

THE SCIENCE OF LEAN SOFTWARE AND DEVOPS

ACCELERATE

Building and Scaling High Performing
Technology Organizations



Nicole Forsgren, PhD
Jez Humble *and* Gene Kim

IT Revolution
Portland, Oregon

PDF COMPANION TO THE AUDIO BOOK



25 NW 23rd Pl, Suite 6314

Portland, OR 97210

Copyright © 2018 by Nicole Forsgren, Jez Humble, and Gene Kim.

Chapter 16 Copyright © 2018 by Karen Whitley Bell and Steve Bell,

Lean IT Strategies, LLC.

All rights reserved, for information about permission

To reproduce selections from this book, write to

Permissions, IT Revolution Press, LLC, 25 NW 23rd Pl, Suite 6314, Portland, OR 97210

First Edition

Printed in the United States of America

22 21 20 19 18 1 2 3 4 5 6

Cover and book design by Devon Smith Creative, LLC

Library of Congress Catalog-in-Publication Data is available upon request.

ISBN: 978-1942788331

eBook ISBN: 978-194278355

Kindle ISBN: 978-194278362

Web PDF ISBN: 978-194278379

Publisher's note to readers: Although the authors and publisher have made every effort to ensure that the information in this book is correct, the authors and publisher do not assume and hereby disclaim any liability to any party for any loss, damage, or disruption caused by errors or omissions, whether such errors or omissions result from negligence, accident, or any other cause.

For information about special discounts for bulk purchases or for information on booking authors for an event, please visit our website at www.ITRevolution.com.

ACCELERATE

Figures

2.1	Software Delivery Performance	1
2.2	Year over Year Trends: Tempo	2
2.3	Year over Year Trends: Stability	3
2.4	Impacts of Software Delivery Performance	4
3.1	Likert-Type Questions for Measuring Culture	4
3.2	Westrum Organizational Culture's Outcomes	5
3.3	Westrum Organizational Culture's Drivers	5
4.1	Drivers of Continuous Delivery	6
4.2	Impacts of Continuous Delivery	6
4.3	Continuous Delivery Makes Work More Sustainable	7
4.4	New Work vs. Unplanned Work	7
5.1	Deploys per Developer per Day	8
7.1	Components of Lean Management	8
7.2	Impacts of Lean Management Practices	9
8.1	Components of Lean Product Management	9
8.2	Impacts of Lean Product Management	10
9.1	Impacts of Technical and Lean Practices on Work Life	11
10.1	Impacts of Technical and Lean Practices on Identity	11
10.2	Impacts of Technical and Lean Practices on Job Satisfaction	12
10.3	Gender Demographics in 2017 Study	13
10.4	Underrepresented Minority Demographics in 2017 Study	14
11.1	Impacts of Transformational Leadership on Technical and Lean Capabilities	15

12.1	Spurious Correlation: Per Capita Cheese Consumption and Strangulation by Bedsheets	15
16.1	Leadership Obeya (360-Degree Panorama)	16
16.2	ING's New Agile Organizational Model Has No Fixed Structure—It Constantly Evolves	17
16.3	Stand-up and Catchball Rhythm	18
16.4	High-Performance Team, Management, and Leadership Behaviors and Practices	19
A.1	Overall Research Program	20
B.1	Firmographics: Organization Size, Industry, Number of Servers in 2017	22

Tables

2.1	Design vs. Delivery	23
2.2	Software Delivery Performance for 2016	23
2.3	Software Delivery Performance for 2017	24
3.1	Westrum's Typology of Organizational Culture	24
13.1	Westrum's Typology of Organizational Culture	25
B.1	Manual Work Percentages	25

Software Delivery Performance

Lead Time

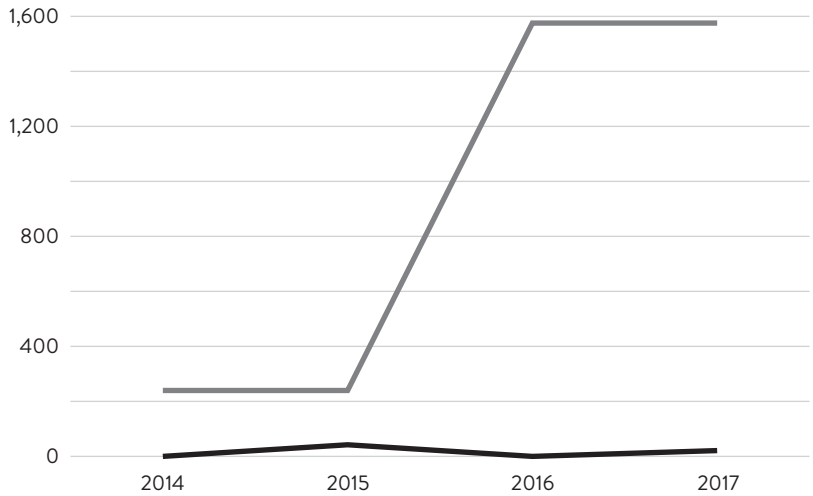
Deployment Frequency

Mean Time to Restore (MTTR)

Change Fail Percentage

Figure 2.1: Software Delivery Performance

DEPLOY FREQUENCY (# OF DEPLOYS PER YEAR)



CHANGE LEAD TIME (MINUTES)

