

Friday 16 May 1924: a new beginning for  
quality



Friday 16 May 1924: a new beginning for quality



# About Mike Harris

Mike has been working in testing for 20 years and is the tester for Geckoboard. He has been a member of a test team, a Solo Tester and a Test Lead. He has also worked as a part of waterfall, lean and agile teams.

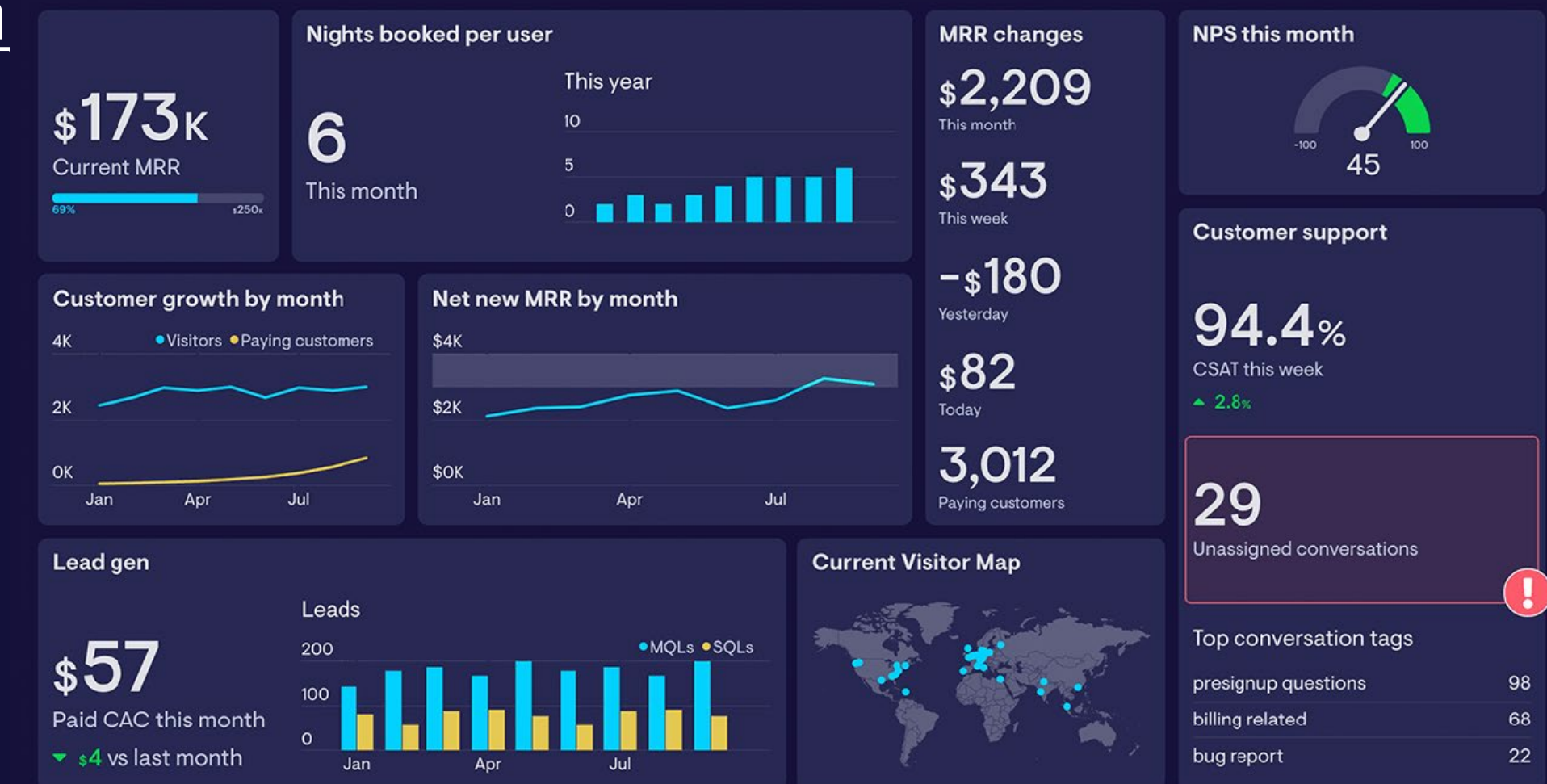
He has set up and led a Testing Community of Practice and been part of a successful agile transition. He is also a Chartered Fellow of the British Computer Society and Vice-Chair and Programme Secretary of the British Computer Society's Specialist Interest Group in Software Testing.

He also contributed to the e-books Testing Stories and How Can I Test This?

LambdaTest publishes posts from Mike on: <https://www.lambdatest.com>

Mike has a blog at <http://testandanalysis.home.blog/>

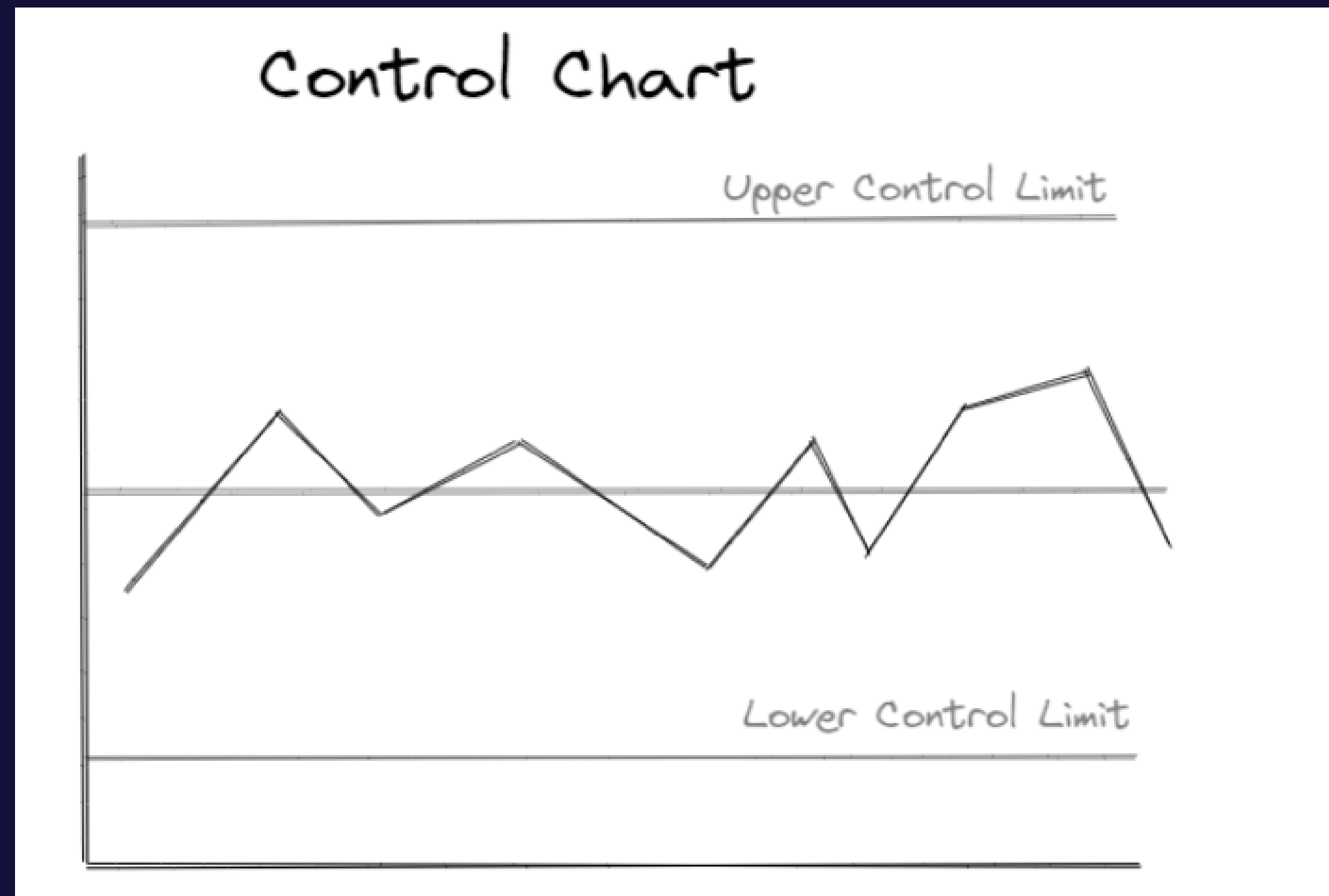
Follow Mike on Mastodon: <https://mastodonapp.uk/@TestAndAnalysis>





