

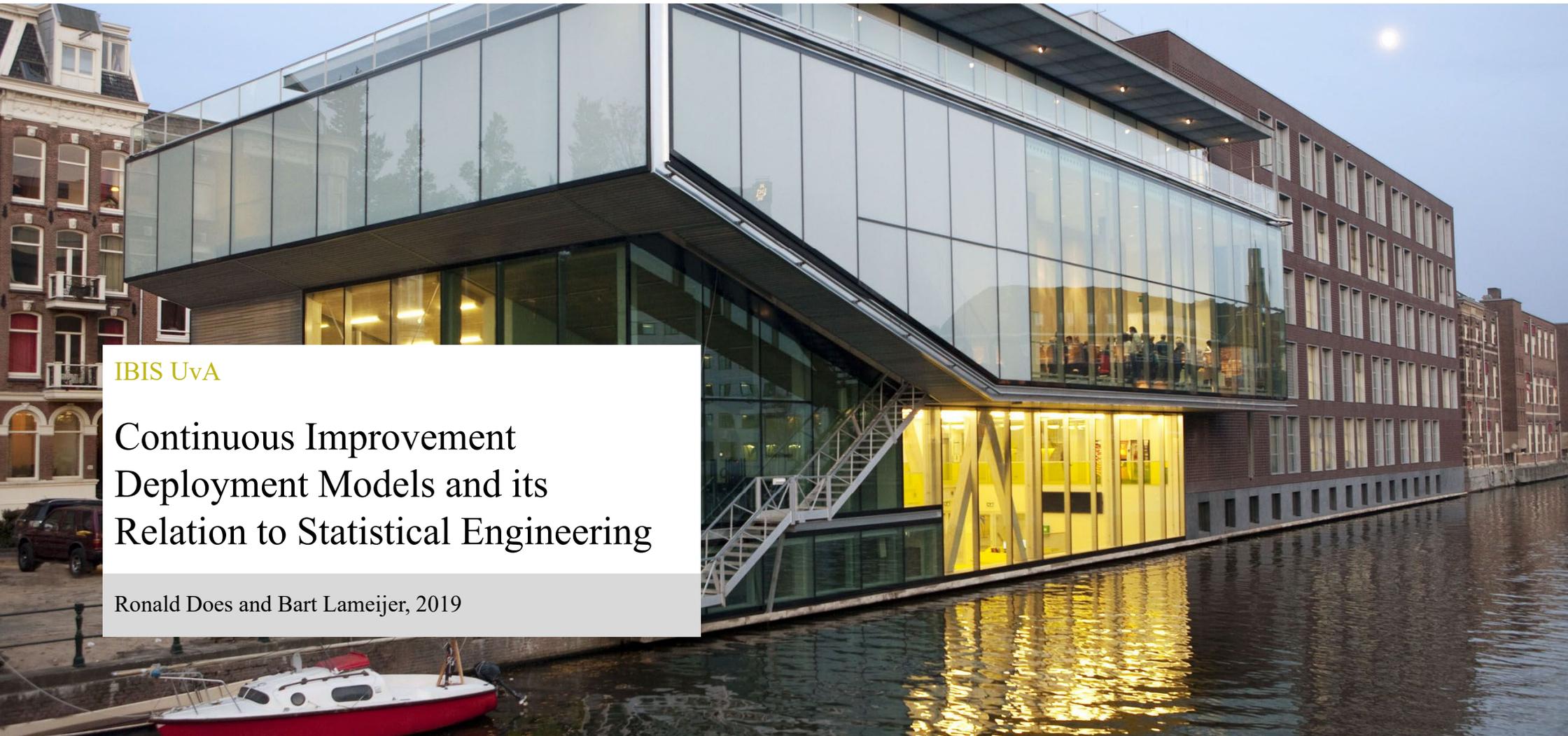


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## Continuous Improvement Deployment Models and its Relation to Statistical Engineering

Ronald Does and Bart Lameijer, 2019





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- Master in Mathematics and PhD in Mathematical Statistics from the University of Leiden
- Worked for Mathematical Centre, University of Maastricht and Philips Electronics as a Statistician
- Founded IBIS UvA in 1994 and became director
- Research interests are in the field of industrial statistics, with a specific focus on control charts, healthcare engineering and operational excellence.
- Teaches in Executive Education (LSS / MBA) and UvA Bachelor and Master programs (Quantitative Methods / Operational Excellence)



