Construction Planning and Feedback Loops
1. **Which planning cycles exist** on today's most advanced construction projects?

2. **How reliable** are these planning cycles?

3. Are results from one cycle **used to learn from and to adjust** the next cycle?
Projects analyzed

Which planning cycles exist on today’s construction projects?

14 projects
- Residential
- Commercial
- Educational
- Industrial

7 countries
- Brazil
- England
- Germany
- Kuwait
- Oman
- Russia
- USA

4 continents
- Asia
- Europe
- North America
- South America

We have data from all 14 projects, we visited 9 projects in person at least once.
4 Planning cycles observed across projects

# Projects

14

Plan

Project/Phase

Construction strategy

14

Plan

2-3 months

Supply Chain Management
- Design documents
- Resources and material
- Logistics

14

Plan

1-2 weeks

Production Planning
- Final sequencing
- Collaborative Commitment

6

Day

Final Decision
- Last Check-in
- Status of completion
Examples

2 months look-ahead planning with PM

Weekly work planning with foremen

Daily huddle among foreman on site
How reliable are these planning cycles?
Reliability of Planning Cycles

1 week ahead
- 40% delayed
- 47% on time
- 13% too early

2 months ahead
- 56% delayed
- 5% on time
- 39% too early

3 months ahead
- 49% delayed
- 51% too early

Data from Projects in Germany and Oman; 8000 BIM elements and 356 work packages analyzed
Planning accuracy of weekly work plans

Project in Germany

N = 918 BIM elements

Stopped weekly planning effort once the planning performance deteriorated

Each dot represents the actual construction of a building element represented in BIM

Deviation from plan [w]

-10 -8 -6 -4 -2 0 2 4 6 8 10


too early on time delayed

13% 40% 47%

Planning accuracy of 2-month look-ahead plans

Major changes in sequence

2-month look-ahead plans were 5% accurate

Project in Germany

N = 5914 BIM elements

Mean delay: 31 d

39%

56%

5%

too early
on time
delayed

Circle diagram

Graph with scattered points and red and blue lines

- Deviation from plan [d] on y-axis
- Dates on x-axis

Legend:
- Red: delayed
- Blue: on time
- Green: too early
Planning accuracy of 3-month look-ahead plans

Each dot represents the actual finish of a work package

None of work packages were delivered on time

Project in Oman

Work Packages N = 356   Mean Delay: 88 d ; Mean Ahead: 76d
Top reasons for non-completion

How reliable are these planning cycles?

What are reasons for non-completion?
Top reasons for non-completion

1. Change of sequence
2. Resource capacity
3. Design changes

Germany

1. Material
2. Logistics
3. Procurement

United Kingdom

1. Material incomplete
2. Design incomplete
3. Resource capacity

Oman, ME

1. Underestimated effort
2. Weather condition
3. Labor capacity

Arizona, USA

1. Design not ready
2. Material incomplete
3. Resource capacity

Kuwait, ME

1. Predecessor late
2. Underestimated effort
3. Change of sequence

California, USA

14 of 18 categories relate to 3-month planning cycle

Extract of top 3 reasons for incompletion from root cause reports of each project
Example: Material management - Delivered vs missing

Delivery not aligned with schedule
Planned erection not possible
Feedback Loops on construction projects

Are results from one cycle used to learn from and to adjust the next cycle?

Is the Deming Cycle used for construction planning in practice?
Feedback Loops on construction projects

Plan ahead in different cycles

Do something different

Study results

No act – No feedback

PDSA?

PDSC!

Cry

Complain

Crash
1. Monthly Look-Ahead Plans are highly unreliable (0 – 5 %)

2. No formalized feedback mechanisms observed in practice
Thank You!

schuetz@Stanford.edu