

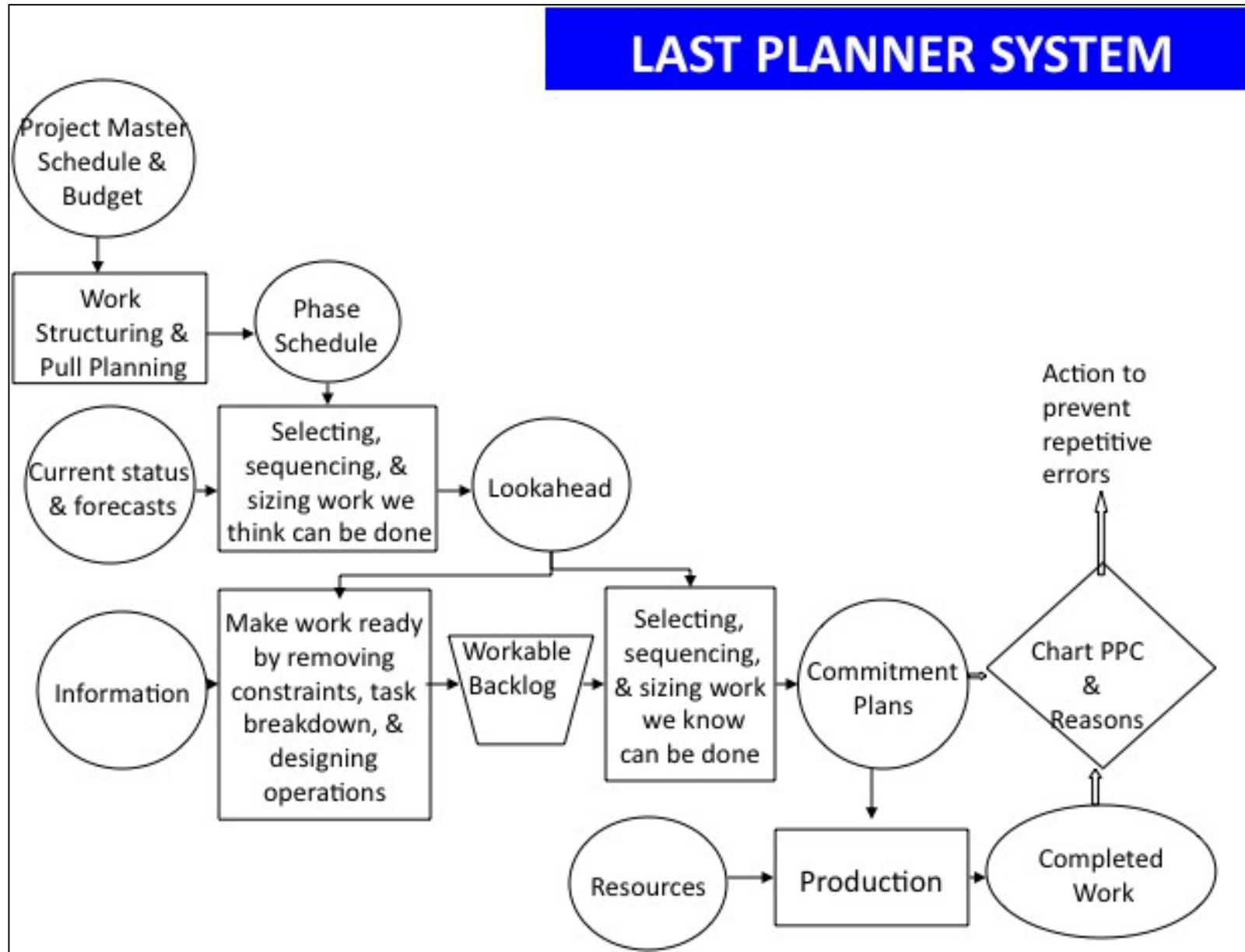
Takt Planning and the Last Planner System

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**From The
Current
Process
Benchmark
for the Last
Planner
System (2016)**

