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26TH LCI CONGRESS
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Reflections of 20 Years of LPS in Design

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SURFING THE WAVE OF LEAN DESIGN AND CONSTRUCTION

October 23, 2024. 11:30 AM

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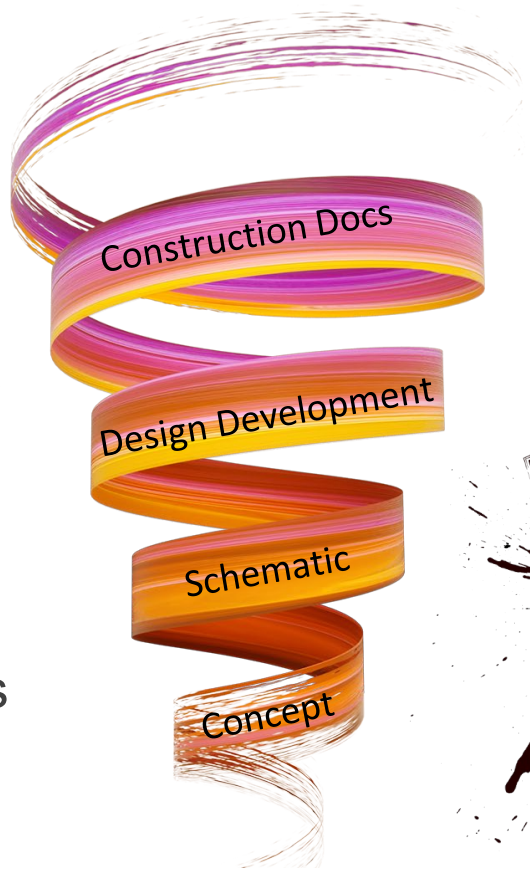
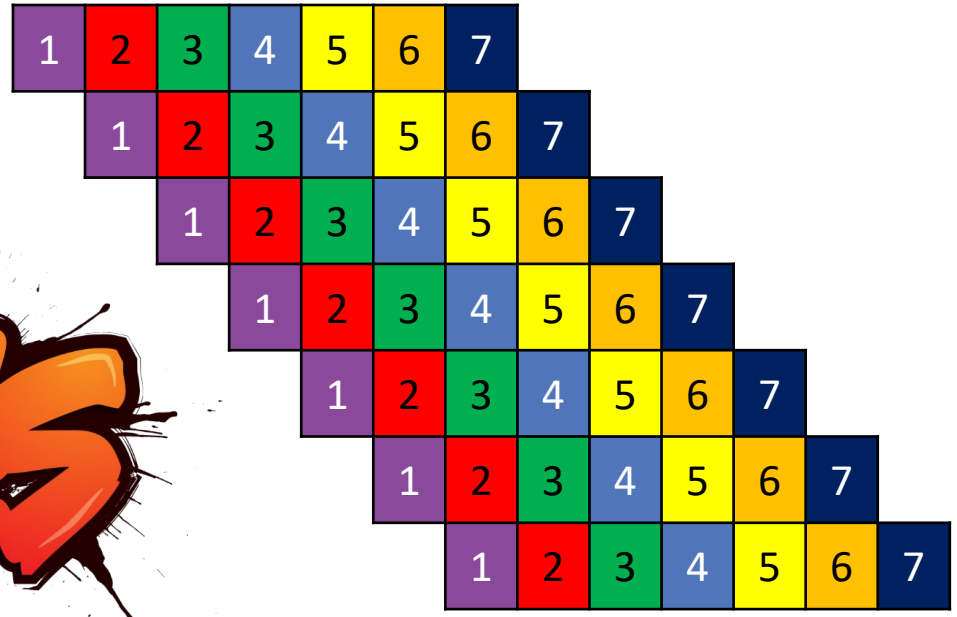
Problem Statement

The mentalities, nuances, and processes of Design Planning are uniquely different from those in Construction Planning.

- Design Process – An iterative process that flows through decision points to build layers of **information** leading to a set of documents.
- Construction Process – A linear finish-to-start process that builds layers of **work** to create a product.





Glossary - "By the book"

- **Constraint** - An item or requirement that will prevent an activity from starting, advancing or completing as planned.
- **Customer** - The individual engaged in a conversation for action who will receive the results of performance either requested from, or offered by, the Performer.
- **Flow** - Movement that is smooth and uninterrupted, as in the "flow of work from one crew to the next" or the flow of value at the Pull of the customer.
- **Kanban** - Japanese term meaning "a signboard." A communication tool used in JIT production systems.
- **Last Planner** - The person or group that makes assignments to direct workers.
- **Last Planner System** - System for project production planning and control, aimed at creating a workflow that achieves reliable execution, developed by Glenn Ballard and Greg Howell, with documentation by Ballard in 2000.
- **Last Responsible Moment** - The moment when failing to take a decision eliminates an important alternative.
- **PDCA** - Stands for Plan - Do - Check - Adjust.
- **Percent Plan Complete (PPC)** - A basic measure of how well the planning system is working - calculated as the "number of promises/activities completed on the day stated" divided by the "total number of promises/activities made/planned for the week".
- **Phase Plan or Pull Plan** - A plan for executing a specific phase of a project using a pull technique to determine hand-offs. It is prepared by the team actually responsible for doing the work through conversation. Work is planned at the "request" of a downstream "customer".

Glossary – How we do it

- Constraint – What's stopping you?
- Customer – Who requested your work?
- Flow - Movement that is smooth and uninterrupted.
- Last Planner – The person capable of and responsible to committing to work.
- Last Planner System – System of reliable commitments of work creating flow.
- Last Responsible Moment – The absolute last day/hour/minute work must be done before delays.
- PDCA - Stands for Plan - Do - Check – Adjust (sometimes we say "Act" too).
- Percent Plan Complete (PPC) – A Calc of "work done"/"work committed".
- Phase Plan or Pull Plan – Athose doing the work plan the work by committing their work as responses of requests.
- Post-Design – Often referred to here as "construction"
- Preliminary Budget – "The Conjecture"

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Reflecting Back

Eric Ubersax

Scott Rasmussen

Romano Nickerson

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Two Questions

- What is the problem we're trying to solve?
- How can we be more effective?

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PollEv.com/ericubersax875

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Specific to planning and implementing LPS in Design, what Problems should we discuss tonight?

