

Alternatives to SPC

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The Questions

- Is SPC the appropriate control-phase method for this process?
- If SPC isn't appropriate, what alternative process control methods are available?
- How do you match process control methods to processes?

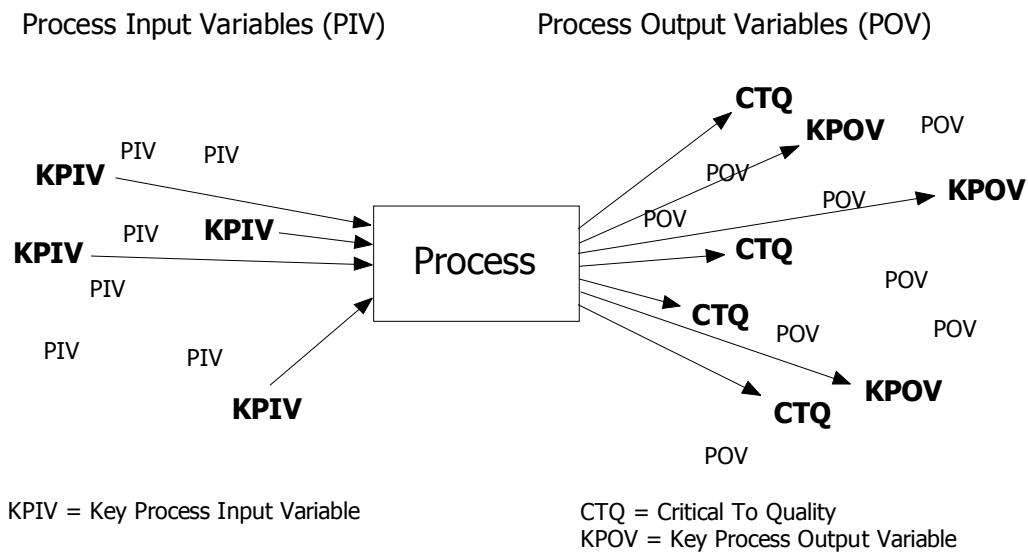
The Six Sigma DMAIC Process

DMAIC - the Six Sigma process used to improve existing processes:

1. **Define:** Define the problem in terms of relevant customer CTQs.
2. **Measure:** Measure actual CTQ performance and compare to goal.
3. **Analyze:** Experiment to 1) identify the KPIVs among the many PIVs that could affect the CTQs and 2) quantify their effect on the CTQs.
4. **Improve:** Leverage your understanding of the relationship between the KPIVs and the CTQs to improve the process.
5. **Control:** Put controls in place to make the improvements permanent.

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Which Process Characteristics to Monitor?



Process Throughput - Standardization Matrix

- SPC is the obvious choice for long production runs of a single product, i.e. statistical *product* control.
- What characteristics of a process determine whether SPC is appropriate or not?
- Eckes (*The Six Sigma Revolution*) suggests characterizing processes using a *Process Throughput-Standardization Matrix*:

		Throughput	
		Low	High
Standardization	Low		
	High		

- What is throughput?
- What is standardization?

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Process Throughput - Standardization Matrix

- What kinds of processes fall into each category?
- What process control methods are available in each category?
 - Statistical methods
 - Non-statistical methods
- For a given process, choose a process control method from the same quadrant.

		Throughput	
		Low	High
Standardization	Low		
	High		

Categorizing Processes

- High standardization and high throughput
 - A single product on a dedicated high speed production line
- High standardization and low throughput
 - Short runs of highly standardized product
- Low standardization and high throughput
 - Transient, immature, unstable process
 - Run away process
- Low standardization and low throughput
 - Unique, custom products
 - Craftsmanship
 - Art
 - Hobby

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Process Control Methods

- High standardization and high throughput
 - Classic long-run Statistical Product Control
 - Automated, perhaps closed-loop, process controls
- High standardization and low throughput
 - 100% inspection
 - Short-run Statistical Process Control
 - Process precontrol
 - Poke Yoke
- Low standardization and high throughput
 - Bar charts, Pareto charts, and histograms
 - Product and process audits
 - Training
- Low standardization and low throughput
 - Operator motivation and attention to detail
 - 100% inspection
 - Checklists
 - Training

Processes Can Change Type

- As processes evolve over time they may shift from one category to another.
- Such shifts require a corresponding change in the process control methods used to manage a process.
- You must recognize when such a change occurs and implement a timely change in the process control method.

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Example: The Impact of Lean

- A high standardization and high throughput process is probably being run under classic long-run SPC (statistical product control)
- Lean pushes for shorter run lengths, i.e. lower throughput, while maintaining high standardization
- Product line maturity and market pressure force processes from the high standardization and high throughput cell to the high standardization and low throughput cell
- Process control methods will have to change accordingly, i.e. SPC may not be appropriate any more
- If long run SPC isn't appropriate any more, then what alternatives are available?

Example: Low Standardization and High Throughput Processes

Low standardization and high throughput processes are in an inherently transient state:

- They must either transition to a high standardization process or
- They will get shut down (e.g. short product life) or
- They will die from customer disgust with the product or being forced from the market by competition from a better quality supplier

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Quiz

Which category of the process throughput-standardization matrix does each case fall into and what methods would you use to control the process?

- Art
- Accountant
- Human Resources
- CEO
- Airplane pilot preflight process
- Space shuttle launches
- Scheduled spacewalk to assemble or repair a device
- Production of custom manufacturing equipment where each machine is different

Quiz

- Custom service provider
 - Shoe repair shop
 - Seamstress
 - Small machine/job shop
 - Statistical consultant - experiment design assistance, data analysis, and report writing to order
- Product Made to Inventory (MTI)
- Product Made to Order (MTO)
- Commodity product

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Refining the Process Throughput-Standardization Matrix

- Despite the insight provided by the process throughput - standardization matrix, it can still be difficult to categorize processes and to find good control method matches.
- Are the two dimensions of Eckes's matrix (process throughput and standardization) sufficient to distinguish the differences between processes and families of control methods?
- What additional characteristics of processes could be used to refine the matrix?

Presentation Notes

- www.mmbstatistical.com/Notes/AlternativesToSPC.pdf