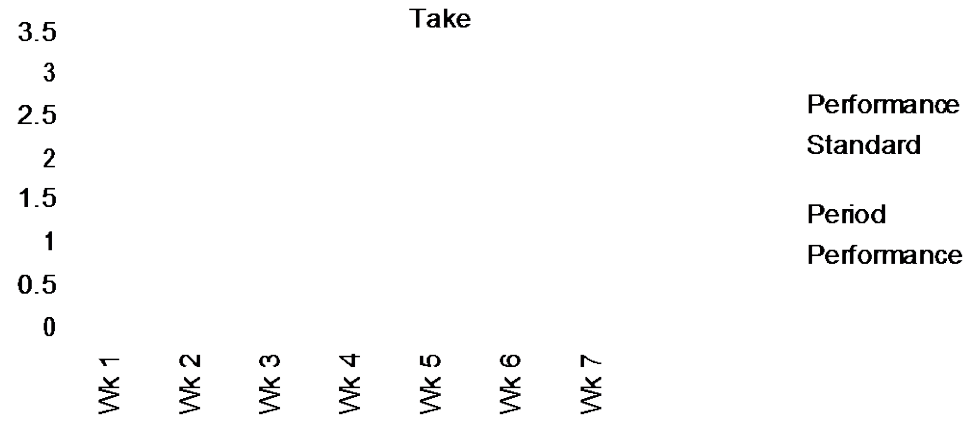


“The Last Planner”-1994

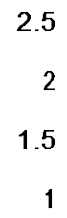
Better planning improves productivity by reducing delays, getting the work done in the best constructability sequence, matching manpower to available work, coordinating multiple interdependent activities, etc. The relationship is obvious and very powerful. One of the very most effective things you can do to improve productivity is to improve planning.

So, what are you doing to improve planning? How well is it working? Are you doing a better job of planning now than a week, month or year ago? I would like to hear your response to these questions, but will first share some thoughts of my own about how to think about planning in a way that leads to improvement.