Friday 16 May 1924: a new beginning for quality

# Control Charts



 Friday 16 May 1924: a new beginning for quality

# Introduction - Bell Telephones

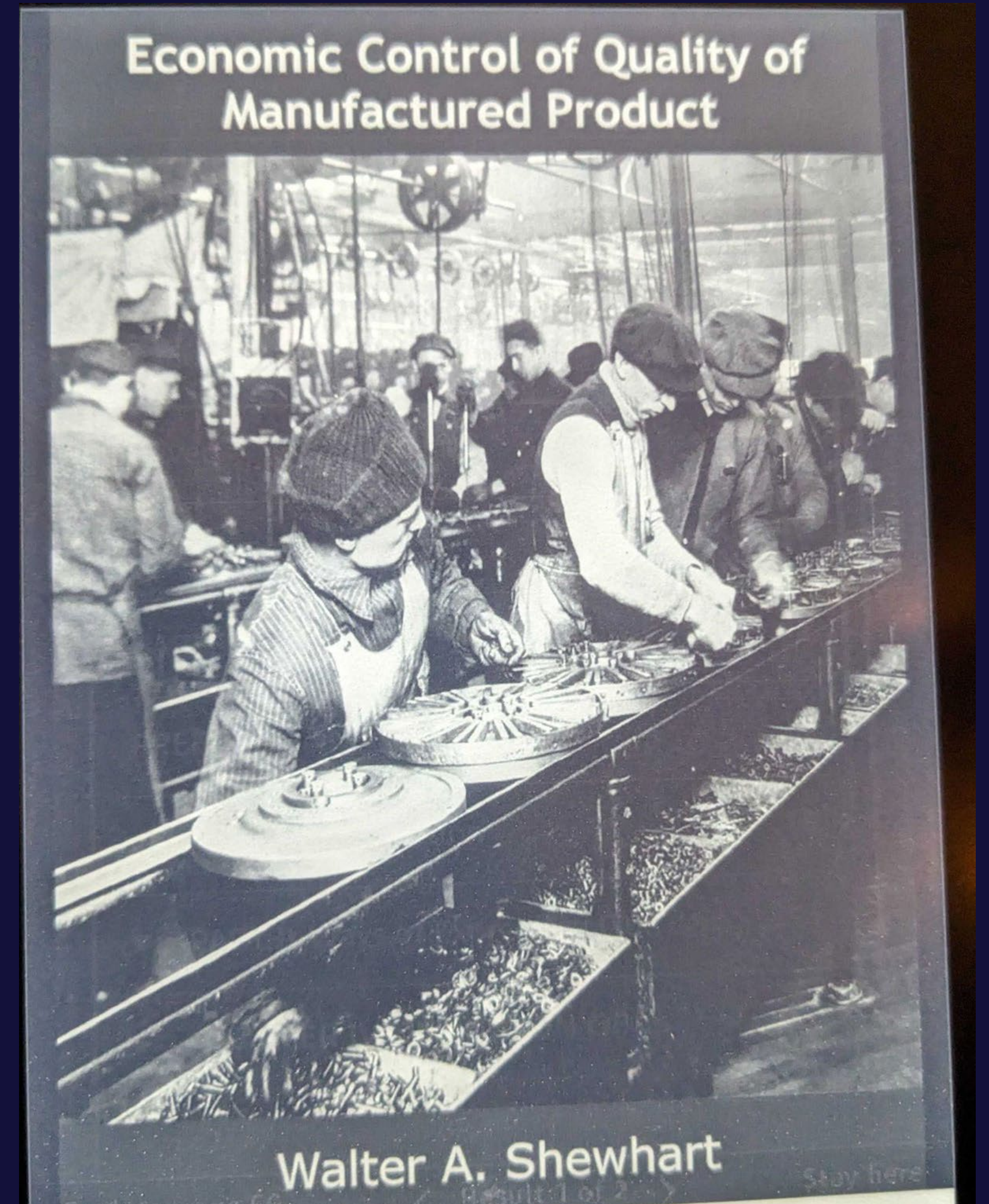
- Shewhart gave his manager a memo recommending Statistical Process Control
- including a drawing of a Process Behaviour Chart





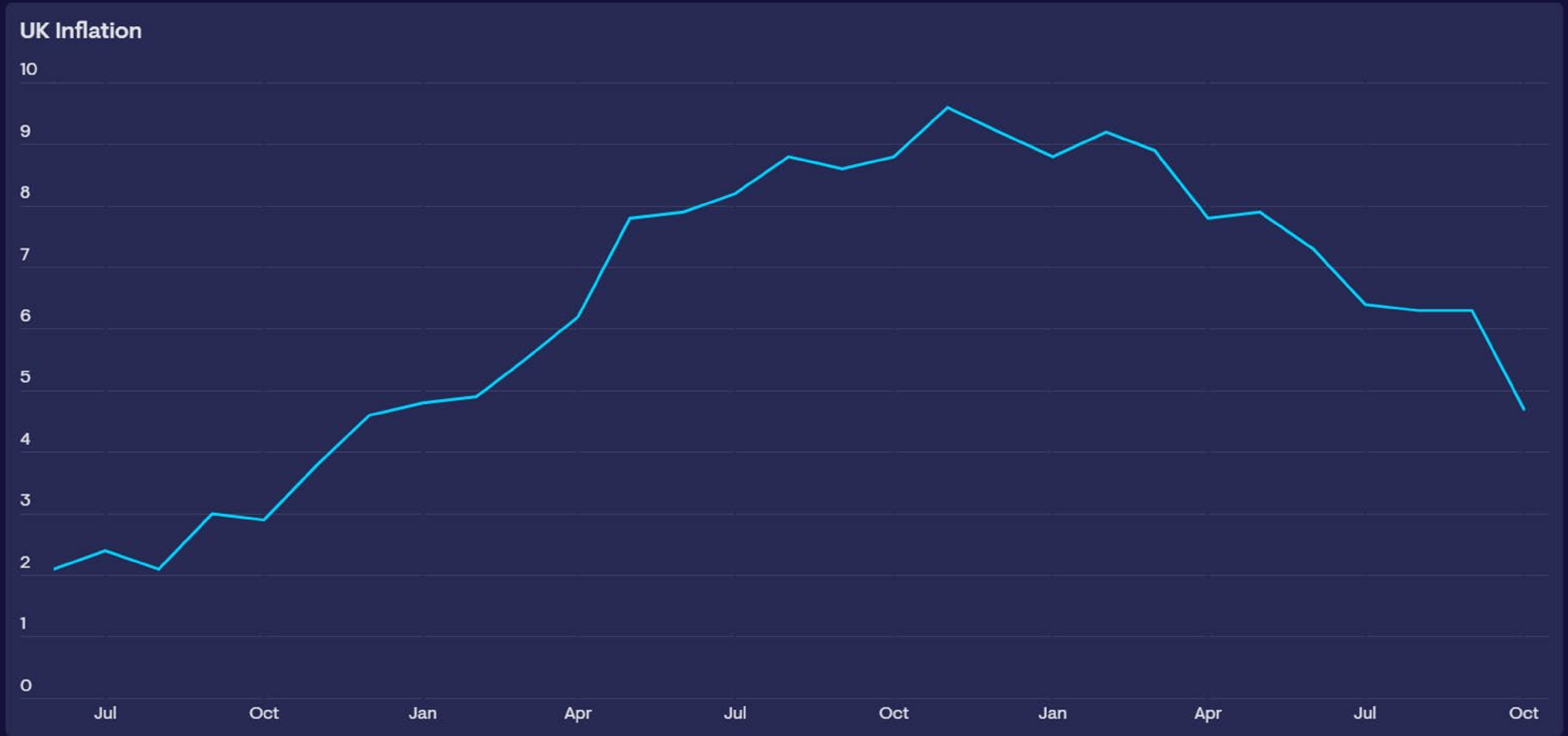
Friday 16 May 1924: a new beginning for quality