I've got too many meetings already. I just need time to do the work. 0%

Contractors don't understand how designers think, and besides, design is iterative so it can't be planned. 0%

Pull planning is exhausting. After 3-hours, we have a couple dozen stickies on the wall. 0%

Supply chain is broken and we're forced to design out of sequence. 0%

That guy thinks DD means one thing, the AIA says something else, and I don't agree with either. 0%

I can't bring on the right people at the right time because blah blah blah... 0%

There's a lack of consistency in how people plan or talk about planning. 0%

I'm hitting 100% PPC! Get off my back. 0%

How can I encourage my team to plan their work? 0%

I've got some teammates with difficult personalities. How c hem?

SEE MORE

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Pick a Problem – Any Problem

I've got too many meetings already. I just need time to do the work.	Contractors don't understand how designers think, and besides, design is iterative so it can't be planned.	Pull planning is exhausting! After 3-hours, we have a couple dozen stickies on the wall	Supply chain is broken, and we're forced to design out of sequence	That guy thinks DD means one thing, the AIA says something else, and I don't agree with either
I can't bring on the right people at the right time because blah, blah, blah	There is a lack of consistency in how people plan or talk about planning	I'm hitting 100 PPC, what's the problem?	I've got teammates with difficult personalities. How do I deal with them?	How can I encourage my team to plan their work?

Problem:

"How can I encourage my team to plan their work?"

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Once Upon a Time in Sacramento

These eight people were the original “lean team” at Boulder Associates
The team was comprised of five architects (one architect and four architectural interns) and three interior designers
The team billed time to 31 projects during the study period
Interior designers had specific project assignments while the architects worked on all projects
On March 17th, 2008, the team began individual and team weekly work planning
The study period included ten weeks leading up to the March 17th start of planning and two subsequent ten-week periods

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Once Upon a Time in Sacramento

Ten weeks prior to 2008.03.17
The team averaged more than 44 hours of OT per week, or 17% of all hours worked
Most people were in the office both Saturday and Sunday
People were frazzled and disgruntled

Once Upon a Time in Sacramento

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Most people were in the office both Saturday and Sunday

People were frazzled and disgruntled

The first ten weeks

The team reduced overtime by 34%, averaging 29 hours of OT per week, or 11% of all hours worked

Fewer people were in the office Saturday and Sunday

People were happier and felt empowered and in control

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Once Upon a Time in Sacramento

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The team reduced overtime by 34%, averaging 29 hours of OT per week, or 11% of all hours worked

Fewer people were in the office Saturday and Sunday

People were happier and felt empowered and in control

The second ten weeks

The team took on more work and delivered on deadlines, but still reduced overtime by 21%, yielding 23 OT hours per week, or 10% of all hours worked

There were 15 days of the 210 day sample where no one recorded any hours. 14 of those days came after March 17

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The LPS in Design Value Proposition

- Work less overtime
- Go home on time
- No work on the weekends
- Share the load with your team
- Reduce stress

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Five Years Later...

41 projects

26% PROFIT

within **6%** of their planned hours

15 people worked on the team and they were all **PART TIME**

Problem:

"I've got some teammates with difficult personalities. How do I deal with them?"

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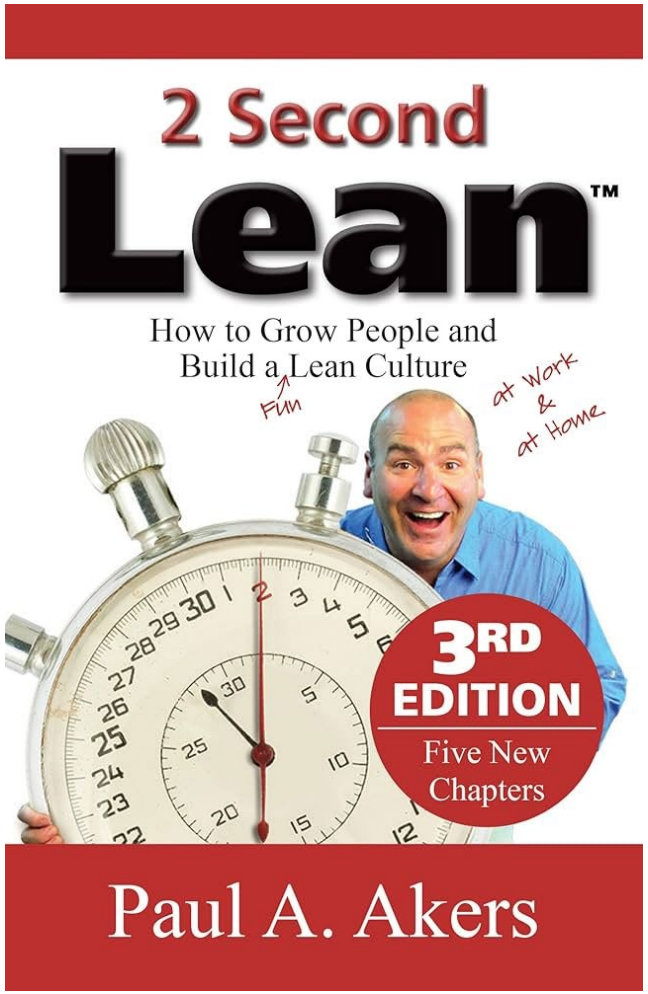
Fix What Bugs You

- Things are rarely perfect
- Almost everyone has a problem
- Almost everyone will accept help
- Ask "what bugs you?" and then help them fix it!



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Problem:

"I've got too many meetings already. I just need time to do the work."