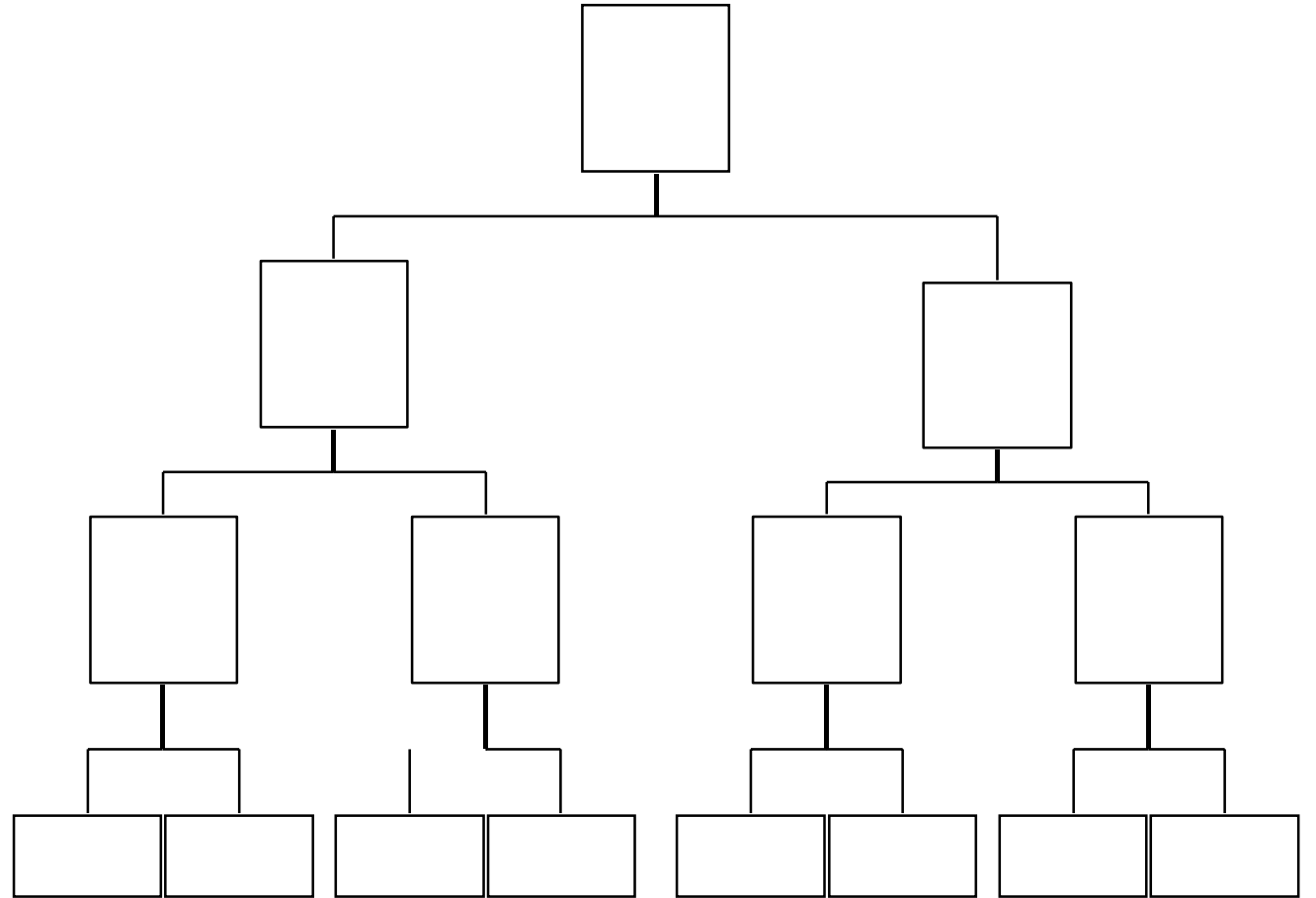
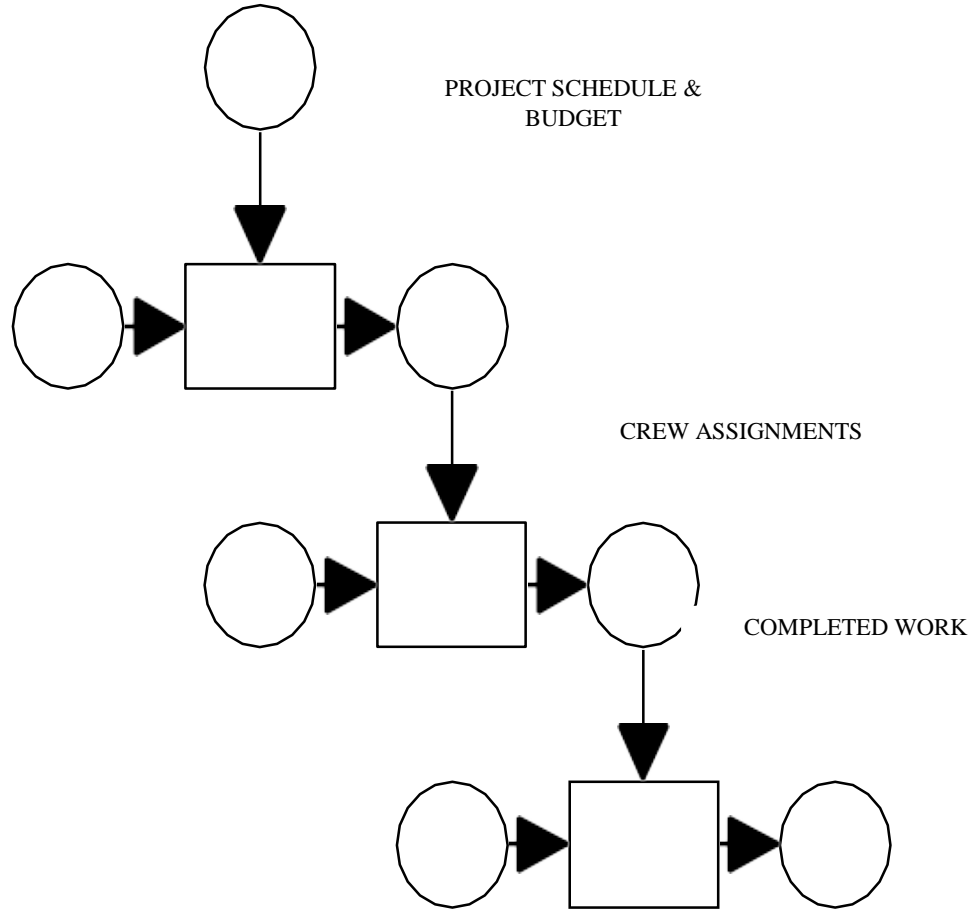
Control