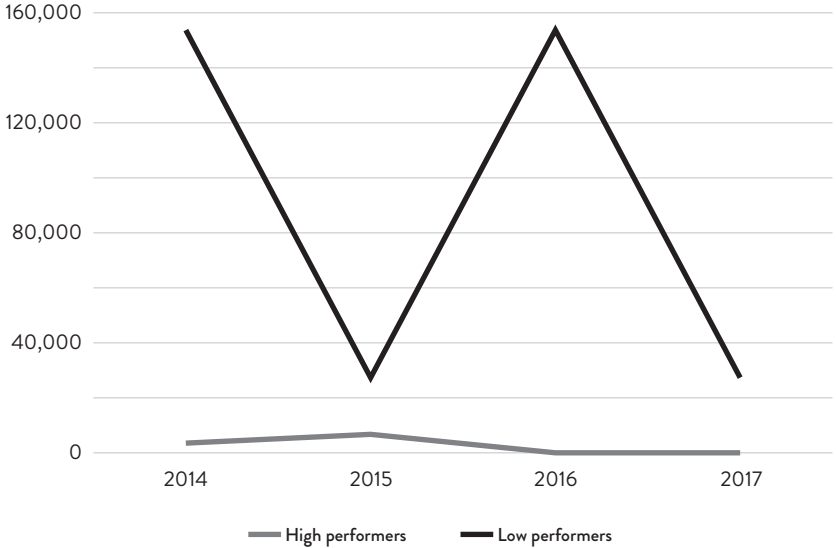


Figure 2.2: Year over Year Trends: Tempo

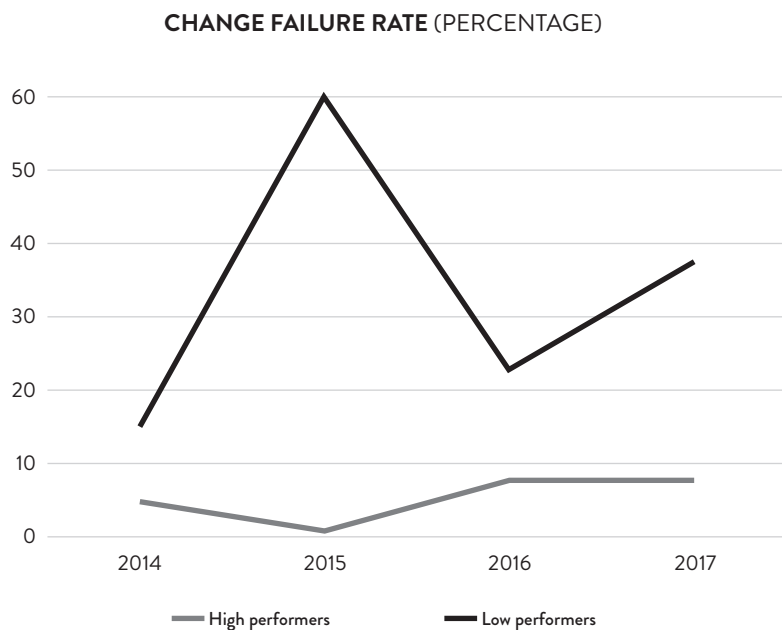
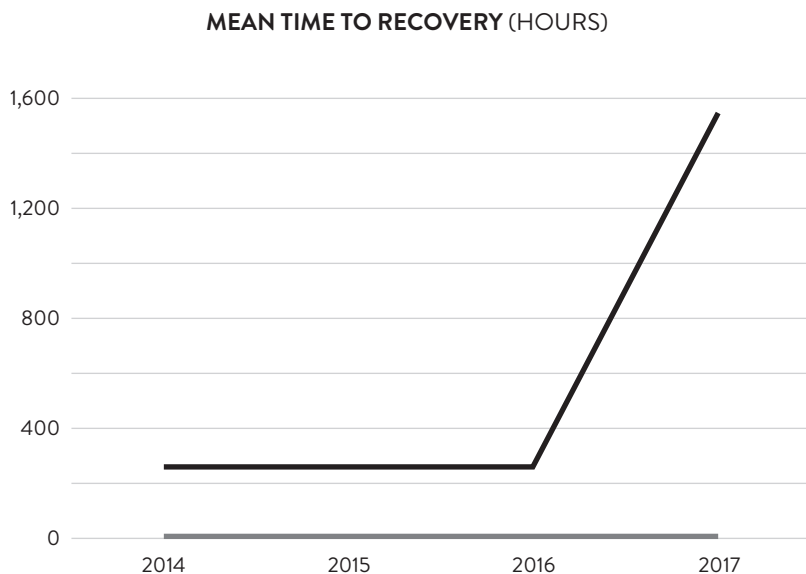


Figure 2.3: Year over Year Trends: Stability

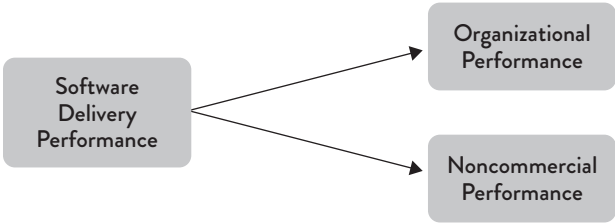


Figure 2.4: Impacts of Software Delivery Performance

	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
Information actively sought.	☐	☐	☐	☐	☐	☐	☐
Messengers are not punished when they deliver news of failures or other bad news.	☐	☐	☐	☐	☐	☐	☐
Responsibilities are shared.	☐	☐	☐	☐	☐	☐	☐
Cross-functional collaboration is encouraged and rewarded.	☐	☐	☐	☐	☐	☐	☐
Failure causes inquiry.	☐	☐	☐	☐	☐	☐	☐
New ideas are welcomed.	☐	☐	☐	☐	☐	☐	☐
Failures are treated primarily as opportunities to improve the system.	☐	☐	☐	☐	☐	☐	☐