Qualities rather than quality



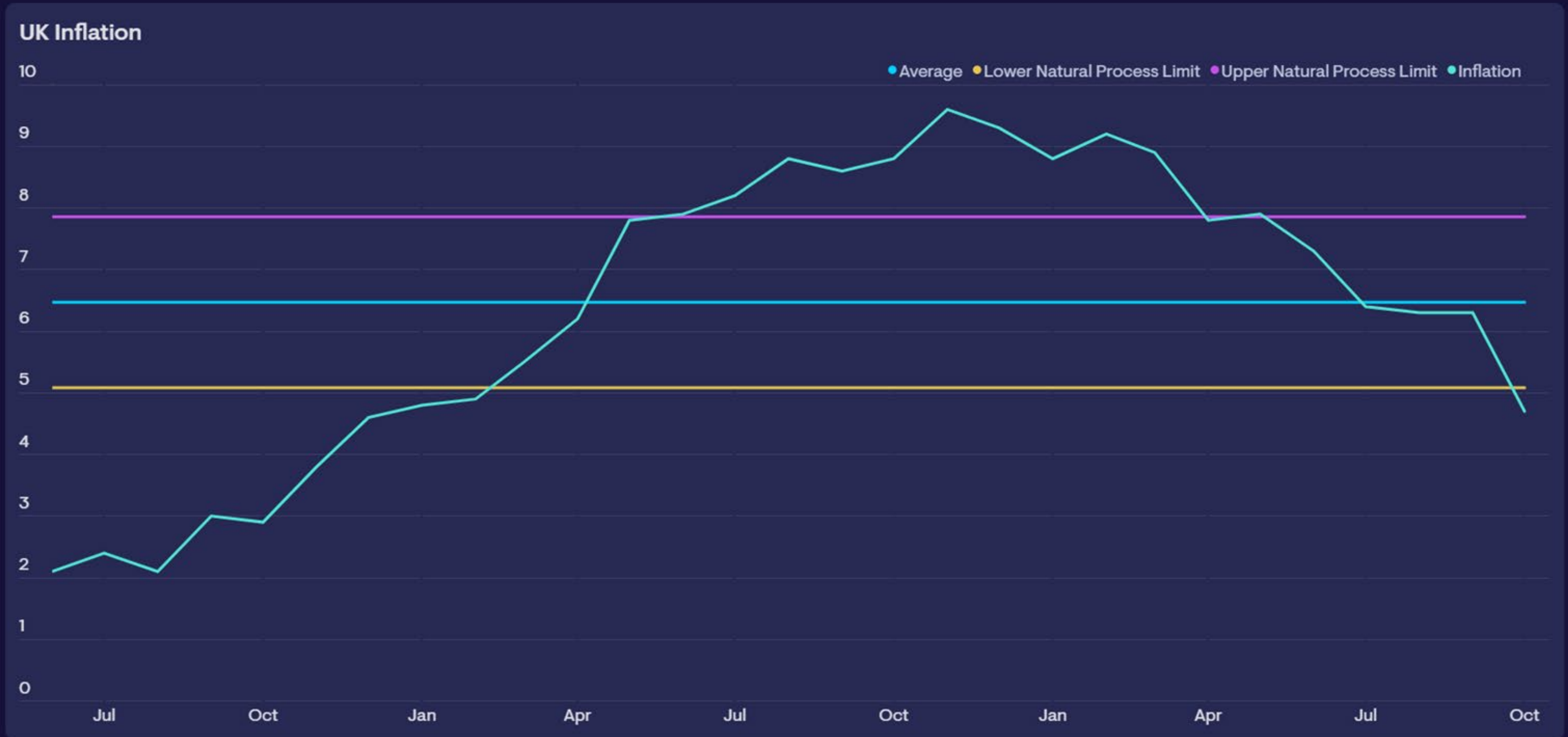


# Friday 16 May 1924: a new beginning for quality





# Friday 16 May 1924: a new beginning for quality





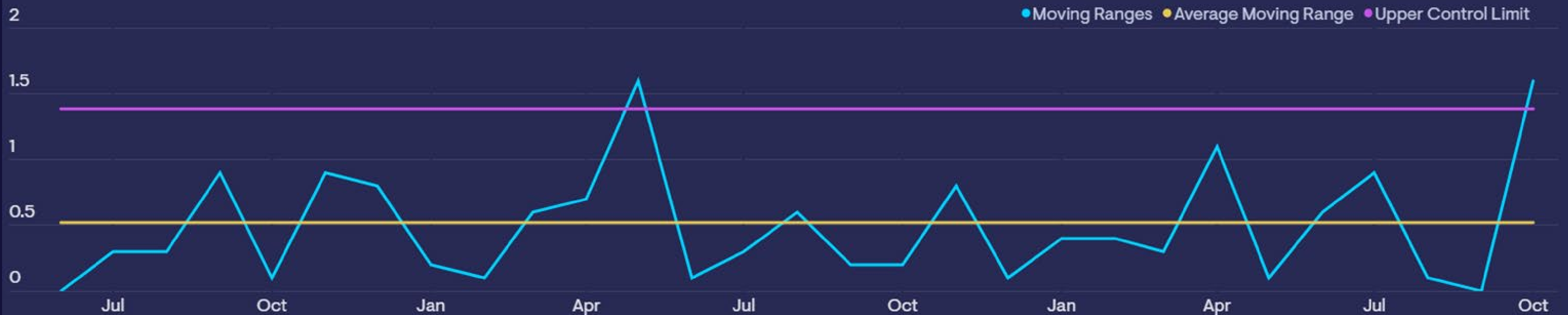
# Friday 16 May 1924: a new beginning for quality