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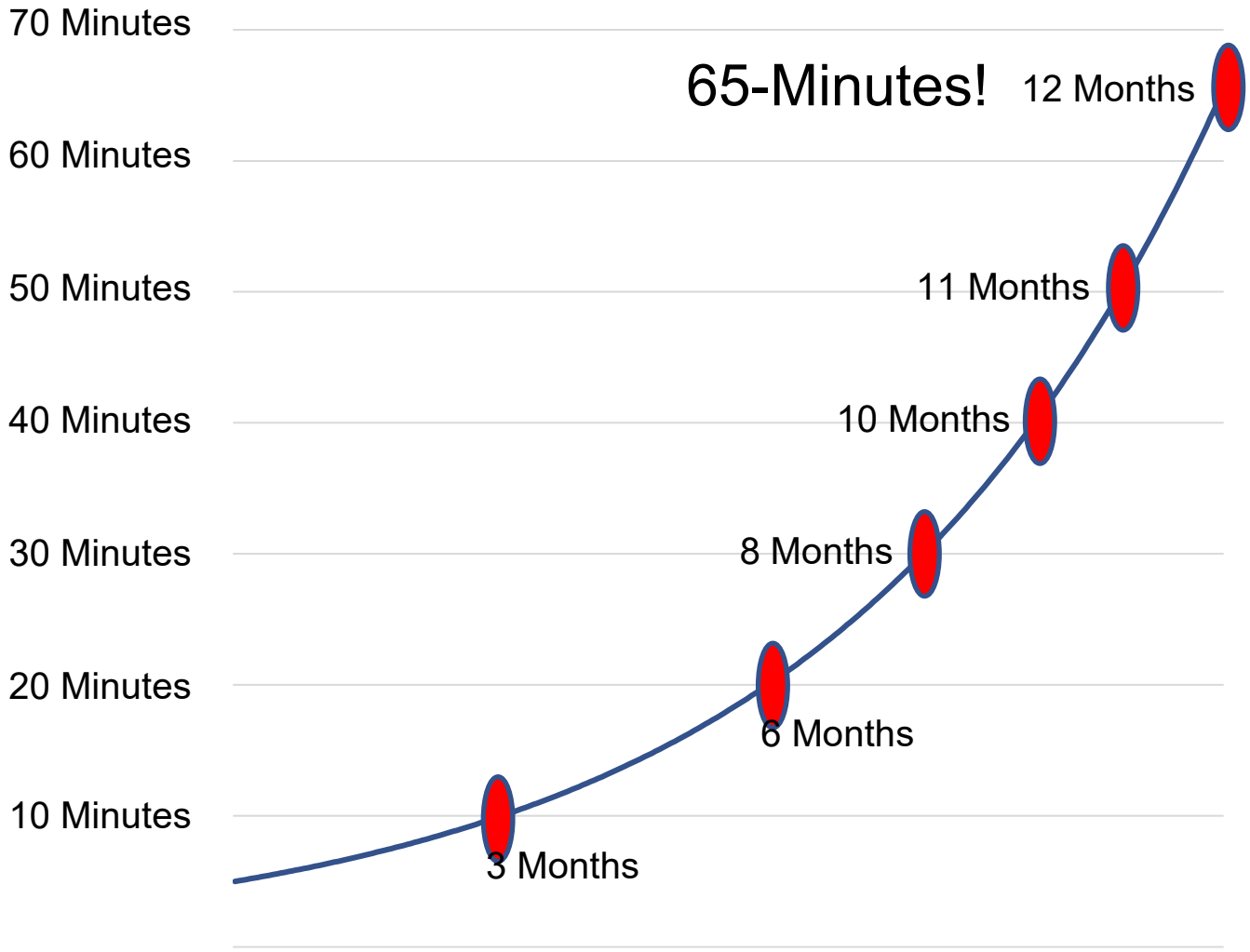
Incremental Improvements

- Can we save, or be more efficient, by 5-minutes per day?
- Can we improve by 1% the next day? That's only 3-seconds!
- Can we repeat that 1% improvement everyday for a year?



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Problem:

"Contractors don't understand how designers think, and besides, design is iterative so it can't be planned."

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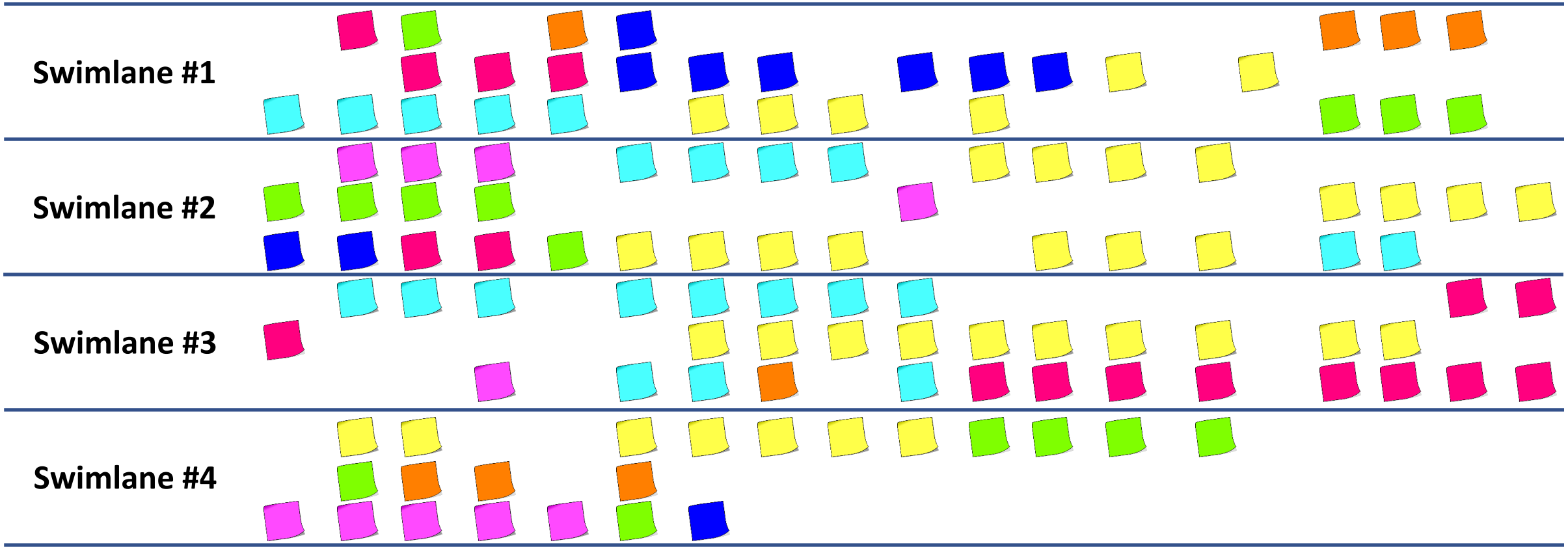
Pull Plan in Construction