Figure 3.1: Likert-Type Questions for Measuring Culture

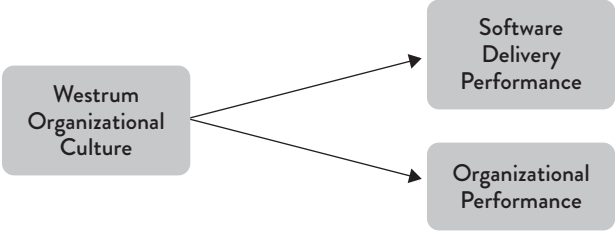


Figure 3.2: Westrum Organizational Culture’s Outcomes

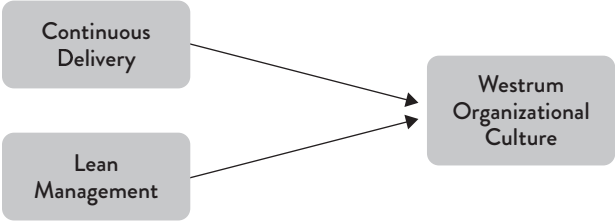


Figure 3.3: Westrum Organizational Culture’s Drivers

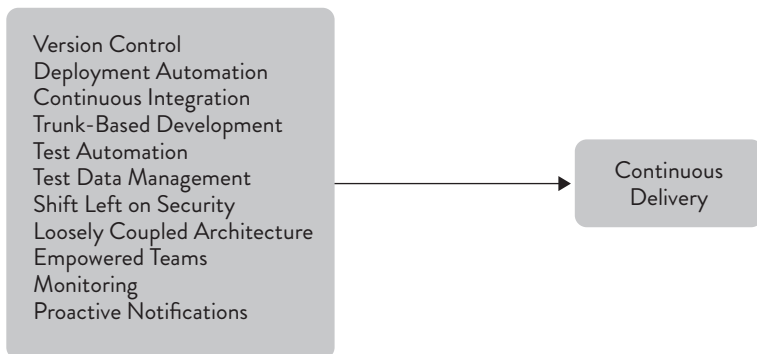


Figure 4.1: Drivers of Continuous Delivery

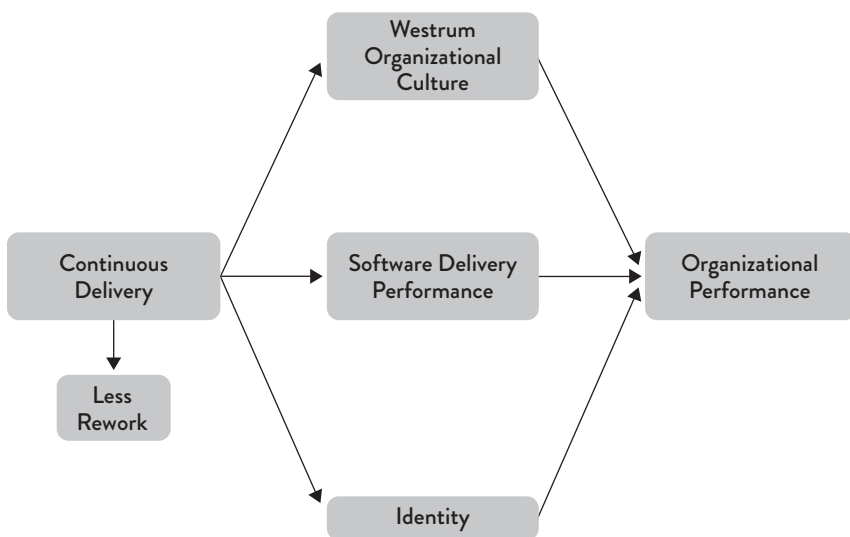


Figure 4.2: Impacts of Continuous Delivery

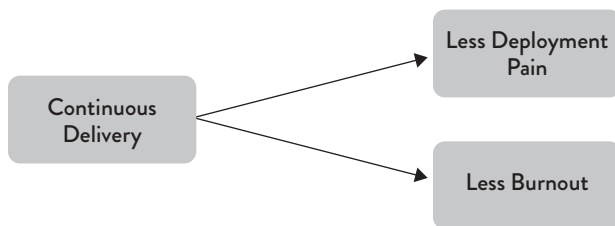


Figure 4.3: Continuous Delivery Makes Work More Sustainable

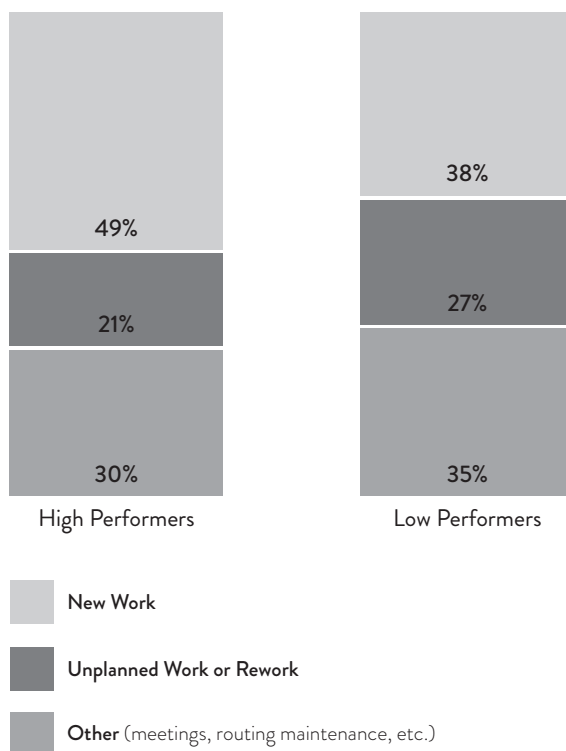


Figure 4.4: New Work vs. Unplanned Work

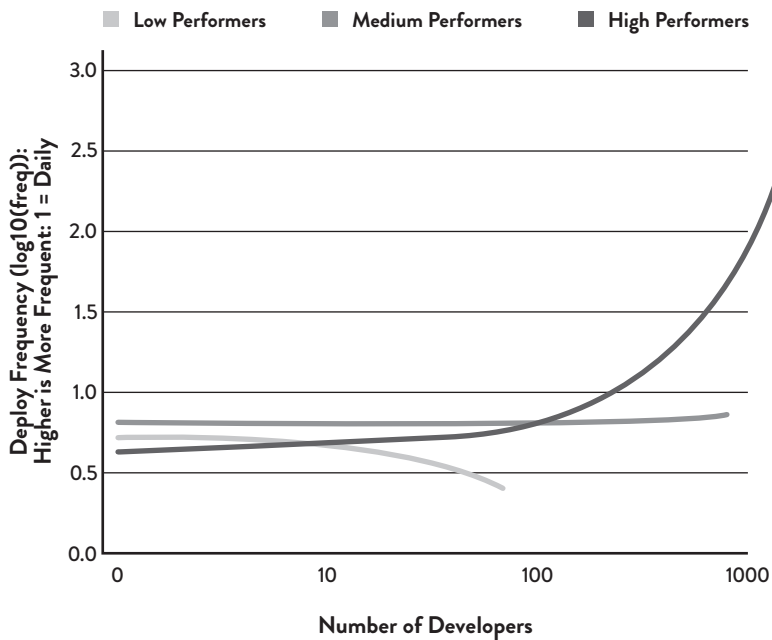


Figure 5.1: Deploys per Developer per Day

Lean Management

- Limit Work in Progress (WIP)
- Visual Management
- Feedback from Production
- Lightweight Change Approvals