## UK Inflation

### Individual Values



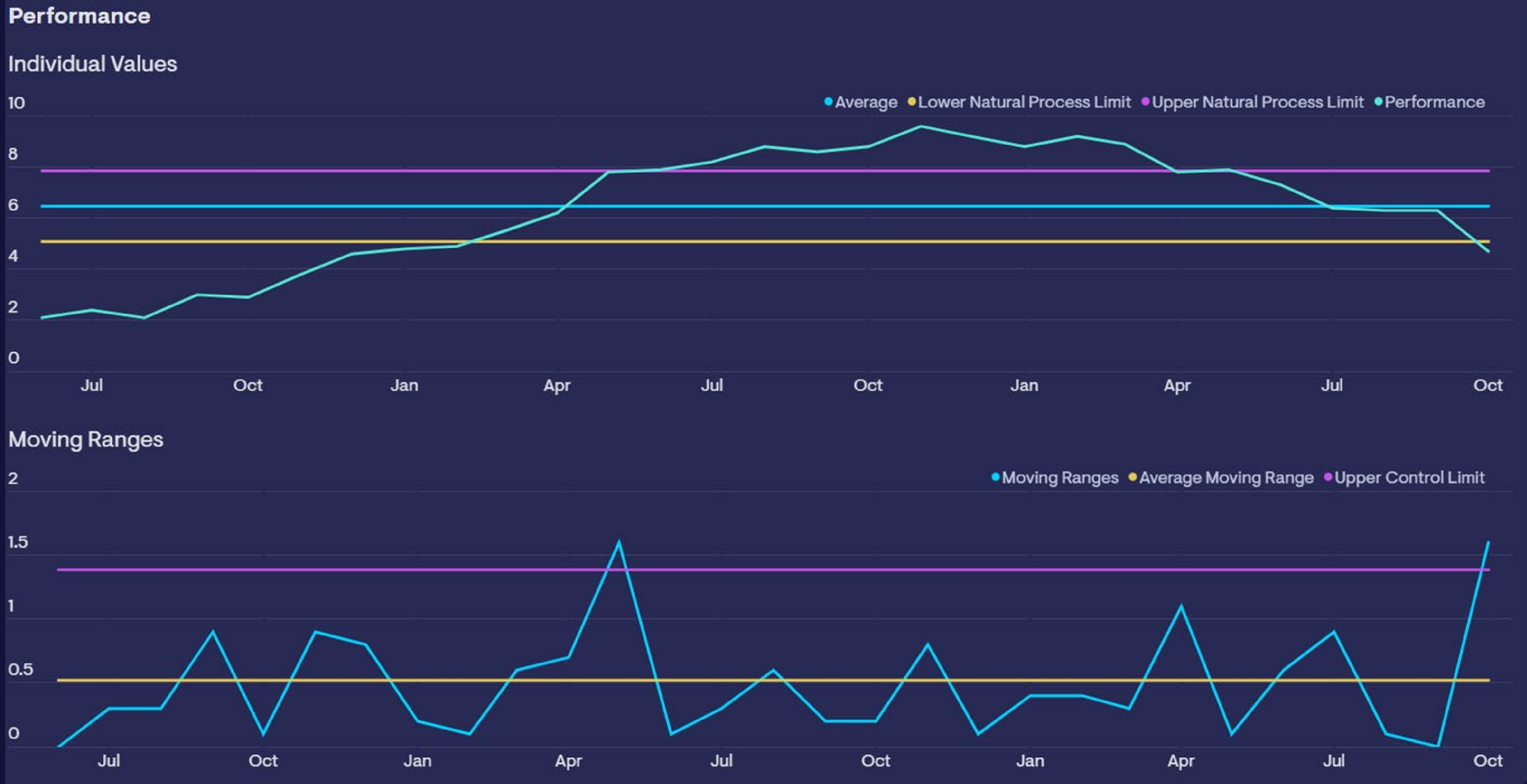
### Moving Ranges







# Friday 16 May 1924: a new beginning for quality





Friday 16 May 1924: a new beginning for quality

# Eight 'Nelson Rules'

## Rule 1

One point is more than 3 standard deviations from the mean.

## Rule 2

Nine (or more) points in a row are on the same side of the mean.

## Rule 3

Six (or more) points in a row are continually increasing (or decreasing).

## Rule 4

Fourteen (or more) points in a row alternate in direction, increasing then decreasing.

## Rule 5

Two (or three) out of three points in a row are more than 2 standard deviations from the mean in the same direction.

## Rule 6

Four (or five) out of five points in a row are more than 1 standard deviation from the mean in the same direction.

## Rule 7

Fifteen points in a row are all within 1 standard deviation of the mean on either side of the mean.

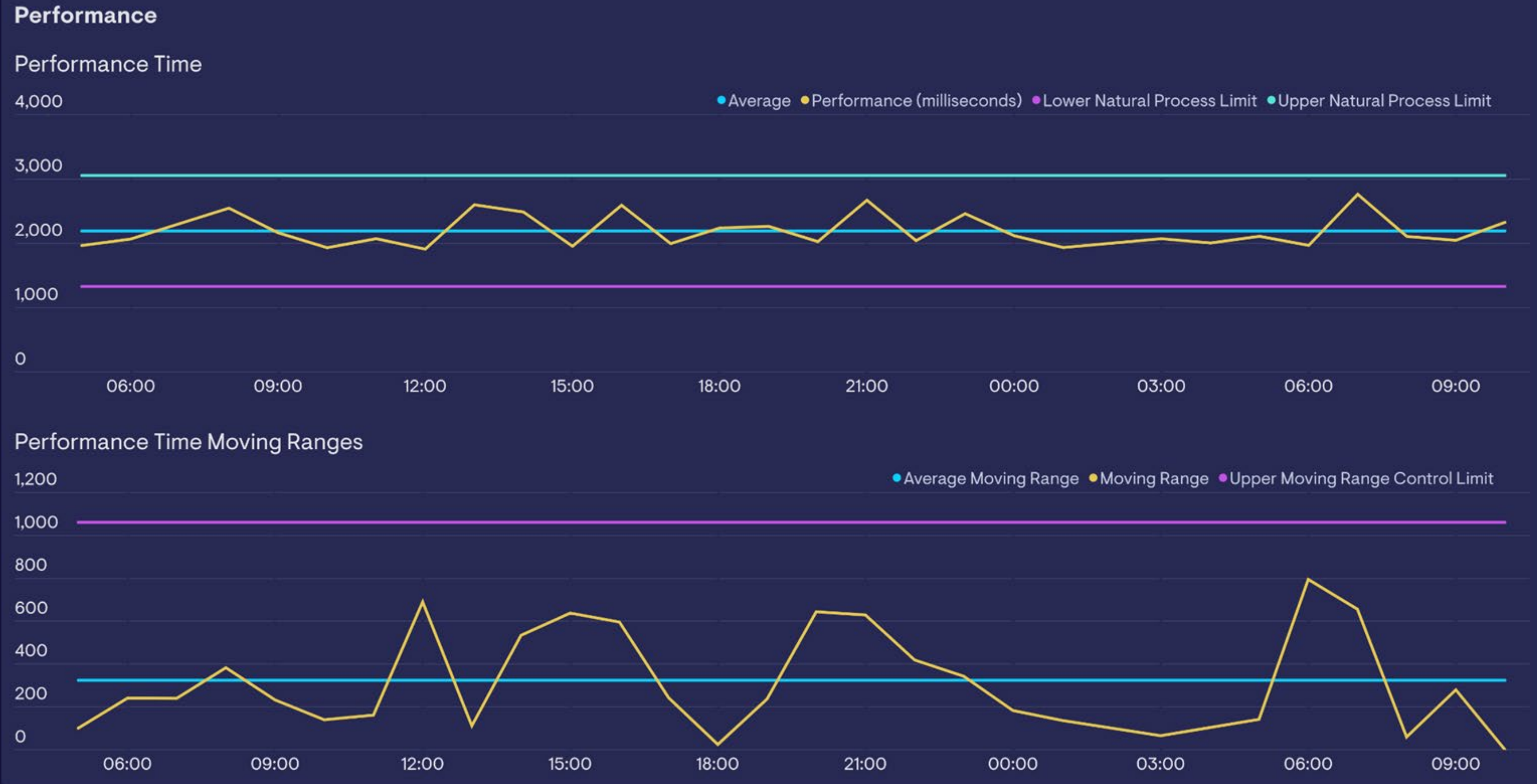
## Rule 8

Eight points in a row exist, but none within 1 standard deviation of the mean, and the points are in both directions from the mean.