## Bart Lameijer

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- Master in Business Administration from Tilburg University
- Worked for ABN AMRO Bank and Deloitte as Operational Excellence consultant
- Joined IBIS UvA part-time in 2014 for PhD program and full-time in 2018 as Assistant Professor
- Research interests are management of CI implementation processes, process improvement, and project implementation
- Teaches in Executive Education (LSS / MBA) and UvA Bachelor and Master programs (Operational Excellence)



# Objectives and agenda

1. Introduction
2. PhD thesis of Bart Lameijer
3. Lessons learned
4. Deployment models
5. Generic deployment model
6. Future research



# Why is research on implementing Lean Six Sigma relevant?

You have successfully executed some LSS projects and decide to start more projects:

- More people become involved
- Tougher problems are solved
- Visible contribution to organizational strategy



## Academic motive

Many studies have established the LSS methodology as a strong operations improvement discipline

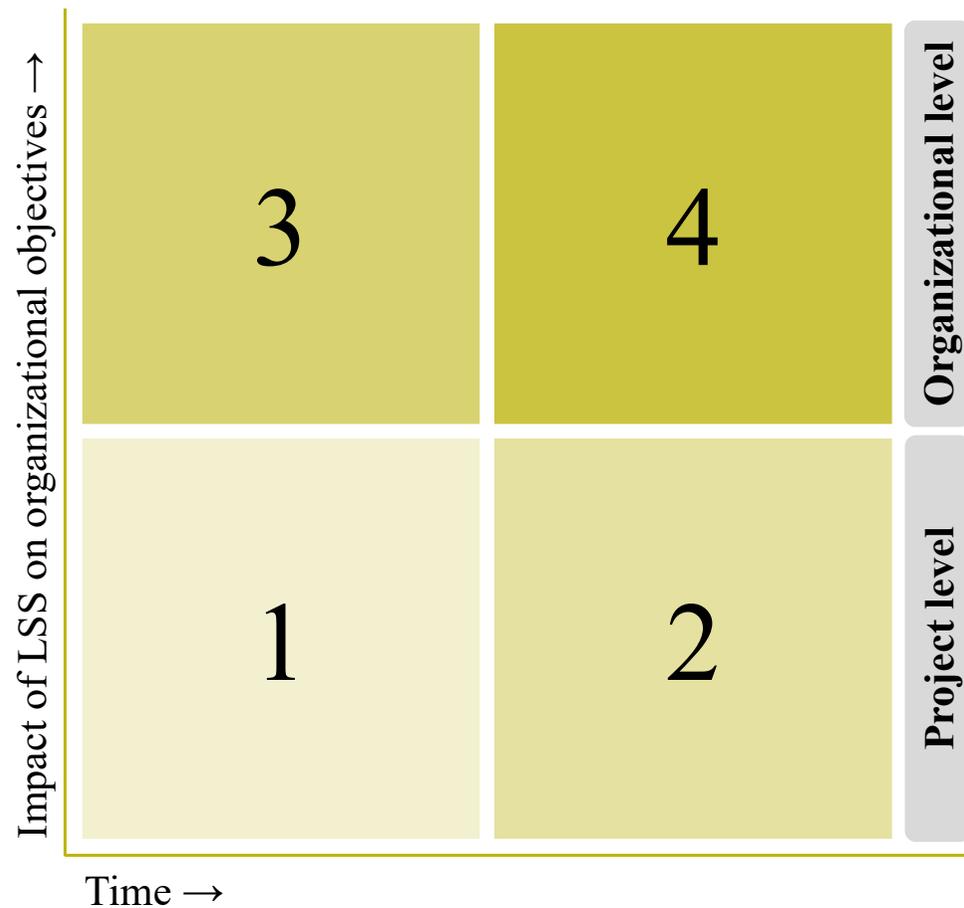
*Nevertheless;*

- LSS studies mostly focused on project methodology and performance gains

*Leaving open;*

- How to best manage LSS implementation at the project level;
- How to best manage LSS implementation at the organizational level

# Typology of Lean Six Sigma implementation research



## Questions we seeked to answer

- 4 How does a LSS implementation process unfold?
- 3 What is the quality and usefulness of LSS implementation models?
- 2 How is attitude towards LSS projects determined?
- 1 What are common generic LSS project definitions?

# Studies into Lean Six Sigma implementation and adoption



## 1. Perceptions of Lean Six Sigma in the Financial Services sector (case-study)

Lameijer, B.A., Veen, D.T., Does, R.J.M.M., & De Mast, J. (2016). Perceptions of Lean Six Sigma: A multiple case study in the financial services industry. *Quality Management Journal*, 23(2), 29-44.