Figure 7.1: Components of Lean Management

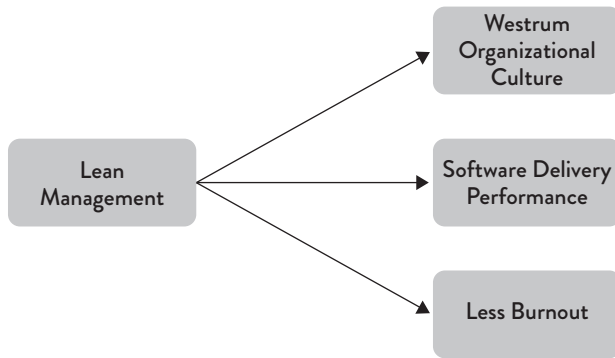


Figure 7.2: Impacts of Lean Management Practices

Lean Product Development

Work in Small Batches
Make Flow of Work Visible
Gather & Implement Customer
Feedback
Team Experimentation

Figure 8.1: Components of Lean Management

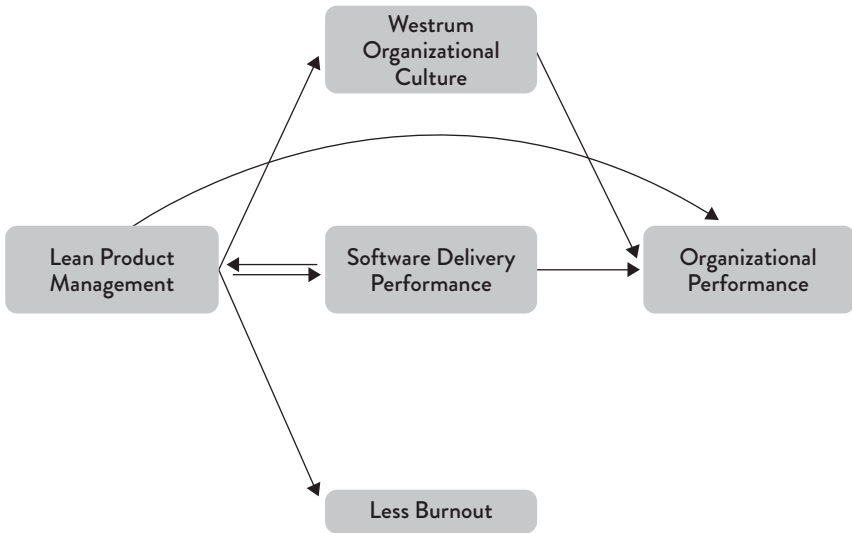


Figure 8.2: Impacts of Lean Product Management

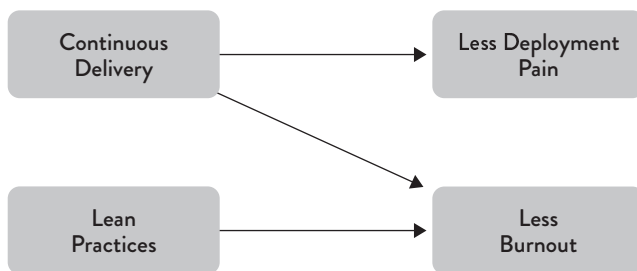


Figure 9.1: Impacts of Technical and Lean Practices on Work Life

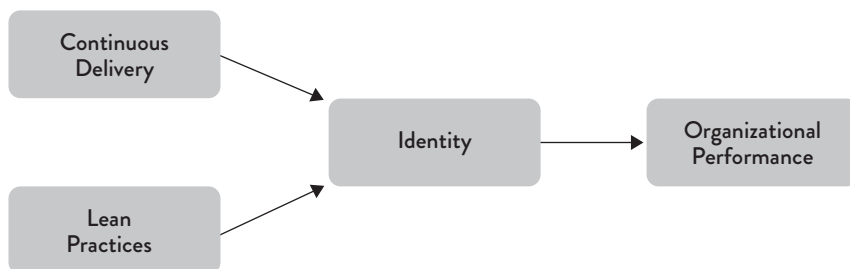