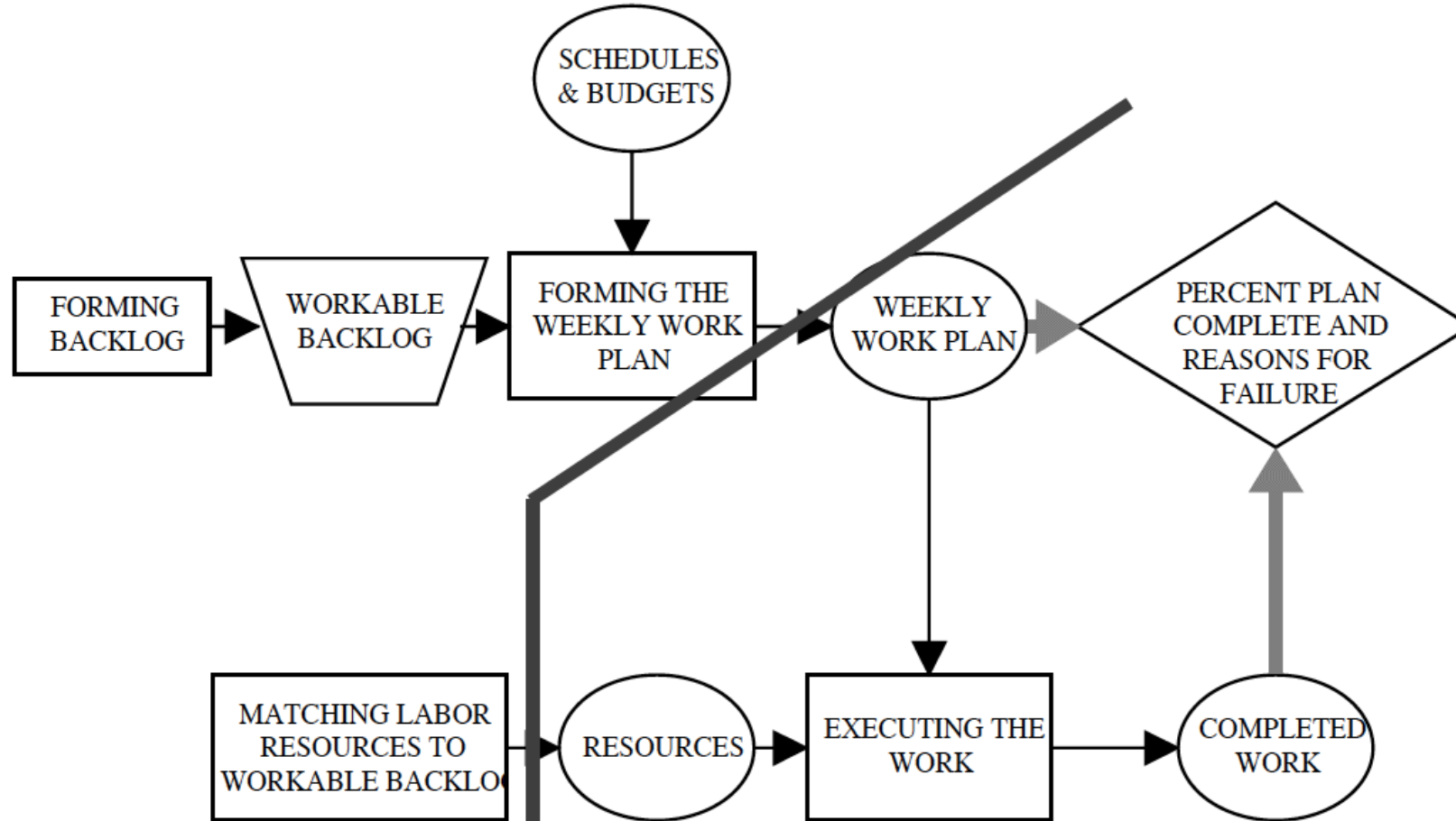
Breakthrough



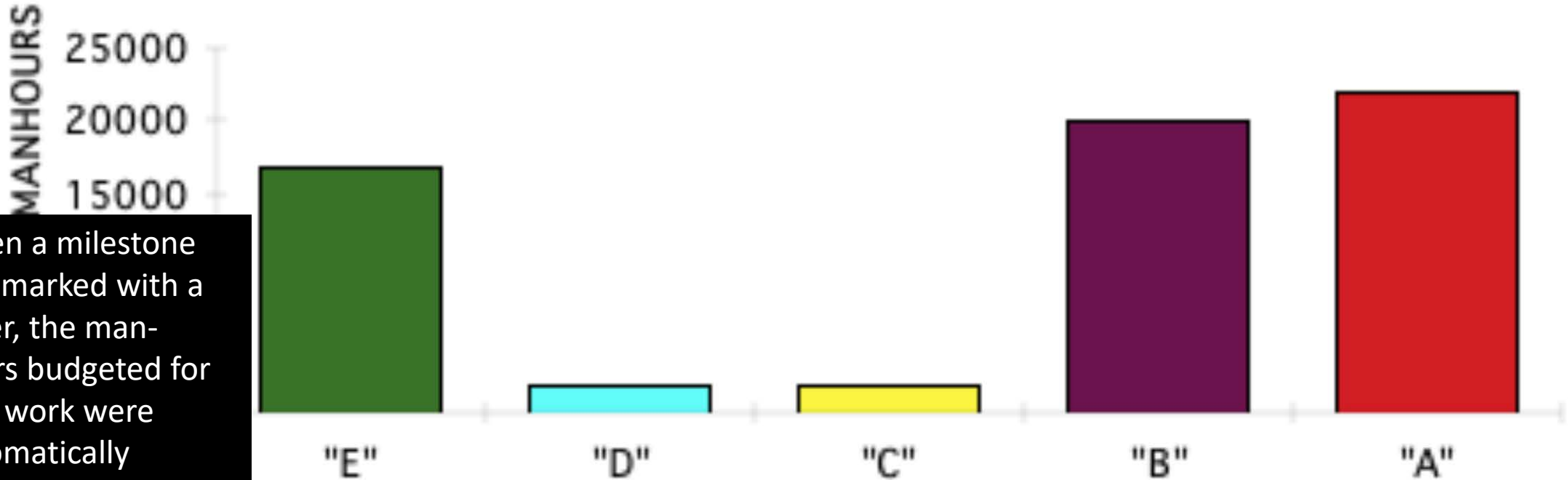
Project Objectives



“Stabilizing Work Flow” (1994)



WORKABLE BACKLOG



When a milestone was marked with a letter, the man-hours budgeted for that work were automatically summed for each drawing and for the total items selected, so the planner could know if the right amount of work had been selected.