## 2. Generic Lean Six Sigma project definitions (secondary data analysis)

Lameijer, B.A., Does, R.J.M.M., & De Mast, J. (2016). Inter-industry generic Lean Six Sigma project definitions. *International Journal of Lean Six Sigma*, 7(4), 369-393.

## 3. Various examples of Lean Six Sigma implementation

- Increasing the First Time Fix Rate in a customer contact center (case-study)

Zwetsloot, I.M., Buitenhuis, M., Lameijer, B.A., & Does, R.J.M.M. (2015). Quality Quandaries: increasing the first time fix rate in a customer contact center. *Quality Engineering*, 27(3), 393-400.

- Improving a customer value stream at a financial service provider (case-study)

Kuiper, A., van de Hoef, R., Wesseling, M., Lameijer, B. A., & Does, R. J. (2016). Quality Quandaries: Improving a customer value stream at a financial service Provider. *Quality Engineering*, 28(1), 155-163.

- Discussion on Lean Six Sigma for the public sector (commentary)

Lameijer, B.A., Zwetsloot, I.M., & Does, R.J.M.M. (2018). Discussion of “Quality and statistical thinking in a parliament and beyond”. *Quality Engineering*, 30(1), 27-33.



# Studies into Lean Six Sigma implementation and adoption



## 4. Review of Lean Six Sigma deployment and maturity models (review study)

Lameijer, B.A., De Mast, J., & Does, R.J.M.M. (2017). Lean Six Sigma Deployment and Maturity Models: A Critical Review. *Quality Management Journal*, 24(4), 6-20.



## 5. Process of Six Sigma implementation (process study)

De Mast, J., Lameijer, B.A., Linderman, K., & Van de Ven, A. The process of implementing six sigma: programmatic change or a transformational learning process?  
*Submitted for publication*



## 6. CI deployment models: a review and propositions for future research (review study)

Lameijer, B.A., Does, R.J.M.M., Antony, J. & Boer, H. (2019), "Continuous improvement deployment models: A reconciliation and holistic metamodel", Submitted for publication.



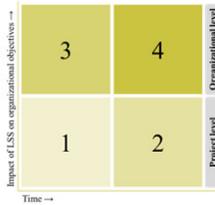
## 7. A systematic literature review of project failure (review study)

Lameijer, B.A., Antony, J., Borgman, H. & Linderman, K. (2019). Process improvement project failure: a systematic literature review and future research directions  
*Submitted for publication.*

# How to implement Lean Six Sigma in organizations?

## What are the key lessons learned on implementing LSS in organizations?

1. There is not one right way to implement LSS in organizations.
2. Be clear about the objective of the LSS implementation.
3. Establish a clear connection between the execution of LSS projects and realization of the organizations strategic goals.
4. Empower.
5. Prepare organizational learning mechanism.
6. Anticipate and do not shy away from radical organizational changes in the LSS implementation process.



# Continuous improvement deployment

**What constitutes successful CI deployment?**

**What percentage of CI deployments are successful?**

**Why are CI deployments failing?**

# Although much debated, many CI deployments fail

## Introduction

- CI deployment in organizations creates management task
- CI theory and associated literature propose a variety of guidance for the deployment process
- Despite the available guidance, high CI deployment failure rates are

## Purpose

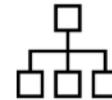
- To integrate the existing knowledge captured in CI deployment models
- To compare knowledge captured in CI deployment models
- Identify areas for future research.
- Distil meta-CI deployment model

# Therefore existing CI deployment models are reviewed



## Data collection

- CI deployment models are collected
- Inclusion criteria:
  - (1) objective is to provide guidance on the CI deployment process,
  - (2) presence of a sequence of CI deployment steps or activities and
  - (3) differentiation between phases or levels of maturity



## Research framework

1.1. Time (phases in CI deployment)	Level 5: CI capability							
	Level 4: Proactive CI							
	Level 3: Goal oriented CI							
	Level 2: Structured CI							
	Level 1: Pre CI	2.1. Exemplary cell						
		Structure	Strategy	Systems	Style	Staff	Skills	Shared Values
		1.2. Organizational dimensions (themes in CI deployment)						

**3.1. Count** of models that address the “level 1 – structure” dimension

**3.2. Readiness factors** before engaging in the phase, e.g. critical resources or presence of tangible organizational success factors

**3.3. Activities**, methods and tools to be deployed, e.g. train staff and management or install certain performance indicators

**3.4. Sustainability results** to test, for before engaging in the next phase, that function as a *feedback mechanism* indicating progress in the organizational change or learning process, e.g. observable key behaviors and measurable results that ensure sustainability