Figure 10.1: Impacts of Technical and Lean Practices on Identity

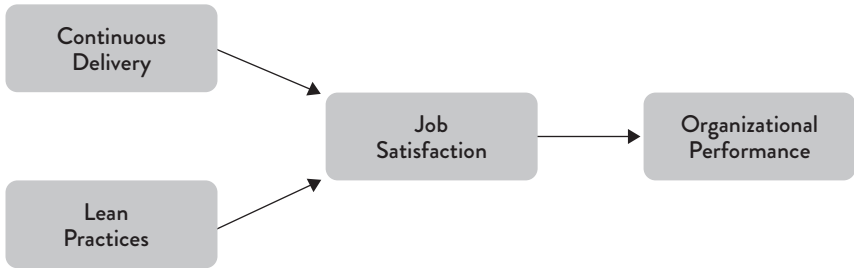


Figure 10.2: Impacts of Technical and Lean Practices on Job Satisfaction

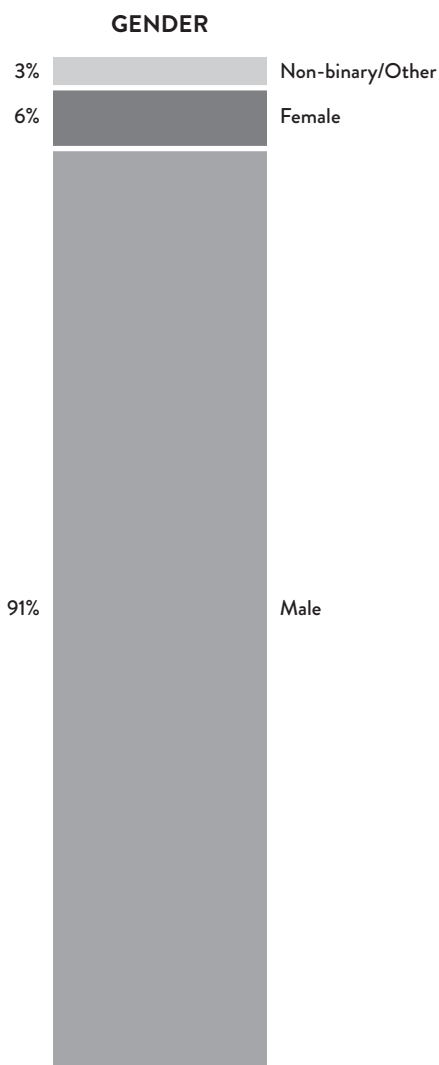


Figure 10.3: Gender Demographics in 2017 Study

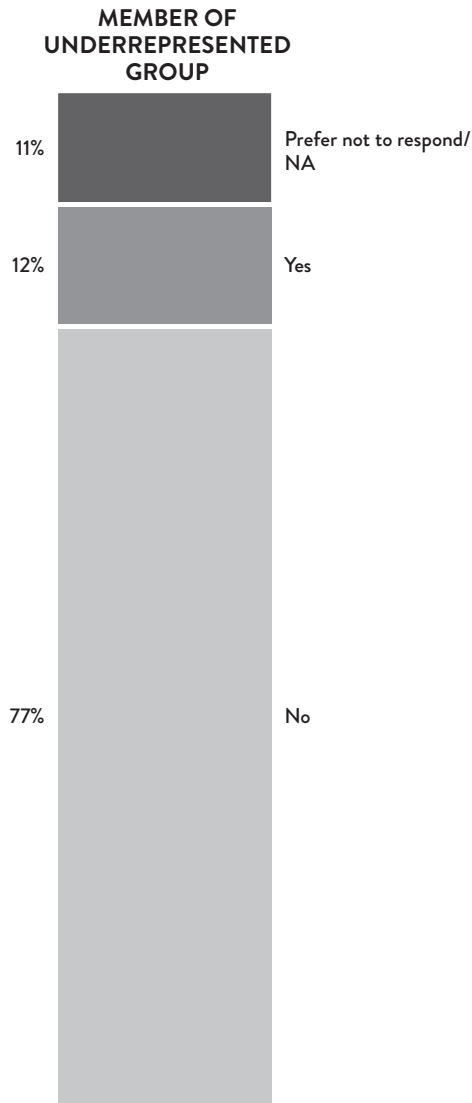


Figure 10.4: Underrepresented Minority Demographics in 2017 Study

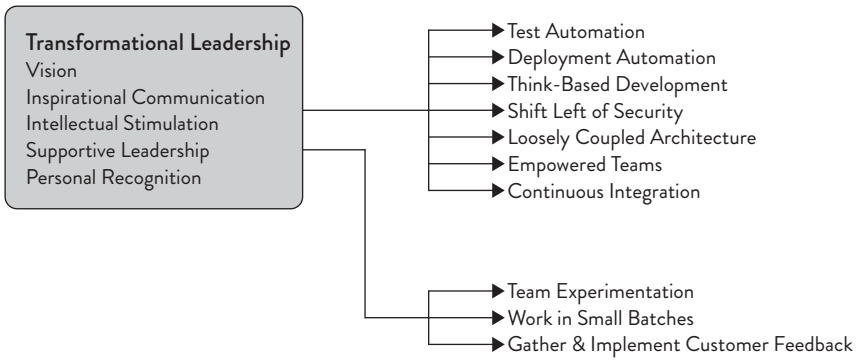


Figure 11.1: Impacts of Transformational Leadership on Technical and Lean Capabilities

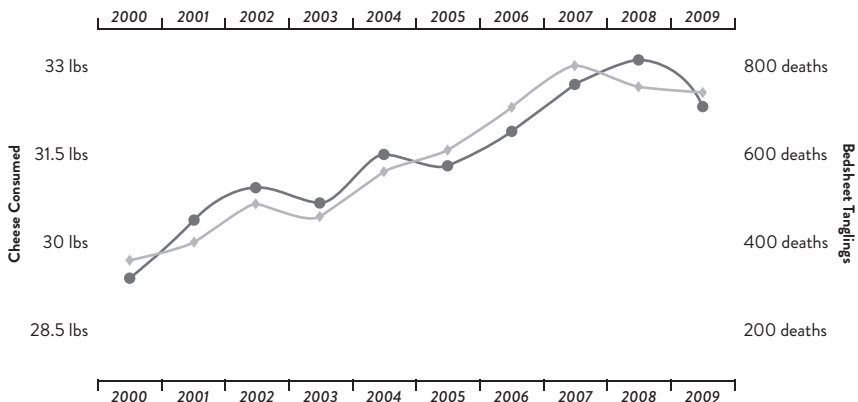
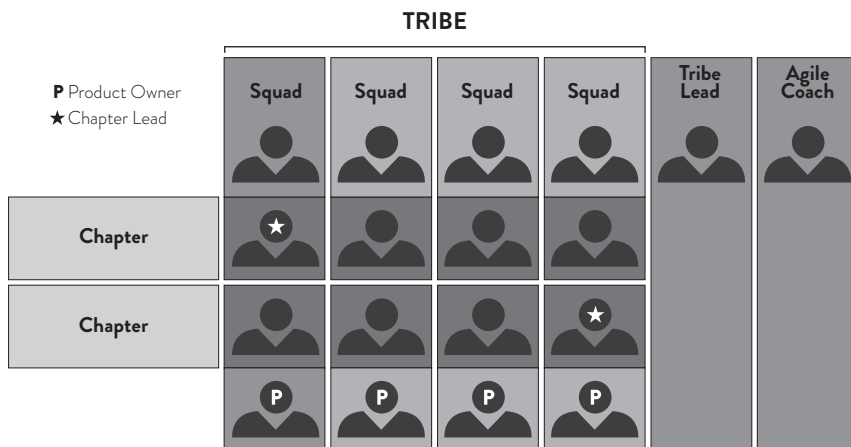