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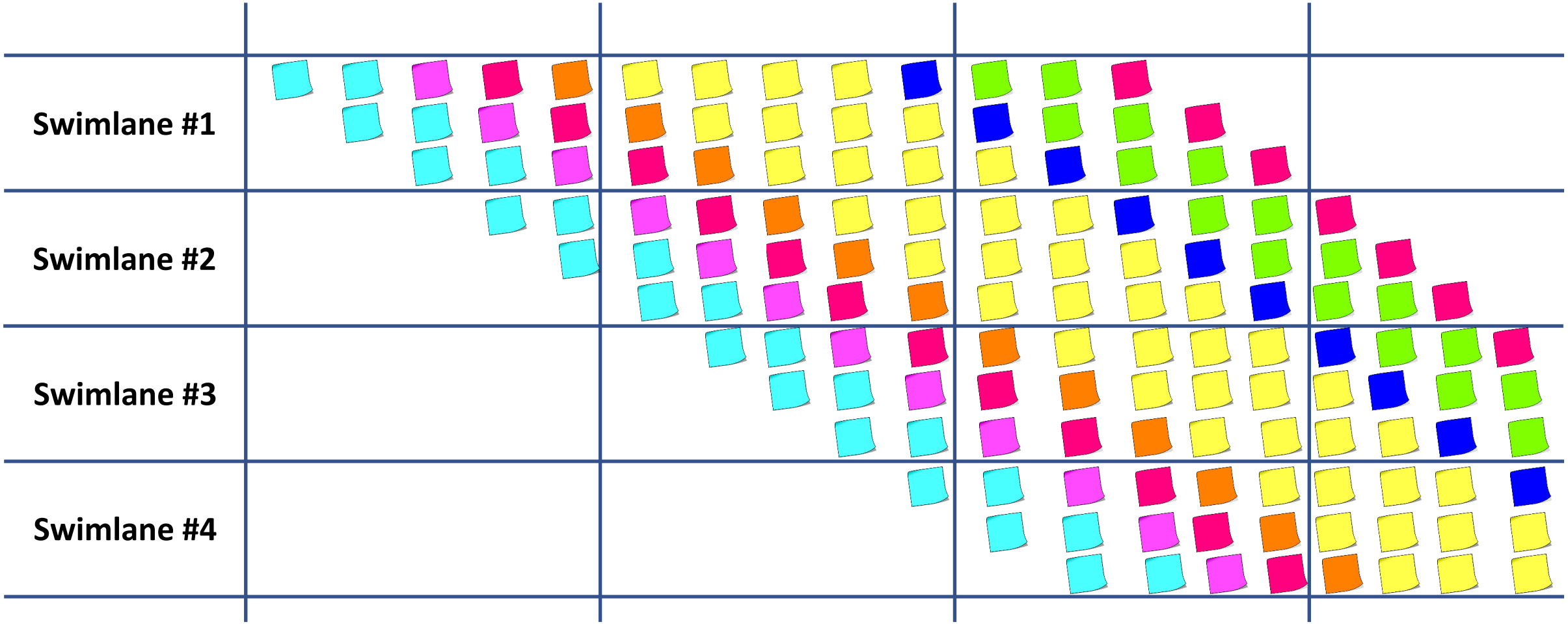
Pull Plan Showing Flow in Construction



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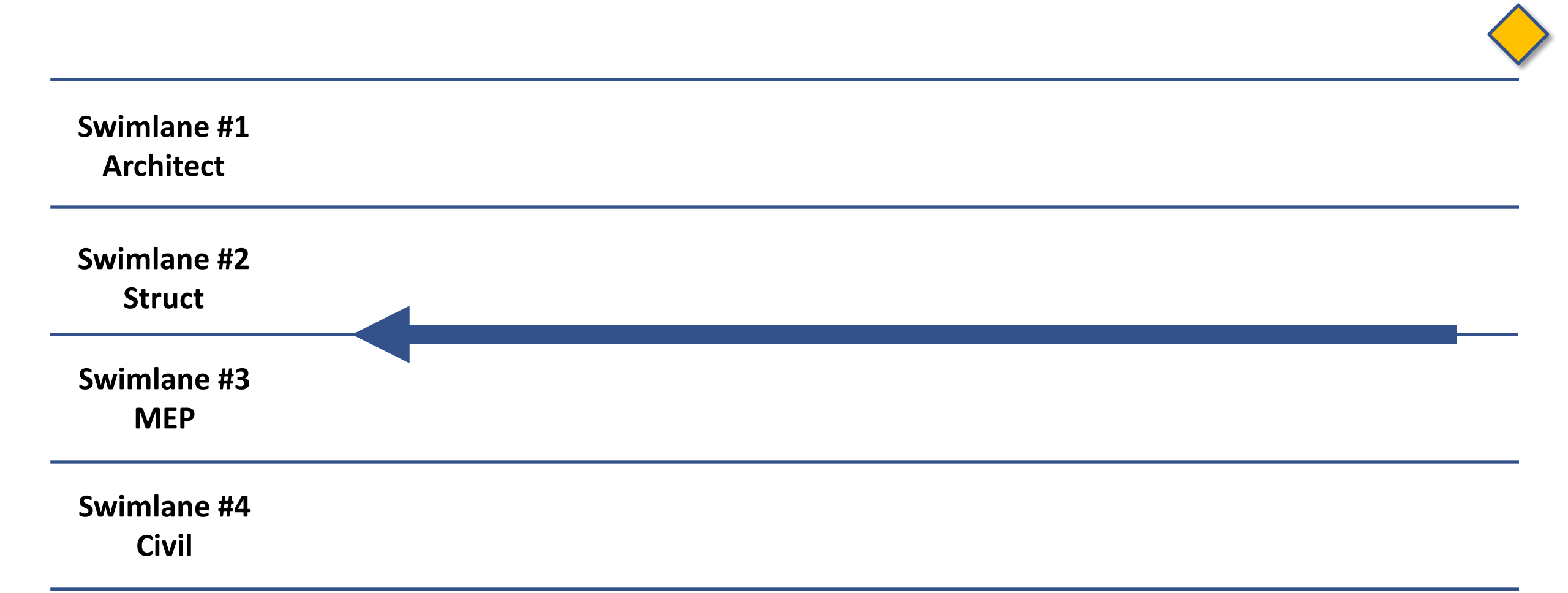
Pull Plan in Design - Swimlanes