**3.5. Evidence of the CI deployment model** assessed on a three point scale based on the quality of the evidence

# An integrated view on CI deployment is created

- Total of 269 coded observations from 17 deployment models

Source	Empirical	Theoretical	Experience	Total	
Academic publications	3		1	4	23%
Practitioner publications		1	7	8	47%
Textbook publications			5	5	30%
<b>Total</b>	<b>3</b>	<b>1</b>	<b>13</b>	<b>17</b>	<b>100%</b>
	18%	6%	76%		

## Illustrative results section

Organizational dimension:		Structure					Strategy					Systems					Style					Staff					Skills					Values					Total:
CI deployment source / Phase <sup>1</sup> :		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Academic publications	1) A conceptual model for the successful deployment of LSS (Hilton & Sohal, 2012)	RF:				•									•																			5			
		ACT:																																-			
		SR:																																-			
	2) Six Sigma implementation framework for SME's (Kumar et al. 2011)	RF:										•	•									•	•	•	•									11			
		ACT:																																	-		
		SR:																																	1		
Academic publications	3) Combining Lean and Six Sigma for optimal results (Cudney et al. 2006)	RF:																																-			
		ACT:																																	8		
		SR:																																-			
Academic publications	4) An evolutionary model of continuous improvement behavior (Bessant et al. 2001)	RF:																																11			
		ACT:																																-			
	SR:																																		6		

- **Academic publications:** focus on end state (level 5) or a few phases, on dimensions systems, style and staff and addresses readiness factors, activities and sustainability
- **Practitioner publications:** focus on all phases, guidance on broader range of organizational dimensions, addresses readiness factors and activities (maturity levels)
- **Textbook publications:** focus on a few phases, on dimensions strategy, systems, style, staff, skills and shared values and addresses mostly readiness factors and activities (maturity levels)

# Continuous improvement deployment model

A guiding holistic model for CI deployment separating readiness factors (RF), activities (AC) and sustainability factors (SF) for seven organizational dimensions and five phases