Figure 12.1: Spurious Correlation: Per Capita Cheese Consumption and Strangulation by Bedsheets



Figure 16.1: Leadership Obeya (360-Degree Panorama)



Tribe

(collection of squads with interconnected missions)

- Includes on average 150 people
- Empowers tribe lead to establish priorities, allocate budgets, and form interface with other tribes to ensure knowledge/insights are shared

Agile coach

- Coaches individual and squads to create high-performing teams

Squad

(basis of new Agile organization)

- Includes no more than 9 people; is self-steering and autonomous
- Comprises representatives of different functions working in single location
- Has end-to-end responsibility for achieving client-related objective
- Can change functional composition as mission evolves
- Is dismantled as soon as mission is executed

Product owner

(squad member, not its leader)

- Is responsible for coordinating squad activities
- Manages backlog, to-do lists, and priority setting

Chapter

(develops expertise and knowledge across squads)

Chapter lead

- Is responsible for one chapter
- Represents hierarchy for squad members (re: personal development, coaching, staffing, and performance management)

Figure 16.2: ING's New Agile Organizational Model Has No Fixed Structure—It Constantly Evolves. (Source ING)

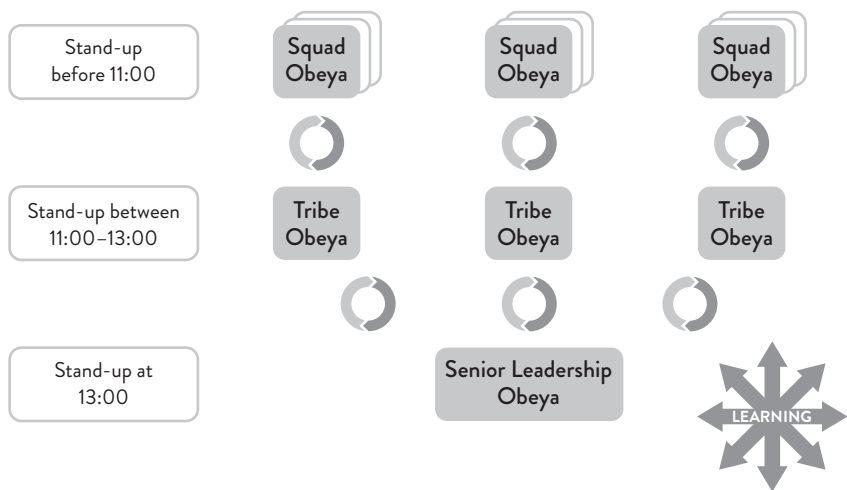


Figure 16.3: Stand-up and Catchball Rhythm

	Team Practices	Management Practices	Leadership Practices
Culture	*Foster generative culture	*Foster generative culture	*Foster generative culture
	*Build quality in, continuously measure and monitor	*Focus on quality, protect teams to ensure quality	*Focus on quality, protect teams to ensure quality
	Focus on promoting organizational learning	Focus on promoting organizational learning	Focus on promoting organizational learning
		*Provide teams with time for improvement and innovation	*Provide teams with time for improvement and innovation
Organizational Structure			*Align, measure, and manage to flow (matrixed, cross-functional value stream organization structure)
		Establish small, cross-functional, multi-skilled teams; support bridging structures so teams can easily communicate and collaborate	Enable and support cross-skilling to reduce expert dependent bottlenecks and form communities of expertise
			Establish and support internal coaches and the appropriate infrastructure to scale and sustain them
Direct Learning and Alignment to Value	*Engage, learn from, and validate with customers (Gemba)	*Engage with and learn from customers and teams (Gemba)	*Engage with and learn from customers, teams, supply chain partners, and other stakeholders (Gemba)
	*Understand & visualize customer value, identify measurable targets for quality	*Understand & visualize customer value, identify measurable targets for quality	
	*Practice creativity as part of overall work	*Practice creativity as part of over-all work, encourage team members to utilize this time to learn and innovate	*Budget for and allocate time for creativity (i.e., Google's 20% target)
Strategy Deployment	*Visualize team goals and targets, understand how these targets advance enterprise strategy	Help teams to set and visualize goals and targets, understand and communicate how these targets advance enterprise strategy (catchball)	Practice strategy deployment, visualize all goals and near-term targets, communicate this clearly to managers and help them set appropriate targets and initiatives
	*Actively monitor and visualize performance to goals/targets	*Actively monitor and visualize performance to goals/targets	*Actively monitor and visualize performance to goals/targets
			Eliminate unnecessary controls, invest instead in process quality and team autonomy and capability (*teams that reported no approval process or used peer review achieved higher software delivery performance)