Friday 16 May 1924: a new beginning for quality

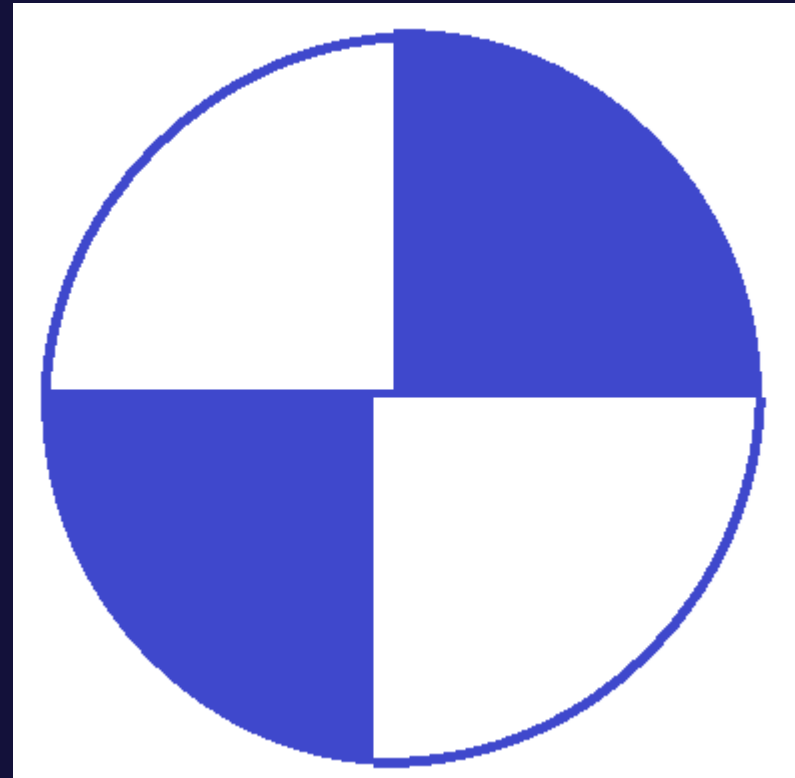
## Performance testing - statistical control





Friday 16 May 1924: a new beginning for quality

# Use PDCA to fix mistakes



- Plan
- Do
- Study
- Act



Friday 16 May 1924: a new beginning for quality

# What metrics can you use a Process Behaviour Charts for?

- Performance metrics
- Number of unit tests created per week
- Frequency of deployments
- Frequency of incidents
- And others..

 Friday 16 May 1924: a new beginning for quality

Metrics without Process Behaviour Charts can be like driving while looking in the rear view mirror



• image from <https://www.istockphoto.com/>



Friday 16 May 1924: a new beginning for quality

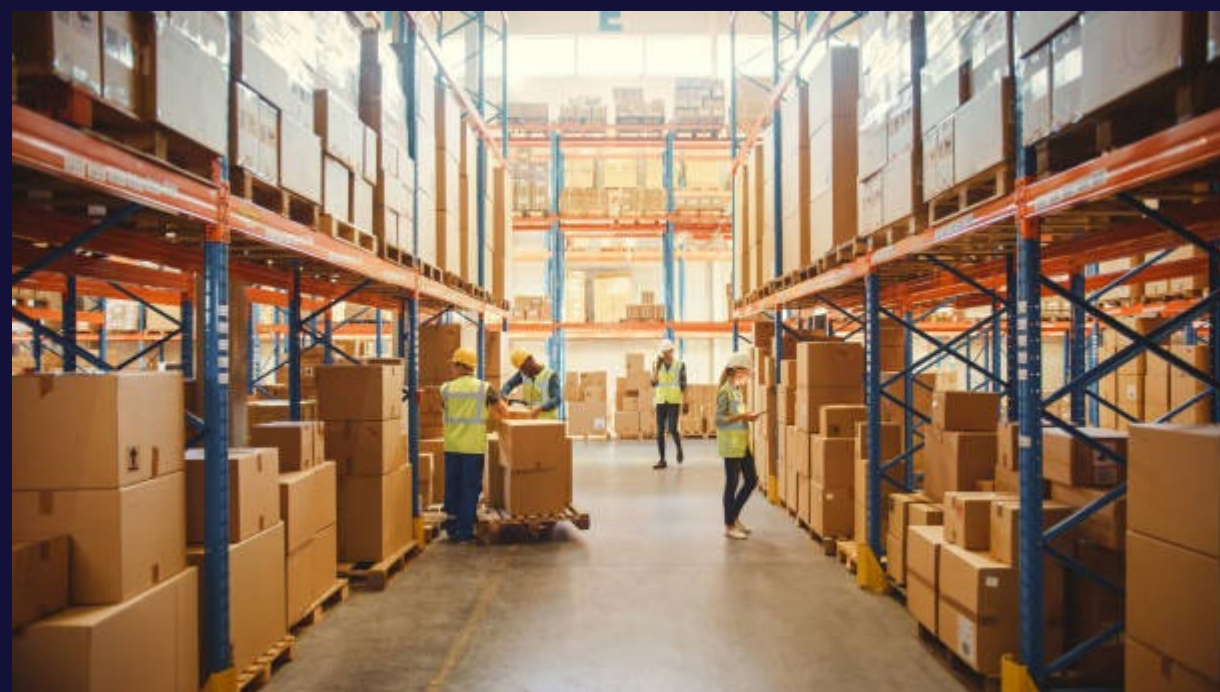
# Powerful tool for managers

- Gave managers a tool to compare variation across workers and machines
- The more managers fixed causes of errors the more products fell within the tolerance limits
- A way to continually improve quality
- A way to manage uncertainty



