# *Operations Management - Quality Control*

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| **Quality Program** |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | ***Quality***  ***Planning*** | **🡪** | ***Quality***  ***Assurance (QA)*** | **🡪** | ***Quality***  ***Control (QC)*** | | Define Quality,  Set Quality Standards,  Create Quality Plan |  | Implement  Quality Plan |  | Monitor Quality Plan  and Improve Quality | |  |  | **🡪** | **🡨** | **🡪** | | Process Control Charts  Acceptance Sampling |  | Quality Reports,  Quality Audits |  | Change Management,  Method of Assignable Cause | |

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| **Statistical Quality Control** | | | | | | | | | | | | | | | |
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|  |  |  |  |  |  | SQC  Statistical  Quality  Control | | | |  |  |  |  |  |  |
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|  |  | SPC  Statistical  Process  Control | | | |  |  |  |  | Acceptance  Sampling | | | |  |  |
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|  | Variables  (Continuous) | |  |  | Attributes  (Discrete) | |  |  | Variables  (Continuous) | |  |  | Attributes  (Discrete) | |  |
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| **Quality Concept** |
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| Acceptance Sampling. Compare quality characteristic from sample with acceptance number or rejection number and make decision about a lot. |
| Statistical Process Control. Examine quality characteristic from sample on process control chart and make inference about the control of the process. |

***Statistical Process Control***

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| *Simple Process Control Chart* | |
| For instructional purposes, assume the random sample from an experiment is { 3,4,4,5,5,5,6,8 }  Sample size is 8, Sample Mean is 5, Sample Variance is 2.  [ n = Sample Size; Sample Mean =`X = SX/n ; Sample Variance = S2 = S(X–Mean)2/n ]  Construct a Process Control Chart. | |
| Control Chart is defined as: Mean ± 3 \* (Standard Deviation of Mean) | |
| Control Chart: Mean ± 3 \* (Standard Deviation of Mean)  Which is equivalent to: Mean ± 3 \* ( √ ( Variance of Mean ) )  Which is equivalent to: Mean ± 3 \* ( √ ( Variance / n ) ) | The “3” is standard.  Standard Deviation = √Variance  Variance of Mean = Variance/n |
| Substitute values: Sample size, n=8, Mean=5, Variance=2  Mean ± 3 \* ( √ ( Variance / n ) )  5 ± 3 \* ( √ ( 2 / 8 ) )  5 ± 3 \* ( 1 / 2 )  5 ± 3/2 | |
| Therefore, the process control chart becomes:  Center Line = 5  Upper Control Limit = 5 + 1.5 = 6.5  Lower Control Limit = 5 – 1.5 = 3.5  Quality characteristic is measured and plotted on the process control chart to control the process. | |
| **Statistical Process Control Chart**   |  |  | | --- | --- | | Upper Control Limit: 6.5 |  | |  | | Center Line: 5.0 |  | | time | | Lower Control Limit: 3.5 |  | |  |   . . . | |

**Common Process Control Charts**:

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| Chart | Description |
| P-chart | Proportion of an Attribute characteristic (an Attribute is a Discrete Measurement)  from a known sample size |
| C-chart | Count or frequency of an Attribute characteristic (an Attribute is a Discrete Measurement)  from a defined interval of consideration. |
| M-chart | Mean of a Variable characteristic (a Variable is a Continuous Measurement)  from a known sample size |
| R-chart | Range of a Variable characteristic (a Variable is a Continuous Measurement)  from a known sample size |