Phase	Dimension	RF	AC	SF		
Phase 1 <i>Preparing for continuous improvement</i>	Values	-Culture and values understood -Prior change initiatives experience analyzed	-Execute cultural assessment -Identify key cultural imperatives			
	Skills	-Act of knowledge sharing is widely ingrained -CI methodology selected and formalized -Organizational change consulting ensured				
	Staff	-CI staff selected and CI methodology trained -First-mover CI enthusiasts identified -Strategic HR planning designed	-Execute CI methodology awareness training -Identify needed resources and CI core team -Engage key influencers in organization -Install frequent CI communication	-Human resource retainment is ensured		
	Style	-Limited leadership alignment ensured -Train leadership on methods and leadership -Install CI sponsor and CI executive council				
	Systems	-Initial CI projects results are visible -(Accounting) system and process data identified -CI deployment processes designed (projects)	-Create detailed CI deployment plan -Create CI deployment processes (infrastructure)			
	Strategy	-Strategic priorities and strategy understood -Underperforming business area selected -Current attitude towards CI analyzed -Investment in CI deployment secured -Initial CI projects and CI metrics selected				
	Structure	-Execute current state self-assessment -Create organizational CI vision and objectives -Identify CI deployment progress gaps				
	Phase 2 <i>Foundational continuous improvement</i>	Values	-CI program and core-team full-time engaged -Execute cultural assessment (continued) -Identify key cultural imperatives (continued)			
		Skills	-Process performance data incidentally collected -Basic problem solving CI methodology applied -Capability to evaluate change process ensured	-Commence specific CI practice development		
		Staff	-CI staff methodology- and project leader trained -Participation by staff more intrinsically driven -Growing awareness by results achieved -Strategic HR performance planning designed	-Select and train CI project leaders continuously -Install CI resources and CI core team -Engage CI staff in shaping deployment -Recognize and actively manage resistance	-CI- and organizational staff moderately engaged	
		Style	-Moderate leadership alignment ensured -Leadership's CI understanding ensured -CI sponsor and CI executive installed	-Ensure strong top management commitment -Link CI deployment to mission, vision and values		
		Systems	-Leadership's 3-5 yr. deployment plan defined -Aggregate progress and impact report designed -Role of financial accounting identified -End-to-end processes and owners installed -CI idea- and result recognition installed -CI project process closure formalized	-Refine CI deployment plan -Create CI deployment progress scorecard		
		Strategy	-CI projects bottom-up and managerially selected -Investment in CI deployment breaking-even -Moderate performing business areas selected	-Integrate need for change in corporate strategy -Devote CI resources to priority problems		
		Structure	-More functional or geographic areas selected -End-to-end process in org. structure supported			
		Phase 3 <i>Functional continuous improvement</i>	Values	-Broad CI awareness across organization -CI deployment program solid in place		
			Skills	-Systematic and efficient process data collected -Basic CI methodology widely applied -Evaluation of organizational change ensured	-Install knowledge management processes	
			Staff	-All CI staff trained and certified -CI staff selection process installed -Critical mass starts participating -CI participation linked to performance planning	-Provide advanced CI methodology training -Select CI staff from all departments -Create cross-functional permanent CI teams	
			Style	-Sufficient leadership alignment ensured -CI vision, goals and roadmap in deployment plan -CI sponsor linked to executive team drives CI	-Set up CI support for line management -Make line management accountable for engagement and adoption of CI	
			Systems	-Role of financial accounting formalized -End-to-end value streams and owners identified -CI project selection process implemented	-Create remaining CI deployment processes -Identify core business process for CI deployment -Create issue process management system -All CI training by centralized budget funded	
			Strategy	-CI projects aligned with business priorities -Investment in CI deployment yields 5:1 -Sufficient performing business areas selected	-Commence CI projects beyond processes alone -Create strategy map to explicate results -Ensure continued CI resource availability	
			Structure	-Multiple functional or geographic areas selected -Value streams in org. structure supported	-Create design teams for product evaluation	
Phase 4 <i>Integrated continuous improvement</i>			Values	-Pull for CI project teams to solve problems -CI deployment program has good reputation	-Communicate progress and success ongoing	
			Skills	-Widespread sharing of knowledge ensured -Involvement of regular staff in CI ensured -Continued support for CI projects ensured	-Improvements tracked with dashboards -Rigorous CI methods understood and applied -Capability to evaluate supply chain changes	
			Staff	-Capability to deliver CI training internally -CI project leader selection process operational -Majority of organization participates in CI -CI participation for all staff required	-Create CI training program for new staff -Develop knowledge management system	
			Style	-Maintaining new way of working ensured -Transition CI roles to existing organization	-Leadership aligned with vital few CI metrics and fully engaged in CI project selection and review -CI deployment driven by executive leader	
			Systems	-CI financial and process metrics installed -Role of financial control fully engaged -Value stream management and owners installed -Mature CI project selection process installed	-Prepare detailed roadmap for next phases -Create CI processes for evaluating progress	
			Strategy	-Limited simultaneous CI project execution -Stable deployment progress and results ensured	-CI methodology key for strategy execution -Investment in CI deployment yields 10:1 -Good performing business areas selected	
			Structure	-CI projects always linked to strategic priorities -Accurate and adequate results tracking	-All business units in multiple locations selected -Value chains in org. structure supported	
	Phase 5 <i>Systemic continuous Improvement</i>		Values	-Strong CI culture and zero-defect mentality -CI deployment integral to culture of business	-Perform period cultural assessments and act	
			Skills	-Ensure ability to articulate basic values of CI -CI projects take advantage of all CI methodology -Create progression to learning organization		
			Staff	-Entire organization participates in CI -CI methodology and system adoption linked to performance planning for all staff	-Identify and train (new) CI staff continuously -Connect CI involvement to intrinsic motivation	-Sustained involvement in CI ensured -CI across organizational boundaries ensured -Learning and sharing at all levels enabled
			Style	-Leadership understanding and faith in CI -CI deployment led by CEO with C-level reporting	-Develop managers dedicated to CI -Create ongoing clarity of CI ownership	-Creation and sustaining of CI behavior ensured -Continuous improvement of CI system ensured
			Systems	-CI metrics in corporate dashboard integrated -CI project benefits linked to budgeting process -Value stream management has strategic targets -CI project selection process linked to strategy	-Review CI performance and impact at all levels -Create scorecard cascade at department level -Create core- and supporting process maps	-Consistency in behavior and values ensured
			Strategy	-Investment in CI deployment yields 20:1 -Excellent performing business areas selected -Strategy- and product development data-driven	-Update strategy map for all core processes	-Link CI activities to strategic goals ensured -CI of continuous improvement ensured
			Structure	-All business units in all locations selected -CI extends to full supply chain deployment	-Create working cells (waste and variability) -Create CI methodology integration plans -Extend value chains to suppliers and customers	



## Future research

- This research serves the purpose of defining a preliminary scale for measuring optimized CI deployment process guidance. **Next steps are:**
- Empirical testing of the developed meta-CI deployment model and propositions
- Identify industry or organizational specific adjustments needed
- Research on the importance of organizational dimensions