Friday 16 May 1924: a new beginning for quality

# Process Behaviour Charts are widely used



- images from <https://www.istockphoto.com/>

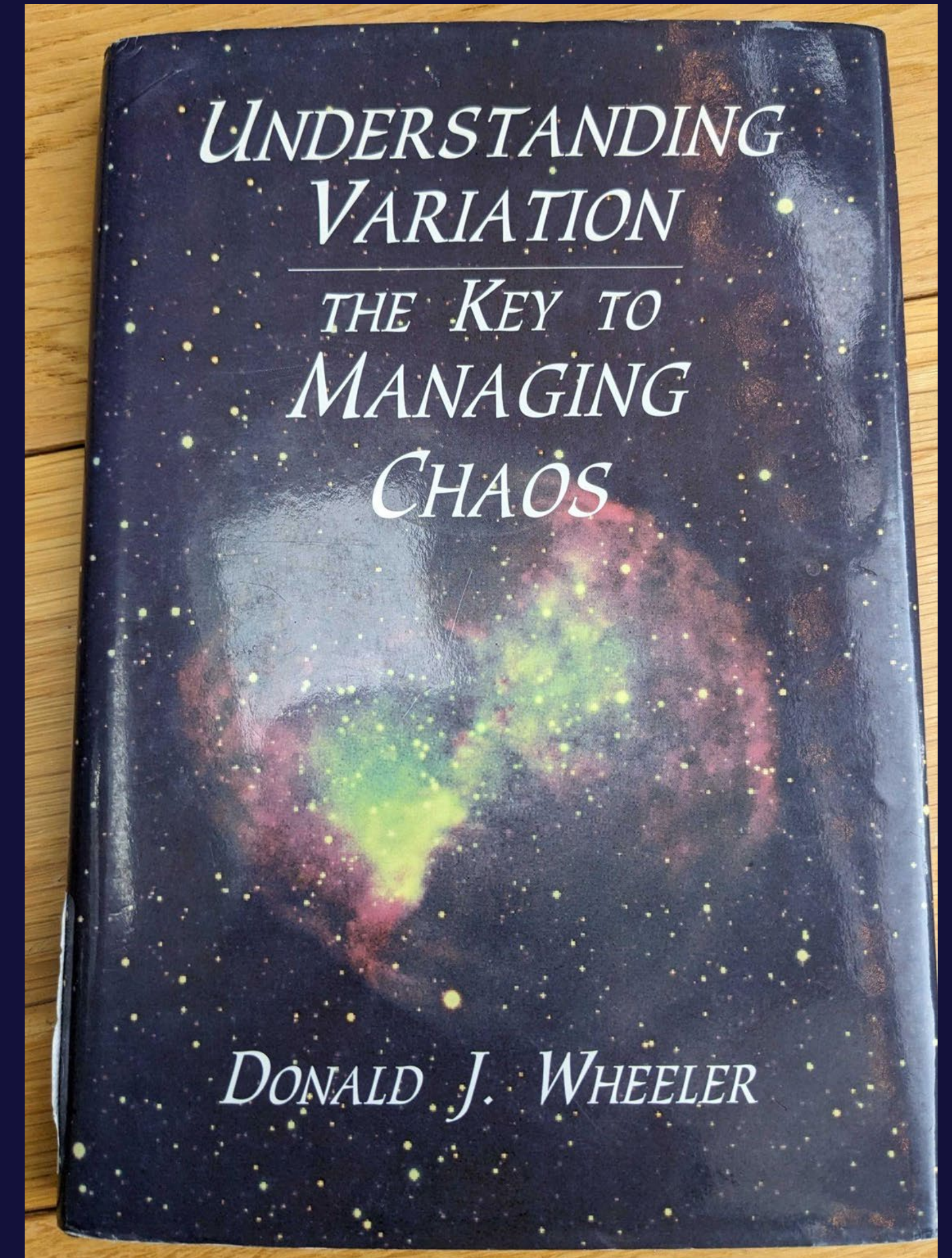




Friday 16 May 1924: a new beginning for quality

# Make your own Process Behaviour Charts

- you can use a spreadsheet template
  - <https://asq.org/quality-resources/control-chart>
- use a book:
  - Understanding Variation: The Key to Managing Chaos by Donald Wheelers
- a video:
  - Deming Profound Book Club Control Charts by Dennis Sergent
    - <https://www.youtube.com/watch?reload=9&v=eiREBemgTN4>
- “Start where it is meaningful for you” Dennis Sergent





Friday 16 May 1924: a new beginning for quality

# Conclusion

I hope that this introduction to Process Behaviour Charts encourages you to try them on your data. I am sure that you will gain insights



Friday 16 May 1924: a new beginning for quality

**Thank you,**

**Mike Harris**

**Tester at Geckoboard**

**Vice-Chair and Programme Secretary at BCS SIGiST**

**<https://mastodonapp.uk/@TestAndAnalysis>**

**<http://testandanalysis.home.blog/>**



Friday 16 May 1924: a new beginning for quality

# Quality Movement

- 1980's
  - Deming
  - Juran
  - Crosby
  - Feigenbaum



Friday 16 May 1924: a new beginning for quality

# Resources to explore Process Behaviour Charts

- a book (that contains the maths):
  - Understanding Variation: The Key to Managing Chaos by Donald Wheeler
- a video:
  - Deming Profound Book Club Control Charts by Dennis Sergent
  - <https://www.youtube.com/watch?reload=9&v=eiREBemgTN4>
- Geckoboard Datasets API
  - <https://developer.geckoboard.com/>
- a spreadsheet template
  - <https://asq.org/quality-resources/control-chart>



Friday 16 May 1924: a new beginning for quality

# The end of blame

- a tool for management to track variation
- managers can then understand variation and fix issues earlier in the process
- it should have meant no more blame!
- Drive out fear (we are still struggling with this)

 Friday 16 May 1924: a new beginning for quality

# Contrast with goals



Friday 16 May 1924: a new beginning for quality

## QA before the memo

- Products inspected at the end of the line
- sub standard products put in trash
- staff blamed



- image from <https://www.istockphoto.com/>



Why talk about Deming?





Friday 16 May 1924: a new beginning for quality

# Cheaper to produce quality than to fix

- Rework is expensive
- cheaper to 'build quality in'
- use systems thinking



How does Deming's work on quality help us?

# Why talk about Deming?

- Believed quality is central to success
- Worked with Japanese industry when Japan had a negative net worth, and helped it grow to become a global success
- “Deming is occasionally mentioned as perhaps the most important management scientist of the twentieth century, and, in my opinion, this is greatly deserved” David Anderson \*
- His ideas have influenced both agile and lean
- He is widely referred to, for example he is quoted several times in the book on Jobs Theory “Competing Against Luck”

\*Kanban: Successful Evolutionary Change for Your Technology Business



How does Deming's work on quality help us?



# Who was Deming?

Photo courtesy of The W. Edwards Deming Institute®



How does Deming's work on quality help us?

# Who was Deming?



- 1930's worked with Walter Shewhart of Bell Telephone Labs
- Primarily known for his work in Japan after World War Two
- In 1950 he was invited by the Union of Japanese Science and Engineering (JUSE) to teach statistical methods to Japanese industry
- The annual Deming Prize is the leading award for quality in Japan
- Has been called “the architect of Japan’s post World War 2 industrial transformation”
- Received the Order of the Sacred Treasure, Second Class from the Emperor of Japan



## How does Deming's work on quality help us?

- In 1980 the documentary “If Japan can... why can't we?” introduced Deming's methods to US managers
- Worked with many companies including Ford, and Proctor and Gamble
- Received the National Technology Medal from the President of the USA
- Founded the Deming Institute in 1993



How does Deming's work on quality help us?

# What is quality?

“Quality can be defined only in terms of the  
agent” \*

\*p 168 “Out of the crisis”



How does Deming's work on quality help us?

# The responsibility of top management for quality

- “It can not be delegated” \*

\*p 35 “The New Economics”





How does Deming's work on quality help us?

Improving Quality improves  
Productivity



How does Deming's work on quality help us?

# Chain Reaction:

- Improved quality
- Improves productivity
- Lowers costs
- Capture the market

Quality affects profitability



How does Deming's work on quality help us?

# Japanese Examples

- Improve quality
- Operational Definitions
- Build Quality in
- Reduce rework

# Operational Definitions





How does Deming's work on quality help us?

# An operational definition puts communicable meaning into a concept

- “Adjectives like good or reliable have no meaning until they are expressed in terms of sampling, test and criterion” \*

\* P276 “Out of the Crisis”

# The “Deming Cycle”





How does Deming's work on quality help us?