Tasks in 4 week lookahead

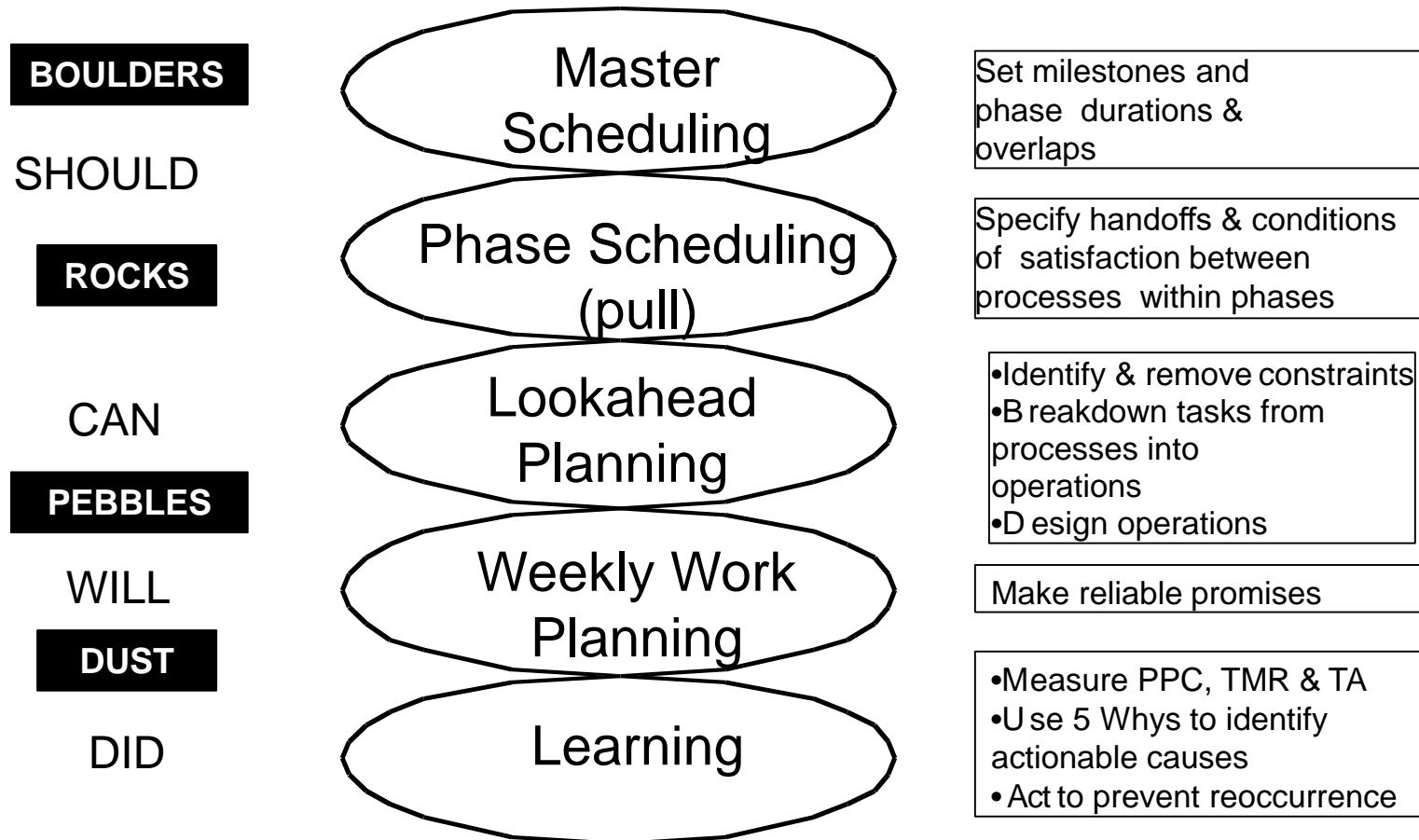
Task materials ready in warehouse

Foremen Pull signal to warehouse to deliver to work area 1 week ahead

Materials in field storage

"B" tasks committed in weekly work plan

The Last Planner System of Production Control



An Update of the Last Planner System (2003)

[Speaking about the history of Last Planner)....We understood the problem in terms of a missing piece and failed to understand that production control was missing because there was no place for it in traditional project management thinking. Consequently, we have not found hard rock in current practice to which to hinge Last Planner and have been compelled to create additional components and to attack the very foundations of project management.

Pull Planning



Courtesy of Alan Mossman

Work Structuring: Lean Construction Institute White Paper 5 (2000)

Work structuring is the most fundamental level of process design, answering the questions:

- In what chunks will work be assigned to specialist production units (PUs)?
- How will work chunks be sequenced through various PUs? [How will trades be sequenced through various work chunks?]
- In what chunks will work be released from one PU to the next?
- Where will decoupling buffers be needed and how should they be sized?
- When will the different chunks of work be done?

The objective is to structure for flow, not only task accomplishment and control, as with conventional work breakdown structures, use of which has encouraged suboptimization.

“Chunk” is preferred to “batch” because the latter is commonly used to indicate multiples of an identical unit.

Lean Construction Institute White Paper #5: Work Structuring (2000)

Continuous flow processes (CFPs) are production networks through which work is advanced from PU to PU on a first-in/first-out basis. Decoupling buffers indicate the boundaries of CFPs. CFPs need not be designed in detail at the beginning of a project unless needed to assure the feasibility of commitments to achieving milestones.

In continuous flow processes, ready work exists ahead of a PU in the work released to it by the preceding PU. For example, a crew of electricians could be released that amount of rooms (perhaps 8) they are able to rough-in each day. Eight rooms is the batch size for that PU in that assembly process. In addition, a materials buffer should be maintained, sized to accommodate variability in material deliveries to the PU. In the example given, the materials buffer would contain switch boxes, conduit, wire, fittings, etc.

Assembly processes that are loosely coupled with downstream assembly operations typically use much larger batch sizes of released prerequisite work. **A pipefitting crew may have released to it a piping activity area containing a reactor, three pumps, and a compressor. The electrician crew that follows them may not be allowed to work in the area until all piping is completed.** Obviously, **reducing batch sizes is desirable because it allows what amounts to an overlap of the two crafts,** but depends on the reliability of future releases to the pipefitter PU.

The Current Process Benchmark for the Last Planner System (2016)