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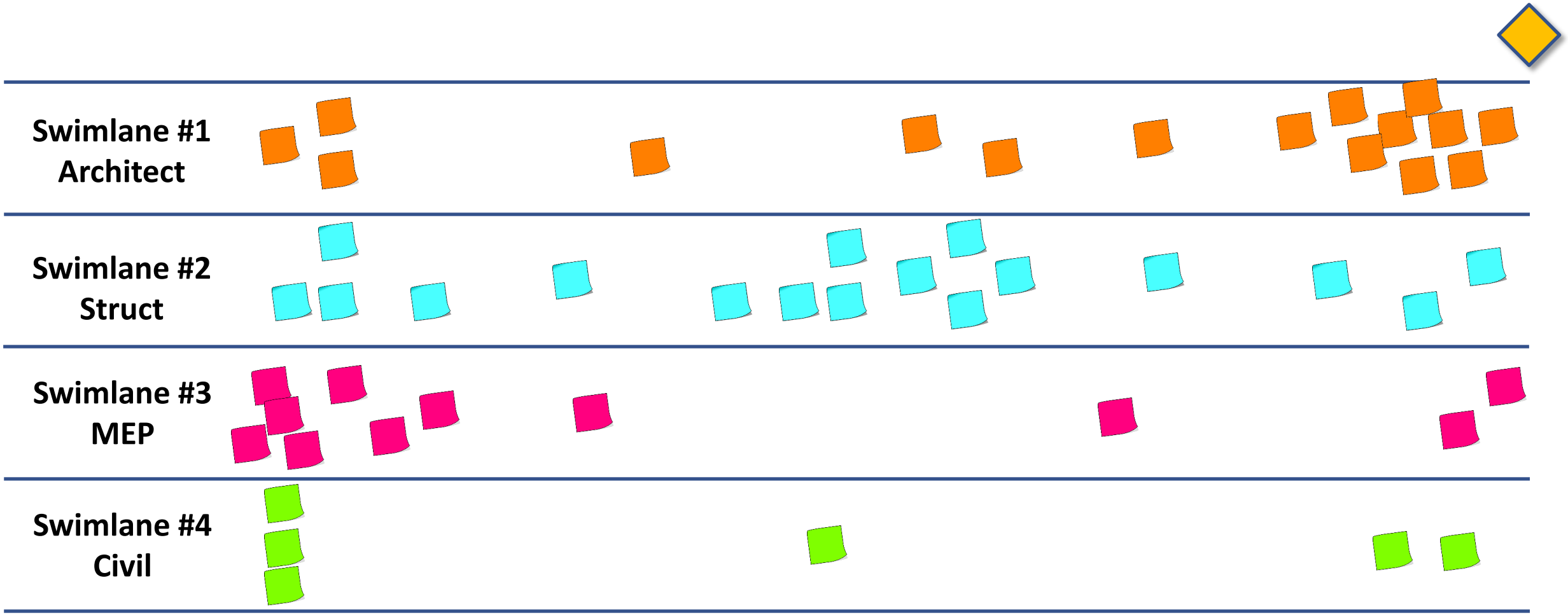
Pull Plan in Design - Swimlanes



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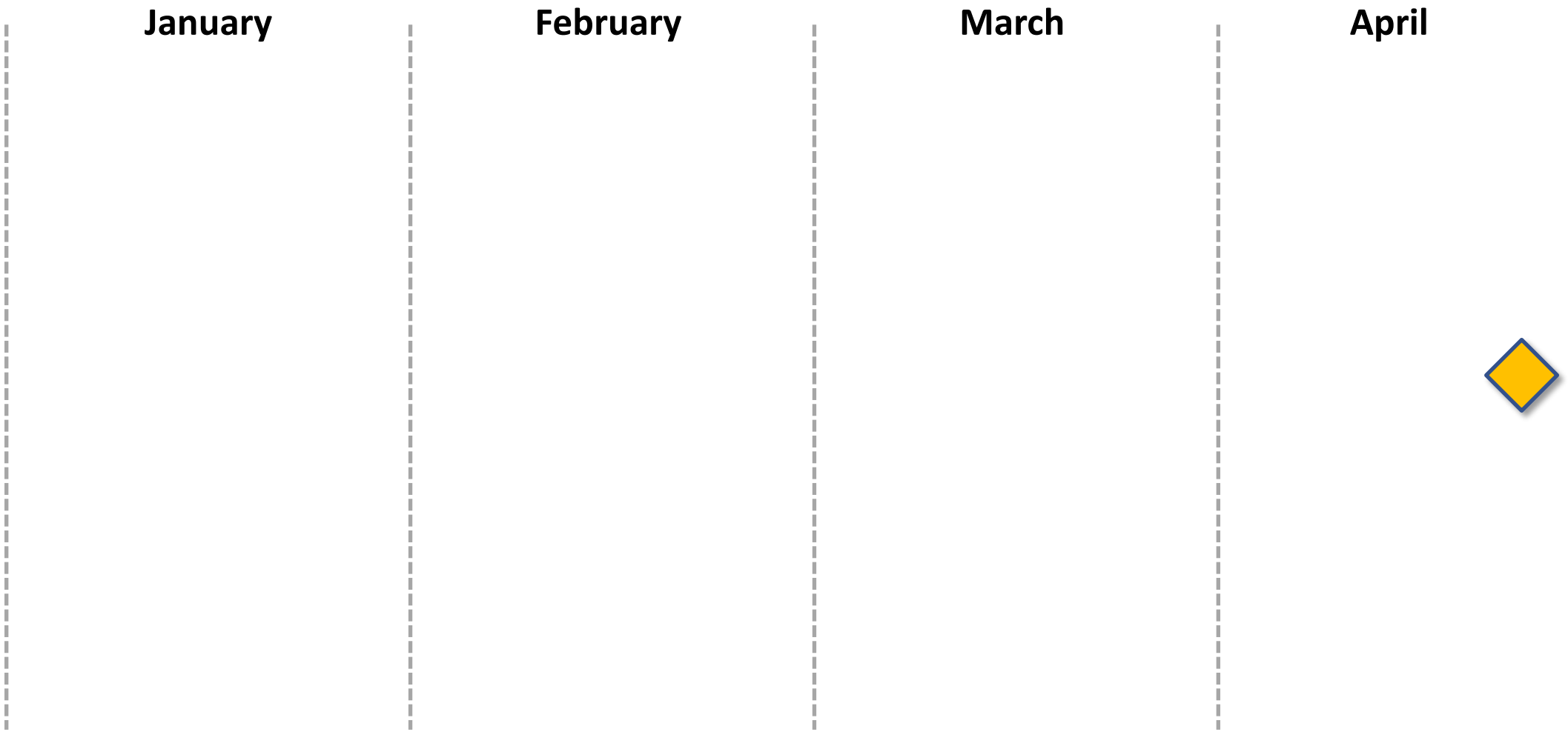
Typical Pull Plan in Design (Following Construction Planning)