# The Deming cycle - a beginning of agile

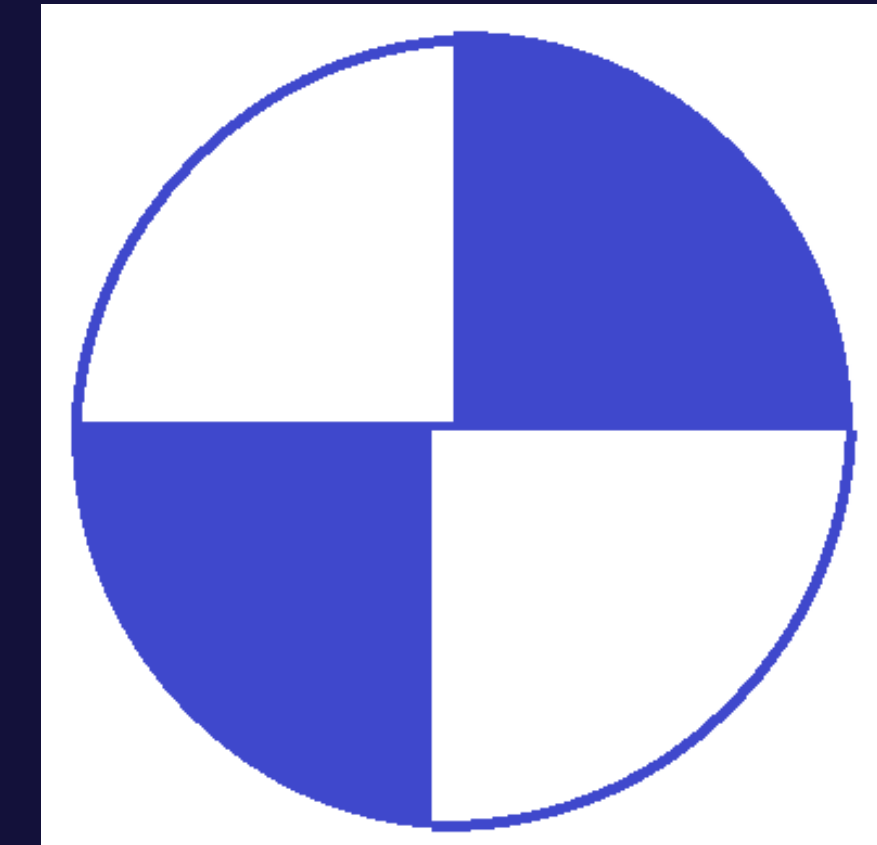
- What Deming is best known for
- An incremental and iterative development methodology
- In 1930's Walter Shewhart of Bell Labs started using Plan-Do-Study-Act (PDSA) cycles
- Deming learnt the cycle from Walter Shewhart
- Deming presented the "Shewhart cycle" in Japan in 1950
- Deming wrote about it under "continual improvement of quality"



How does Deming's work on quality help us?

# Shewhart cycle\*

- What are the most important accomplishments for the team?
- Carry out the change or test decided upon
- Observe the effects of the change or test
- Study the results what did we learn?
  
- Repeat with knowledge accumulated and onward



\*Out of the crisis p88

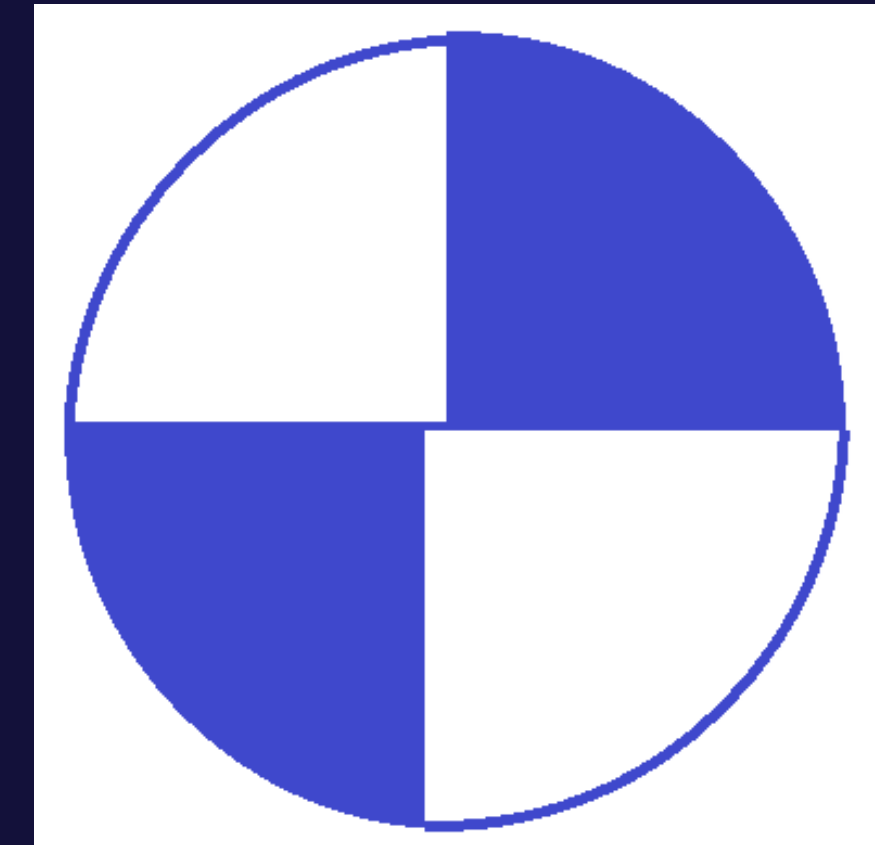




How does Deming's work on quality help us?

# Deming cycle

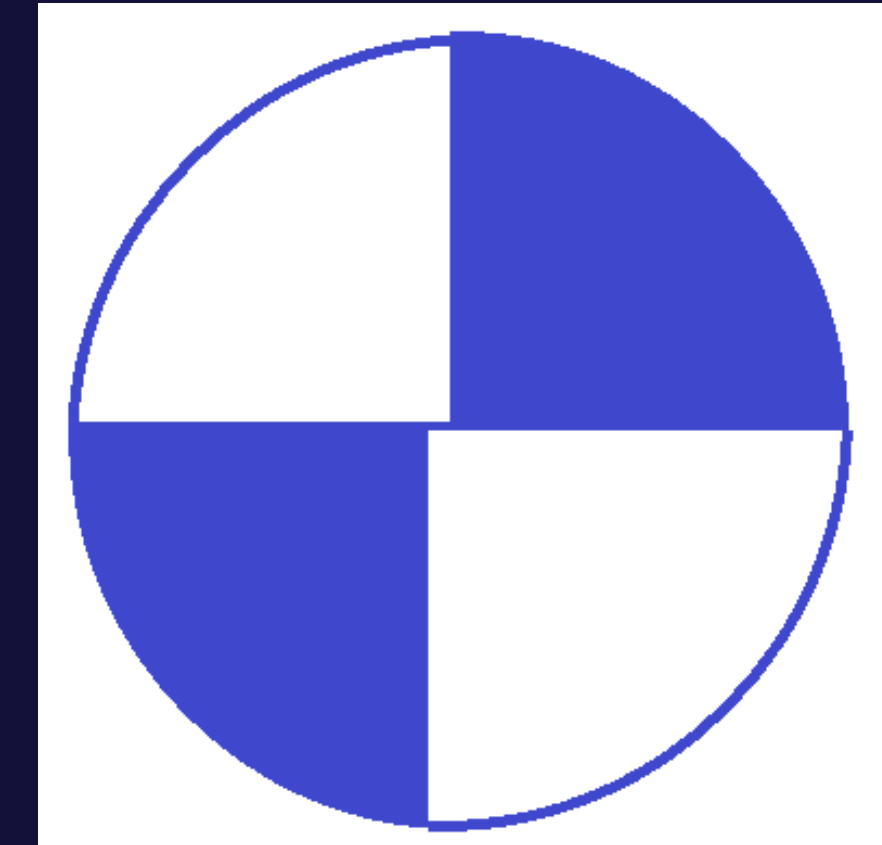
- Plan - plan what the team will do
  - Do - build and test
  - Study - What went wrong? what was right?
  - Act - change the way of working based on real results
- 
- Deming spoke about it as a wheel which rolls along the line of “concepts regarding product quality” and “sense of responsibility for product quality”





How does Deming's work on quality help us?

