Using Process Control Charts to Monitor Performance

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Introduction

Process control charts allow senior and operational management to quantify the impact of a change in the process of delivering a service.

They are especially important for achieving set targets since they also inform if the natural variability in the current process is too high to allow a target to be guaranteed.

Examples will be given for A&E performance targets.

How Variable is Our Process

The following table contains data on the proportion of patients seen within the four hour A&E waiting time target. The data demonstrates how a moving range can be used as the basis for measuring process variation. The moving range is the absolute difference between successive measurements, hence, 0.4% = 79.2% - 78.8%, 1.9% = 80.7% -78.8%, etc

% Achieved per week	**Moving range**
79.2%	
78.8%	0.4%
80.7%	1.9%
79.6%	1.2%
77.7%	1.9%
81.1%	3.4%
81.4%	0.3%
74.3%	7.1%
75.7%	1.3%
74.0%	1.7%
83.3%	9.3%
78.1%	5.2%
72.0%	6.0%
81.1%	9.0%
Average	**3.8%**

The more stable the process the lower will be the moving range since in a stable process the value of % achieved will always be roughly similar.

In the example above the average of the moving range is 3.8% while the average of % achieved is 78.3%.

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Using a simple conversion factor developed by Shewhart in 1924 we can calculate that this process is capable of delivering performance within a range of 2.66 times the average moving range, hence, 2.66 x 3.8% = 10%. So our process is capable of delivering 78% ±10%. In other words our current process is only capable of guaranteeing 68% achieved. Our average of 78% will only be exceeded on roughly 50% of weeks.

Clearly if we are trying to achieve a target of 80% in the absence of any process change we would need to add more resources to lift out average to 90%. In this case – in the absence to any fundamental change to our process - we would need to add 15% (90/78 = 1.15) more resources (staff, etc) to achieve our target.

Where the process signal chart becomes enormously helpful is that it will now allow us to measure the effect of a change in our process.

For example, a member of the team has suggested that we could get far better performance if we dedicated 2 members of the team to dealing with a specific range of incoming patients.

No one knows whether this change will make a measurable effect but they have agreed to try this change for ten weeks. They obtain the following results with an average weekly performance of 79.6%

% Achieved per week	Moving Range
79.2%	
78.8%	0.4%
79.9%	1.1%
79.6%	0.3%
80.3%	0.7%
81.1%	0.8%
81.4%	0.3%
79.3%	2.1%
77.7%	1.6%
75.9%	1.8%
83.3%	7.4%
78.1%	5.2%
78.5%	0.4%
81.1%	2.6%
Average	**1.9%**

They are surprised to note that while they have only managed to move the average from 78.3% to 79.6% their new process is now far more stable since the average moving range has dropped from 3.8% to 1.9%. Hence using Shewhart's conversion factor of 1.66 their process will now deliver 80% ± 5%. The theoretical extra resources to hit the target has now reduced to 6% (85/80 = 1.06) more rather than the 15% more required previously. The new process is now able to guarantee 75% achieved compared to only 68% achieved prior to the process change. This demonstrated that the variation is just as important as the average when it comes to achieving guaranteed targets.

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They make another trial change by dedicating another 2 staff to a different sub-set of patients and eventually reach a point where 3% more resources will guarantee the target. They take on a part time member of staff to cover this difference.

Footnote:

Hospitals in the UK were not able to achieve the A&E waiting time and hence resorted to ‘admitting’ patients in order to achieve the target. As a result the volume of zero day stay emergency ‘admissions’ increased dramatically.

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