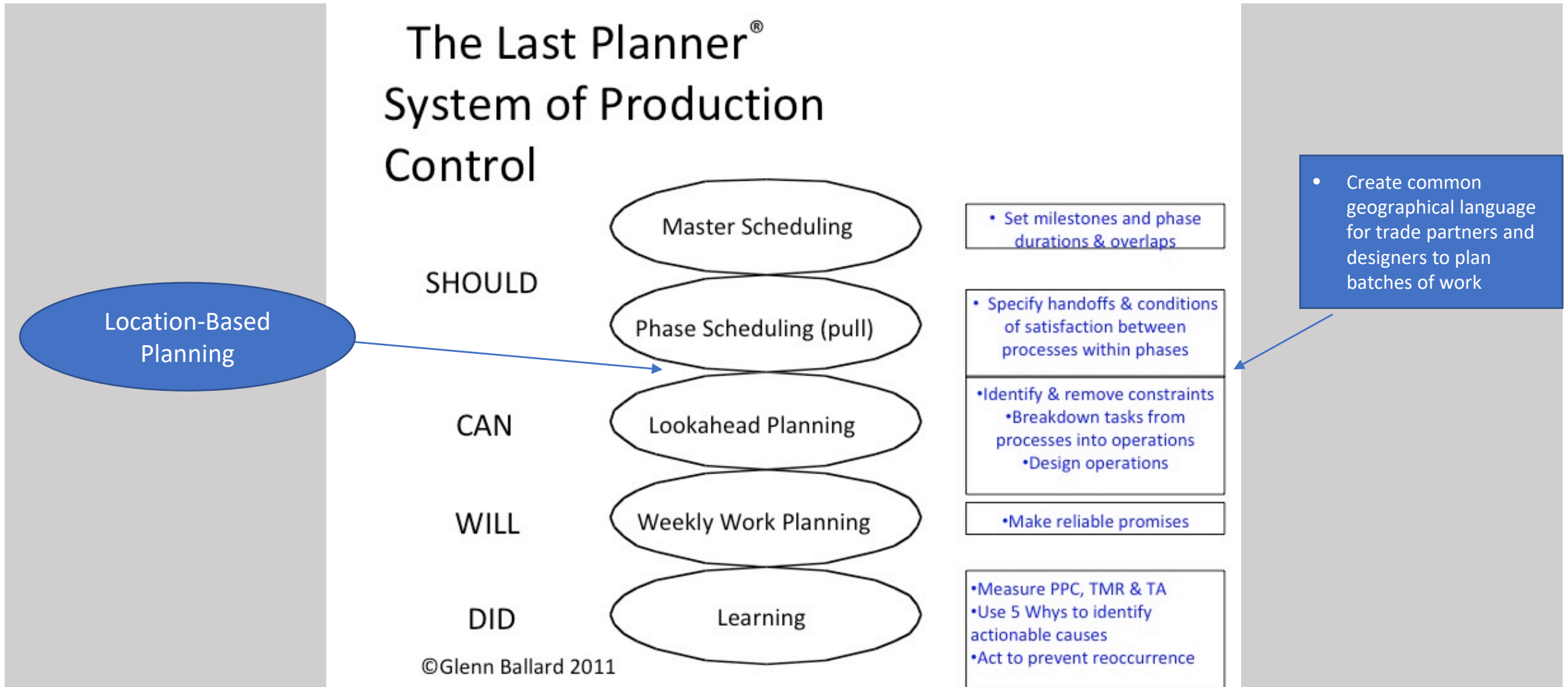
Chapter I: Future Research

“We do not believe that the current benchmark is the best that can be achieved, especially as regards methods... Based on research to