# Deming cycle



- The reason to study is to learn how to improve tomorrow's product
- Everyone can take part
- Everyone has a chance to contribute ideas
- Masaaki Imai said that Japanese executives recast the “Deming cycle” into the PDCA cycle \*
- The cycle has continued to evolve due to work by people such as Kaoru Ishikawa \*
- It is not unlike the cycle that Eric Ries uses in “Lean Startup”
- Also mentioned in the Toyota Way

\*Ronald D. Moen and Clifford L. Norman



How does Deming's work on quality help us?

# The Deming Cycle & Scrum

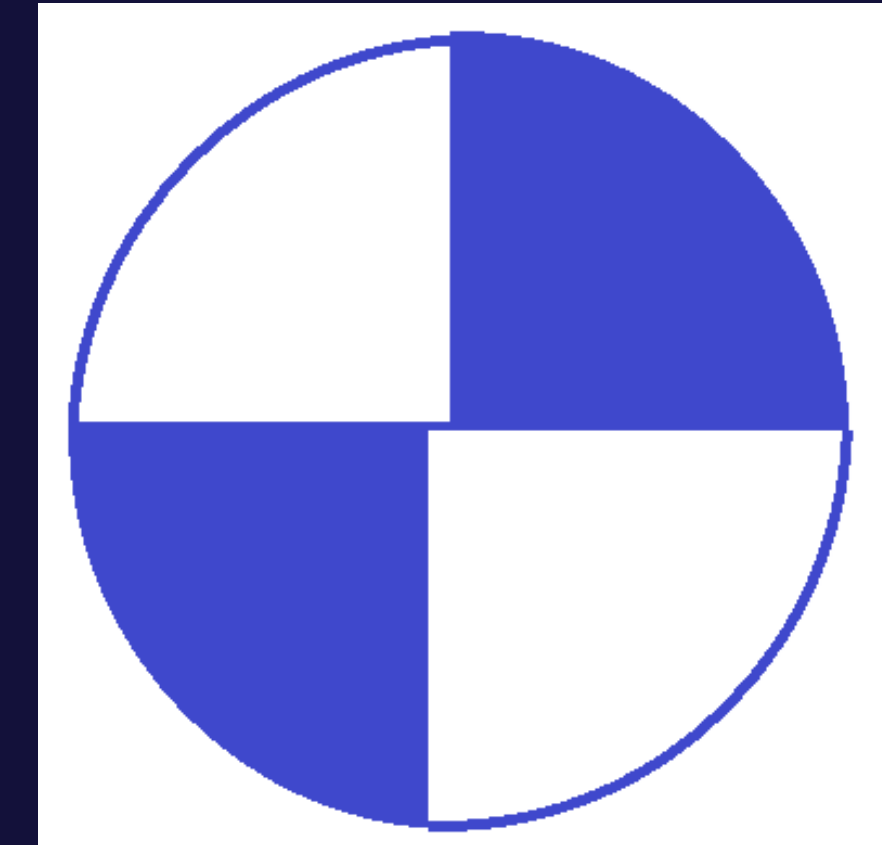
- “It’s how...Scrum product development is done” Jeff Sutherland \*
- Jeff Sutherland uses the PDCA cycle to train people to do Scrum with paper airplanes
- He found that if teams go through the cycle three times they get significantly better

\* P35 “The Art of Doing Twice the Work in Half the Time”



How does Deming's work on quality help us?

# Test automation



- I plan the test. This includes planning what functions and modules I will need, and how I will assert that the test has passed.
- I then “do” the test automation. I automate the test using my plan.
- I then study the test. I run the test and study the test results. I run the test several times, both on my workstation and in CI. I study the results to see if the test fails. If the test fails I study the test and the test result to work out why it failed.
- I then act and take the findings of my study into a new plan-do-study-act cycle and plan the fix for the failure.



How does Deming's work on quality help us?

# How The Deming Cycle Empowers Us

- If we use a PDCA cycle we can use it to learn and improve our work
- If we work in lean or agile teams the Deming Cycle is helping you
- The Deming Cycle is about continuous improvement of quality
- We can use Retrospectives to raise issues that will help us improve quality
- We should feel empowered to improve quality



How does Deming's work on quality help us?

# Deming's 14 Points for Management



How does Deming's work on quality help us?

# Deming's 14 Points for Management

- These points were the basis for lessons to top management in Japan
- Adoption of the points is a signal that management intend to stay in business
- The 14 points apply anywhere, to both small and large organisations



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.





# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.





# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.
11. Eliminate numerical quotas for the workforce and numerical goals for management.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.
11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove inhibitors to good work, and eliminate the annual rating or merit system.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.
11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove inhibitors to good work, and eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.



# Deming's 14 Points for Management

1. Create constancy of purpose for improving products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations and targets for the workforce.
11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove inhibitors to good work, and eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.
14. Put everybody in the company to work accomplishing the transformation.



# Deming's 14 Points for Management

1. The points all support one another
2. Each of the 14 points is implicit in all the others:
  - a. The way not to depend on Mass Inspection (point 3)
  - b. Is to continually improve the process (point 5)
  - c. To do that you need quality supplies (point 4)
  - d. If finding a quality supplier remember Constancy of Purpose (point 1)
3. The 14 Points are one philosophy



# An example of how we still struggle with the 14 Points

Drive out fear: Deming's Examples of fear

1. I am afraid I will lose my job
2. I am afraid that I may not always have an answer when my boss asks something
3. I am afraid to admit a mistake
4. My boss believes in fear



# How Deming's 14 Points for Management helps Us

1. This is a theory of management for the improvement of quality, productivity and competitive position \*
2. These Points provide support for creating a successful work environment
3. Deming said that management will struggle with them, and when we see management fail to meet them we see that struggle
4. If we suffer under a manager who does not try to live up to these Points, then these Points help us see the problem
5. Make us feel confident, if there is fear in the workplace then this is a management failure!
6. It illustrates how powerful his ideas were on cooperation and human potential\*\*

\*Out of the Crisis p19

\*\* Deming's Journey to Profound Knowledge p163





How does Deming's work on quality help us?

# In conclusion

# Deming's work helps us:

- A better understanding of quality
- Learning and improvement - PDSA
- Building quality in
- A framework for cooperative working and human potential including psychological safety - 14 Points



How does Deming's work on quality help us?

# References

## Books

- W. Edwards Deming "Out of the Crisis"
- W. Edwards Deming "The New Economics for Industry, Government, Education"
- W. Edwards Deming "Deming's 1950 Lecture to Japanese Management"
- Jeff Sutherland "SCRUM: The art of doing twice the work in half the time"
- David J. Anderson "Kanban"
- Womack, Jones and Roos "The Machine that changed the World"
- Gerry Weinberg "Agile impressions"
- Jeffrey K. Liker "The Toyota Way"
- Lloyd Dobyns and Clare Crawford Mason "Quality or Else: The Revolution in World Business"
- Mary and Tom Poppendieck "Lean Software Development: An Agile Toolkit"
- John Willis and Derek Lewis "Deming's Journey to Profound Knowledge"

## Articles

- Craig Larman and Victor R. Basili "[Iterative and Incremental Development: A Brief History](#)"
- Ronald D. Moen and Clifford L. Norman "[Circling Back, Clearing up myths about the Deming cycle and seeing how it keeps evolving](#)"
- John Krafcik "[Triumph of the Lean Production System](#)"



How does Deming's work on quality help us?

# A final quote from Deming:



“We are Here to Learn,  
Make a Difference and Have  
fun”

Photo courtesy of The W. Edwards Deming Institute®



# What is quality?

“Quality can be defined only in terms of the agent”