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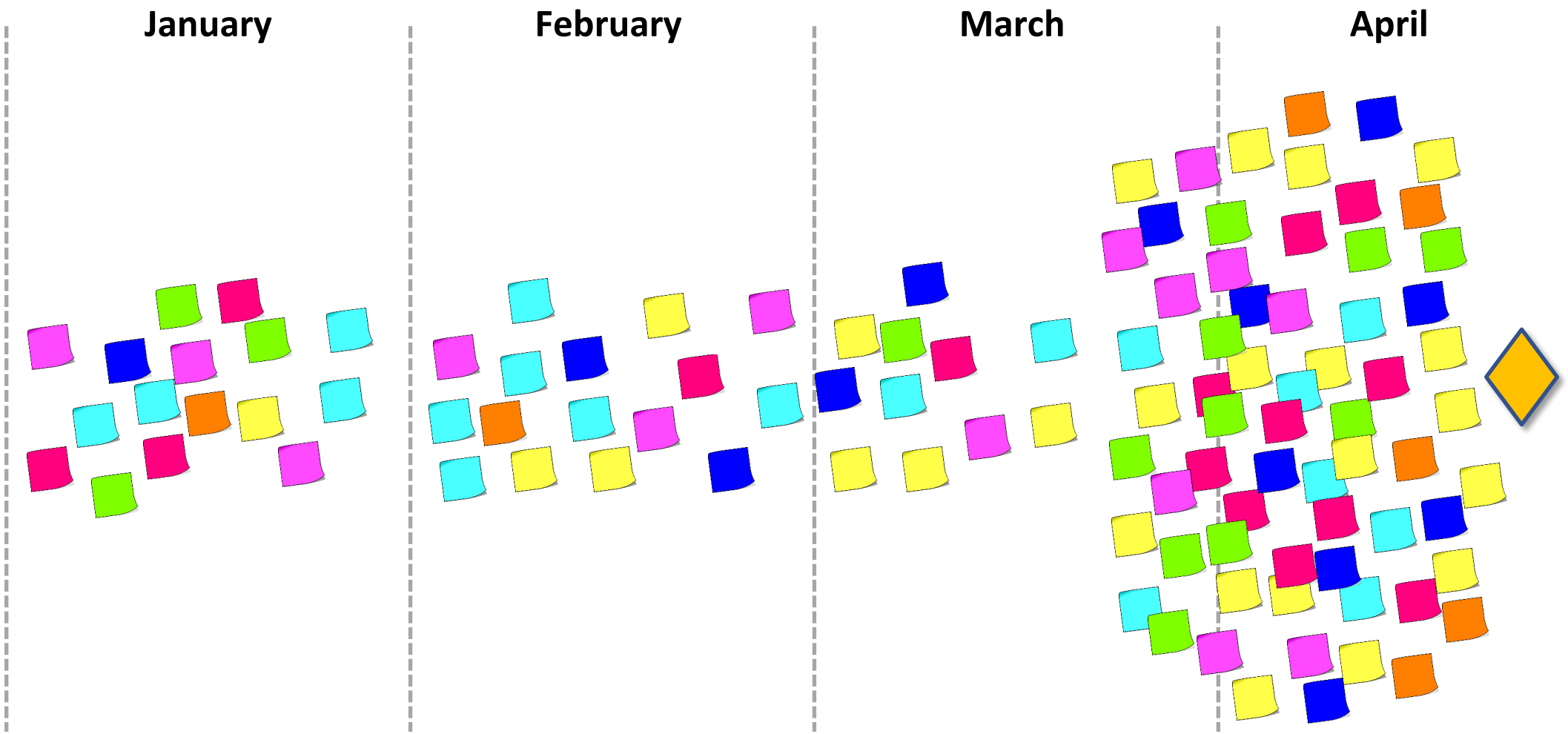

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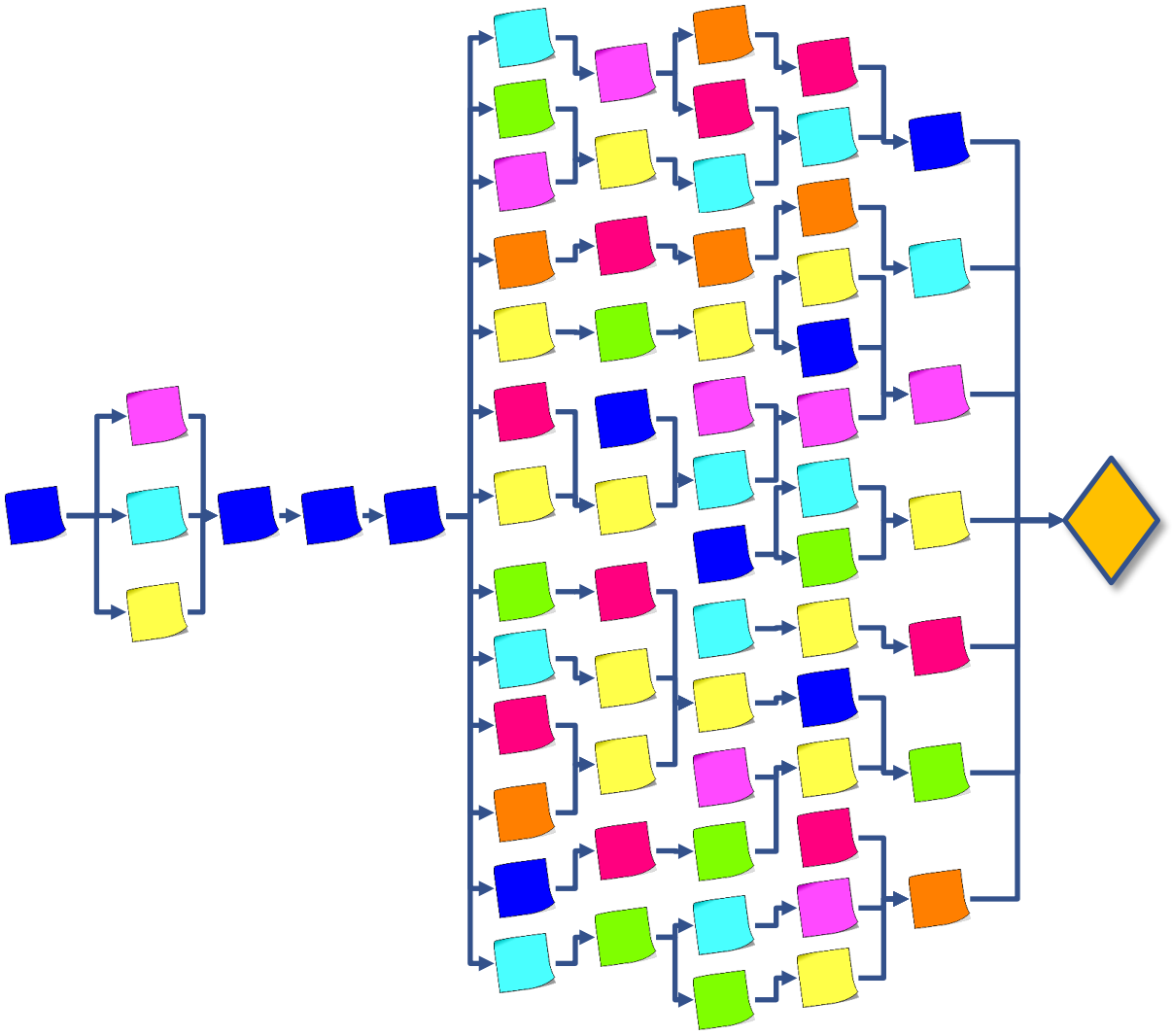