date, we offer the following tasks to be performed and hypotheses to be explored and experimentally tested...”:

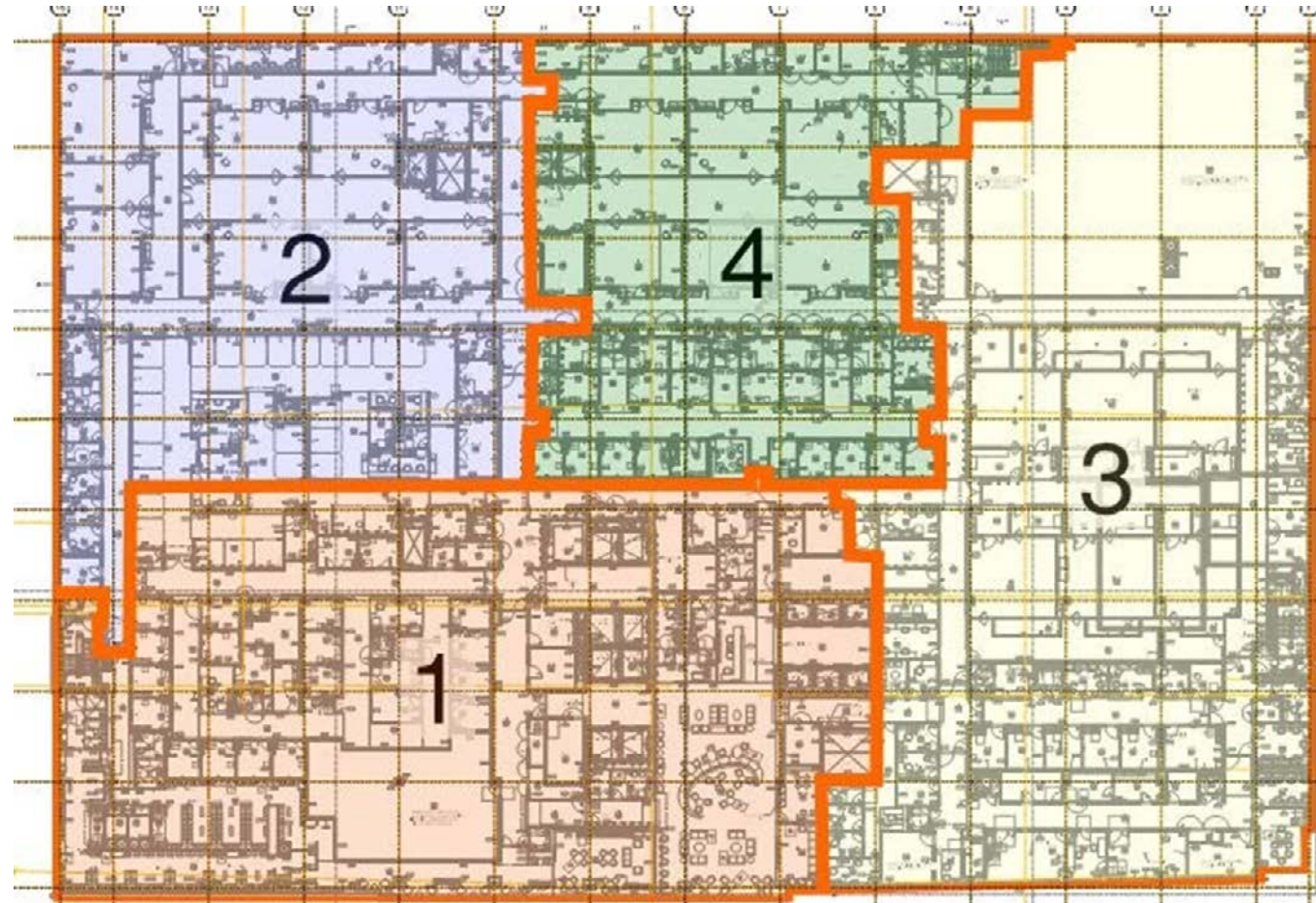
Task teams now working on an improved benchmark:

