Measuring Continuous Delivery

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Continuous Delivery

“Speed is essential because there is an opportunity cost associated with not delivering software”

Dave Farley and Jez Humble

Continuous Delivery: when stability and speed can satisfy business demand

Discontinuous Delivery: when stability and speed are insufficient
Continuous Delivery

- Version Control
- Automated Configuration
- Automated Infrastructure
- Deployment Pipeline
- Trunk Based Development
- Continuous Integration
- Evolutionary Architecture
- Database Migrations
- Test Driven Development
- Acceptance & Smoke Tests
- Exploratory Testing
- Dynamic Test Data
- Monitoring and Alerting
- Canary Deployments
Continuous Delivery

- SMALL BATCH SIZE
- DEVOLVED DECISION MAKING
- SHARED INCENTIVES
- BLAMELESS POST-MORTEMS
- EVERYONE DOES ON-CALL
- CONTINUOUS CHANGE REVIEWS
- TRACEABILITY OF CHANGES
- UPSKILL EMPLOYEES
- CROSS-FUNCTIONAL TEAMS
- CONWAY’S LAW ALIGNMENT
The Improvement Kata

1. Understand the DIRECTION
   - What is our vision?

2. Grasp the CURRENT CONDITION
   - What is our current state?

3. Establish a TARGET CONDITION
   - What is our next step?

4. ITERATE towards the Target Condition

Plan  |  Do  
Act   |  Check
Continuous Delivery Measures

“Higher throughput \textit{and} higher levels of stability are possible at scale”

\textit{DevOps: Profiles in ITSM Performance and Contributing Factors}

Nicole Forsgren and Jez Humble (WDSI 2016)

Continuous Delivery improves throughput and stability in unison

Continuous Delivery leads to strong IT performance
Continuous Delivery Measures

Stability = Change Failure Rate and Failure Recovery Time

Throughput = Lead Time and Frequency
Deployment Indicators

Deployment Stability = Deployment Failure Rate and Deployment Failure Recovery Time

Deployment Throughput = Deployment Lead Time and Deployment Interval
Deployment Stability Indicator

Deployment Failure Rate

Deployment Failure Recovery Time

Version Control

Commit

Production

Branch Commit

Mainline Commit

Release Artifact

Release Success

Release Failure
Deployment Throughput Indicator

Diagram showing the process from Version Control to Commit to Production, highlighting Deployment Lead Time and Deployment Interval.
The Government Dept – 60 teams
The Government Dept – 60 teams
Deployment Indicators

- Deployment Stability = Deployment Failure Rate (<= 5%)
- Deployment Throughput = Deployment Lead Time (<= 7 days)
- Deployment Failure Recovery Time (<= 1 day)
- Deployment Interval (<= 14 days)
Deployment Stability Indicator

Version Control

Commit

Integration Testing

Performance Testing

Production

Branch Commit

Mainline Commit

Release Artifact

Release Success

Release Failure

0 vs. 10%

0 vs. 5 days

FAIL

FAIL
Deployment Stability - Team Apples

Deployment Failure Rate [\%] vs Time

- Deployment Failure Rate
- Median Deployment Failure Recovery Time
- Std dev Deployment Failure Recovery Time

Time:
- Jan
- Feb
- Mar
- Apr
- May
- Jun

Deployment Failure Recovery Time [Days]

- 0%
- 20%
- 40%
- 60%
- 80%
- 100%
Deployment Stability - Apples

Deployment Stability - Team Apples

Deployment Failure Recovery Time improved from 9 days to 0

Deployment Failure Rate improved from 20% to 0%
Deployment Throughput Indicator

Version Control

Commit

Integration Testing

Performance Testing

Production

Branch Commit

Mainline Commit

Release Artifact

Release Success

Release Failure

1 vs. 12 days

5 vs. 21 days

1 vs. 12 days
Deployment Throughput - Bananas
Deployment Throughput - Bananas

Deployment Interval regressed from 3 days to 14 days
Build Indicators

Build Stability = Build Failure Rate = Build Throughput

and

Build Failure Recovery Time = Build Lead Time = Build Interval
Build Stability Indicator

- Build Failure Rate
- Build Failure Recovery Time
Build Throughput Indicator

Version Control

Commit

Build Lead Time

Build Interval

Branch Commit

Mainline Commit

Release Artifact

FAIL Build Failure
Build Indicators

Build Stability = Build Failure Rate \leq 1\% and Build Failure Recovery Time \leq 0\ hours

Build Throughput = Build Lead Time \leq 0\ hours and Build Interval \leq 24\ hours
Build Stability Indicator

Version Control → Commit

FAIL

0 vs. 19%

0 vs. 4 hours

Branch Commit → Mainline Commit → Release Artifact → Build Failure
Build Stability – Grapes

Build Stability - Team Grapes

- **Build Failure Rate**
- **Median Build Failure Recovery Time**
- **Stdev Build Failure Recovery Time**

![Graph showing build stability metrics over time](image)
Build Stability – Grapes

Build Stability - Team Grapes

- Build Failure Rate
- Median Build Failure Recovery Time
- Stdev Build Failure Recovery Time

Build Failure Recovery Time near-static at 10 hours
Build Throughput Indicator

Version Control

Commit

0 hours

2 hours vs. 2 days

Branch Commit Mainline Commit Release Artifact Build Failure

FAIL
Build Throughput - Oranges

Build Throughput - Team Oranges
- Median Build Lead Time
- Stdev Build Lead Time
- Median Build Interval
- Stdev Build Interval

Hours

Time

Jan  Feb  Mar  Apr  May  Jun
Build Interval improved from 4 days to 28 hours... then regressed to 4 days
Code Indicator

Code Throughput = Mainline Commit Lead Time and Mainline Commit Interval
Code Throughput Indicator

Version Control

Mainline Commit Lead Time

Mainline Commit Interval

Branch Commit  Mainline Commit
Code Indicators

\[ \text{Code Throughput} = \text{Mainline Commit Lead Time} \leq 0 \text{ hours} \quad \text{and} \quad \text{Mainline Commit Interval} \leq 24 \text{ hours} \]
Code Throughput Indicator

Version Control

0 hours

2 hours vs. 5 days

Branch Commit

Mainline Commit
Code Throughput – Pears

Code Throughput - Team Pears

- Median Mainline Lead Time
- Stdev Mainline Lead Time
- Median Mainline Interval
- Stdev Mainline Interval

Hours:
- Jan: 150
- Feb: 300
- Mar: 450
- Apr: 600
- May: 600
- Jun: 750

Time: Jan, Feb, Mar, Apr, May, Jun

Graph shows the trend of code throughput over time with different performance metrics.
Code Throughput – Pears

Mainline Commit Interval increased from 4 to 27 days!

Mainline Commit Lead Time increased from 0 to 34 hours!
The Government Dept – 60 teams
Summary

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The what, why, and how of measuring Continuous Delivery

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