Figure 16.4: High-Performance Team, Management, and Leadership Behaviors and Practices (not a complete list, for a larger, downloadable version visit <https://bit.ly/high-perf-behaviors-practices>)

continued on next page

	Team Practices	Management Practices	Leadership Practices
Improve Flow Through Analysis and Disciplined Problem Solving	Visualize & analyze workflow, identify obstacles to flow, (process/ value stream mapping & analysis); *understand the connection between the work they do and its positive impact on customers	Visualize and analyze workflow, identify obstacles to flow, (process/ value stream mapping & analysis), help teams understand how they support larger value stream	Visualize and analyze overall value stream flows (enterprise architecture), identify systemic obstacles to flow, prioritize and support mapping and analysis of lower-level supporting flows
	Prioritize obstacles to customer value and experience, and team targets and goals	Prioritize obstacles to customer value and experience, and team targets and goals	Prioritize systemic obstacles to flow
	Apply disciplined problem solving to prioritized problems, analyze to identify root causes	Apply disciplined problem solving to prioritized problems, analyze to identify root causes	Apply disciplined problem solving to complex systemic issues to identify strategic improvement themes and targets (strategy deployment), apply learning to update standard work
	Escalate cross-functional and systemic problems	Coordinate cross-functional problem solving, solve or escalate systemic problems	Cascade prioritized problem solving targets to the appropriate stakeholders through catchball PDCA
	Form hypotheses about root causes, design and conduct controlled experiments, measure results, communicate learnings, repeat if needed, incorporate improvements	Form hypotheses about root causes, design and conduct controlled experiments, measure results, communicate learnings, repeat if needed, incorporate improvements	Learn from organization-wide PDCA cycles, and repeat learning/ improvement cycles
Way of Work, Rhythm, & Routine	*Visualize, measure, and monitor workflow, monitor for deviations, respond to deviations appropriately	*Visualize, measure, and monitor workflow, monitor for deviations, respond to deviations appropriately	*Visualize, measure, and monitor workflow, monitor for deviations, respond to deviations appropriately
	*Break demand into small elements (MVP's) and release regularly and often		
	*Visualize demand, WIP, and "done" (kanban)	*Visualize demand, WIP, and "done" (kanban)	*Visualize demand, WIP, and "done" (kanban)
	*Minimize and visualize WIP	*Minimize and visualize WIP	*Minimize and visualize WIP
	Prioritize demand to goals and targets	Prioritize demand to goals and targets	Prioritize demand to goals and targets
	Develop & practice team standard work (rhythm & routine)	Develop & practice team standard work (rhythm & routine)	Develop & practice team standard work (rhythm & routine)
	Conduct daily stand-ups with standard routine, escalate obstacles as needed (catchball)	Conduct daily stand-ups with team leads, standard routine, resolve or bridge/escalate obstacles as needed (catchball)	Conduct stand-ups with direct reports with standard routine on a regular cadence, resolve escalated obstacles (catchball)
	Support team and peer learning	Coach team members; support team learning	Coach managers, have your own coach
	Conduct regular cadence of retrospectives (work and way of work)	Conduct regular cadence of retrospectives (work and way of work)	Conduct regular cadence of retrospectives (work and way of work)

Figure 16.4, cont.: High-Performance Team, Management, and Leadership Behaviors and Practices (not a complete list, for a larger, downloadable version visit <https://bit.ly/high-perf-behaviors-practices>)