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Pull Plan in Design (Top-Down Planning)

MEP	Struct	Arch	Civil	Landscape

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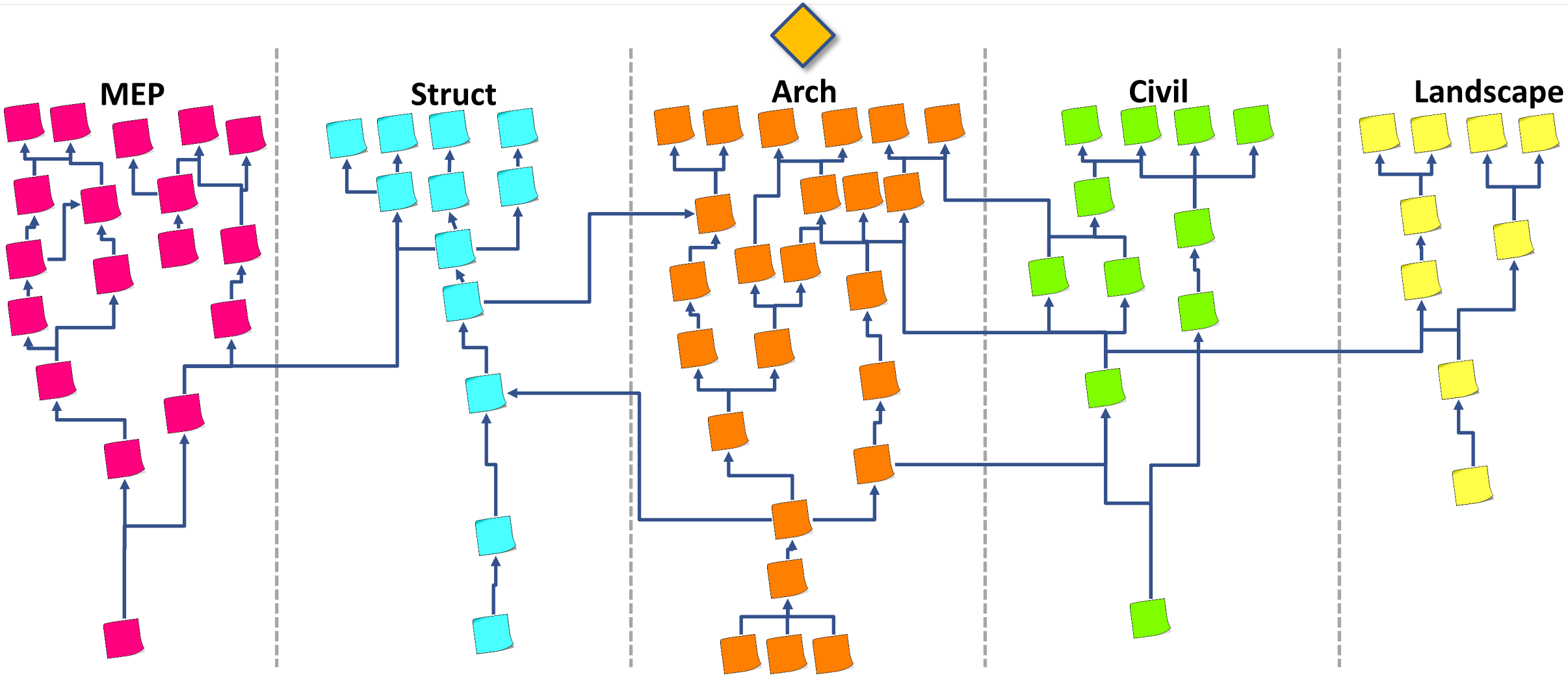
Pull Plan in Design (Top-Down)



