expand team member scope with those that understand potential and limitations of technology solutions.
Changing Regulatory Environment	Teams must be agile & able to quickly communicate any changes in foreign and domestic government regulations.	Team members from regulatory bodies will be needed with team-wide awareness of regulatory effects across globe.
Rise of Knowledge Workers	Concept of rewarding teams rather than individuals will become more difficult as good workers become harder to retain.	Need to convince workers that real benefits will come to them personally since they will not be motivated by slogans or money.
Managing in a Volatile Environment	Traditional team management approaches might be too slow & cumbersome, lacking the agility necessary to adapt.	Many members of team will be new to company or to job and therefore teams need to be amorphous.

Table 4: The DMAIC Process

	How LSS Elements Mesh	What Needs to Change in LSS
SBD	DMAIC can be applied to any process – could be used as part of broad intangible framework like sustainability.	Need to find better ways to measure future & indirect effects, & would need to sacrifice short-term profits for sustainability.
Global Marketplace	Logical and thorough "scientific method" can be well suited for competing within global marketplace.	Need to be proactive in identifying opportunities for improvement as market preferences change and evolve.
Global Operations	DMAIC is useful for all operations, whether domestic or overseas; universality of approach is appealing.	Differences in education practices could complicate training of tools; challenges in central vs. local control must be overcome.
Rapidly Evolving Technologies	DMAIC may be too slow when technology is moving at breakneck speed with projects taking months.	More risk taking in choosing projects & potential for "user" of project results being unable to understand implementation.
Changing Regulatory Environment	DMAIC process can provide structured way for companies to assess changes within the regulatory environment.	Changes in regulations often motivate improvement projects but recommendations may require law changes to implement.
Rise of Knowledge Workers	DMAIC helps workers gain in-depth insight into the details of process – not just superficial "managerial" knowledge.	Tools will evolve to downplay manufacturing by including those specific to knowledge jobs - would impact training.
Managing in a Volatile Environment	DMAIC may be too slow when technology is moving at breakneck speed with projects taking months.	Need to modify DMAIC to move quickly (Kaizen would help) and controls will be emphasized to identify new problems.

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Table 5: Design for Six Sigma

	How LSS Elements Mesh	What Needs to Change in LSS
SBD	Tools and concepts of DFSS will take on increased importance, as the criteria for effective designs are broadened.	Norms, guidelines, and paradigms for sustainable design need to be part of DFSS projects to account for total life cycle costs.
Global Marketplace	Tools and concepts of DFSS will take on increased importance, as diversity of customer types increases.	Designs must be cognizant of various user emphases with decisions regarding design flexibility becoming important.
Global Operations	Tools and concepts of DFSS will take on increased importance, as diversity of operations types and locations increases.	Designs must take into account manufacturability in more diverse ways, including capabilities across regions.
Rapidly Evolving Technologies	DFSS would still be valid, but methodology needs to be applied in flexible, rapid manner.	Project teams must be aware of how users from around globe understand or deal with technology.
Changing Regulatory Environment	Tools and concepts of DFSS will take on increased importance, as number of stakeholders increases.	Designs must be developed that are able to evolve as regulations change and are updated.
Rise of Knowledge Workers	Black belt system requires high skill set; black belts would do well in knowledge worker economy.	Increased emphasis will be placed on design of services and solutions, with corresponding differences in approaches.
Managing in Volatile Environment	DFSS would still be valid, but methodology needs to be applied in flexible, rapid manner.	Design processes must be fast and their work processes will need to be periodically reviewed and updated.