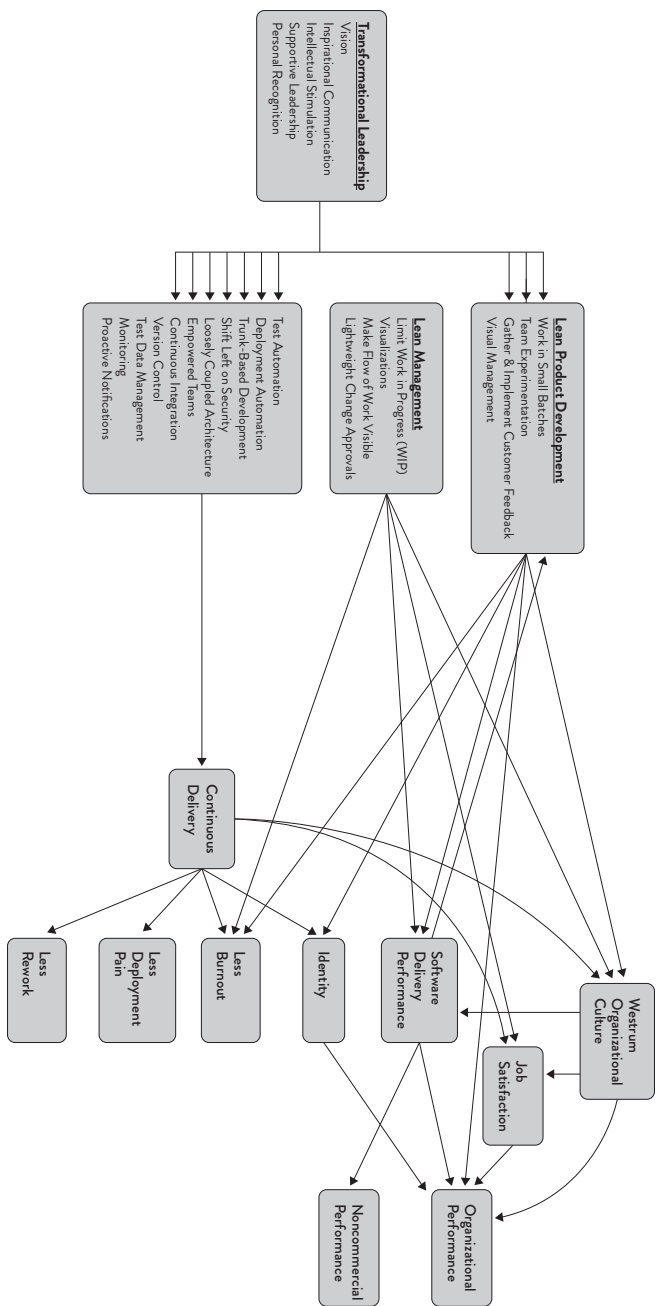


Figure A.1: Overall Research Program

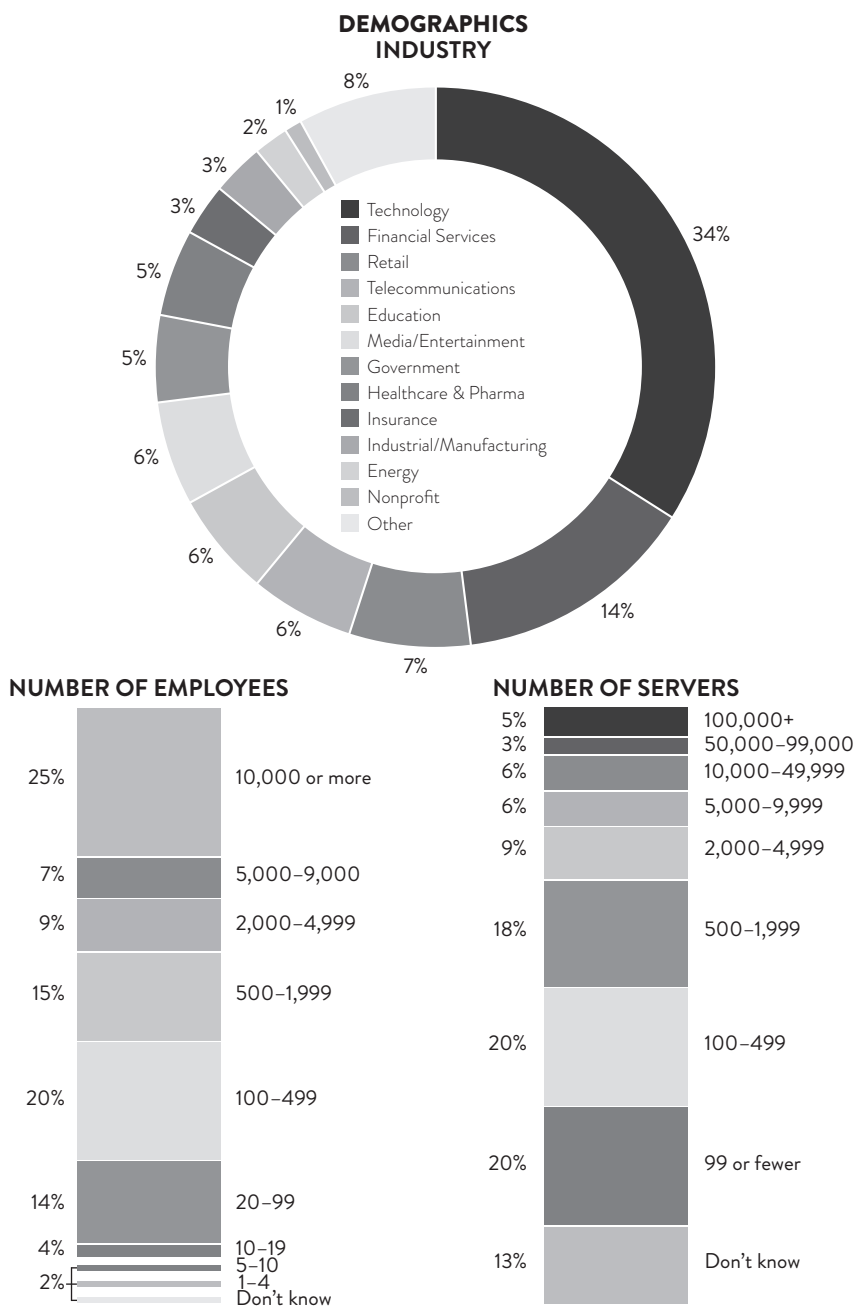


Figure B.1: Firmographics: Organization Size, Industry, Number of Servers in 2017

Product Design and Development	Product Delivery (Build, Testing, Deployment)
Create new products and services that solve customer problems using hypothesis-driven delivery, modern UX, design thinking.	Enable fast flow from development to production and reliable releases by standardizing work, and reducing variability and batch sizes.
Feature design and implementation may require work that has never been performed before.	Integration, test, and deployment must be performed continuously as quickly as possible.
Estimates are highly uncertain.	Cycle times should be well-known and predictable.
Outcomes are highly variable.	Outcomes should have low variability.

Table 2.1 Design vs. Delivery

2016	High Performers	Medium Performers	Low Performers
Deployment Frequency	On demand (multiple deploys per day)	Between once per week and once per month	Between once per month and once every six months
Lead Time for Changes	Less than one hour	Between one week and one month	Between one month and six months
MTTR	Less than one hour	Less than one day	Less than one day*
Change Failure Rate	0–15%	1–45%	6–30%

Table 2.2 Software Delivery Performance for 2016

2017	High Performers	Medium Performers	Low Performers
Deployment Frequency	On demand (multiple deploys per day)	Between once per week and once per month	Between once per week and once per month*
Lead Time for Changes	Less than one hour	Between one week and one month	Between one week and one month*
MTTR	Less than one hour	Less than one day	Between one day and one week
Change Failure Rate	0–15%	0–15%	31–45%

**Low performers were lower on average (at a statistically significant level) but had the same median as the medium performers.*

Table 2.3 Software Delivery Performance for 2017

Pathological (Power-Oriented)	Bureaucratic (Rule-Oriented)	Generative (Performance-Oriented)
Low cooperation	Modest cooperation	High cooperation
Messengers “shot”	Messengers neglected	Messengers trained
Responsibilities shirked	Narrow responsibilities	Risks are shared
Bridging discouraged	Bridging tolerated	Bridging encouraged
Failure leads to scapegoating	Failure leads to justice	Failure leads to inquiry
Novelty crushed	Novelty leads to problems	Novelty implemented

Table 3.1 Westrum’s Typology of Organizational Culture

Pathological (Power-Oriented)	Bureaucratic (Rule-Oriented)	Generative (Performance-Oriented)
Low cooperation	Modest cooperation	High cooperation
Messengers “shot”	Messengers neglected	Messengers trained
Responsibilities shirked	Narrow responsibilities	Risks are shared
Bridging discouraged	Bridging tolerated	Bridging encouraged
Failure leads to scapegoating	Failure leads to justice	Failure leads to enquiry
Novelty crushed	Novelty leads to problems	Novelty implemented

Table 13.1 Westrum’s Typology of Organizational Culture

Manual Work	High Performers	Medium Performers	Low Performers
Configuration management	28%	47%*	46%*
Testing	35%	51%*	49%*
Deployments	26%	47%	43%
Change approval process	48%	67%	59%

**Differences are not statistically significant between medium and low performers for configuration management and testing.*

Table B.1 Manual Work Percentages