1. Extend the Last Planner System (LPS) to project execution planning.
2. Recommend that all construction phases have a location based work structure.
3. Identify or develop a better method for learning from breakdowns.
4. Identify or develop metrics for assessing project performance, as distinct from current LPS methods that only measure planning system performance.
5. Develop case studies that illustrate how to apply LPS in design.

Preliminary Recommendations



Example: Common Batches of Work for Planning



How Last Planner is used with Takt Planning

- Last Planner has long called for scheduled tasks to be broken down into operations and those operations be collaboratively designed in lookahead planning. The need for that doesn't go away; it intensifies. Takt planning can almost entirely assure reliable release of work between trades, but the focus shifts to reliable release of work within trades. The ability to accurately predict when specific operations will be performed in 6 weeks enables coordination of flows of basic materials, fabricated objects and design information with those future dates. When starting a new takt chain, many, perhaps even all, the operations in the first takt area will lack standard designs, so that work needs to start at least n weeks before scheduled start of the phase, where n is the number of weeks in the lookahead window.
- Moving from one takt area to another, it is likely that there will be increasingly fewer new operations to be designed, but there is still need for the front line supervisor to understand the work in future takt areas well enough to identify nuances for which tweaks in the standard operation design are needed. The good news is that the stability of takt structures reduces the day to day burden on the front line supervisor—if they have done their planning and preparation. PPC is measured for release of takt areas and, as normal, for weekly work plans planned to the day.
- Buffers are needed in takt structures for the same reason they are needed elsewhere—to absorb variation that cannot yet be eliminated. Both time and capacity buffers are needed—capacity buffers to absorb variation in cycle times between different trades and within individual trades from one takt area to another, and time (schedule buffers) to allow for prototyping and unplanned restarts. Without time buffers, the pressure to keep the train moving, even when the work in a takt area has not been completed, can become destructive. This 'go back' work can transform takt plans from something better to something worse than no takt plan.

In case you're wondering why the gap between 2003 and 2016

- A. Created Target Value Delivery for built environment projects by adapting target costing from manufacturing's product development.
- B. Developed forms of collaborative contract that remove the <'Who pays? Who gains?> obstacle to improvement and innovation.
- C. Developed a process for supplier development suitable for firms with repeat business over multiple geographic regions.
- D. Launched Lean in the Public Sector.
- E. Identified integrated task planning and improving psychological safety as methods for a) reducing the frequency with which construction workers get into hazardous situations, and b) helping construction workers get out of hazardous situations without harm.
- F. Began research on conceptual estimating in Target Value Delivery. Findings will be reported in a book to be published in 2020.

Thanks for your attention. Questions?

Examples of work structuring

Takt planning is not only for final assembly on site. Like all work structures, takt plans precoordinate the work to be performed by designers, suppliers, fabricators, installers, inspectors....

- Phasing is a work structure
- Deciding in advance the sequence of walls in an excavation to secure with 'nails' is a work structure
- Deciding which foundations to construct in what order is a work structure
- Deciding which faces of a building on which to erect curtain walls is a work structure.