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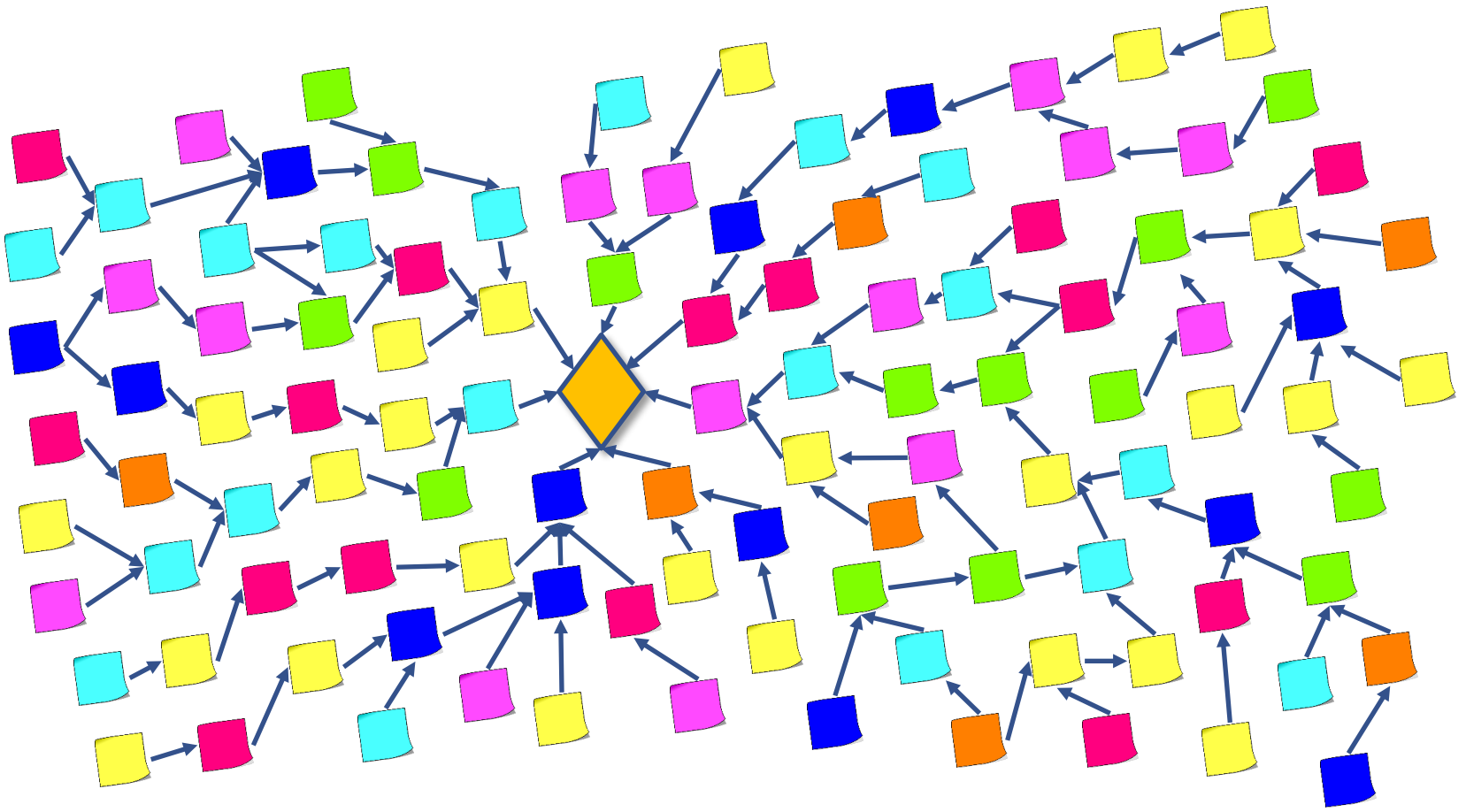

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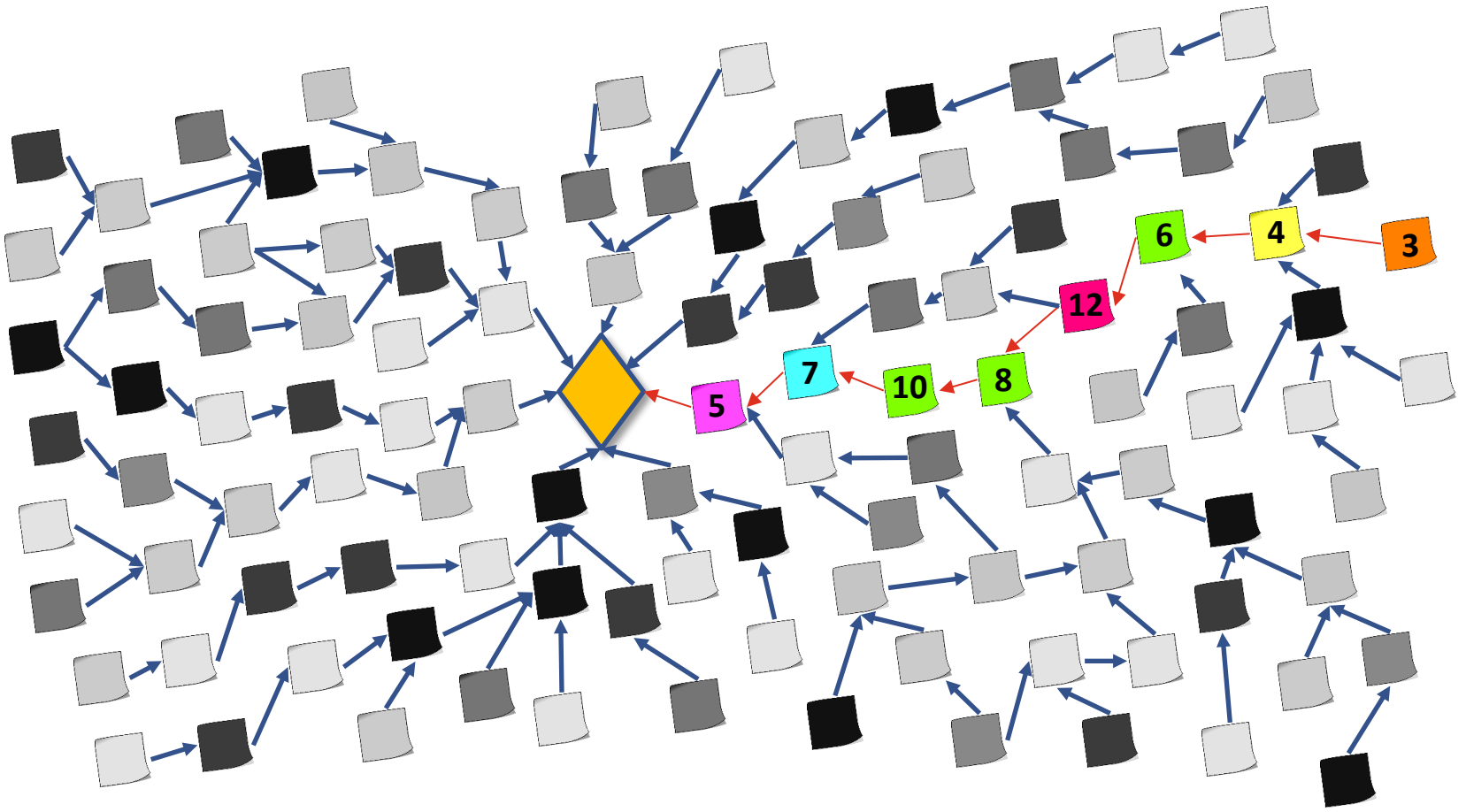

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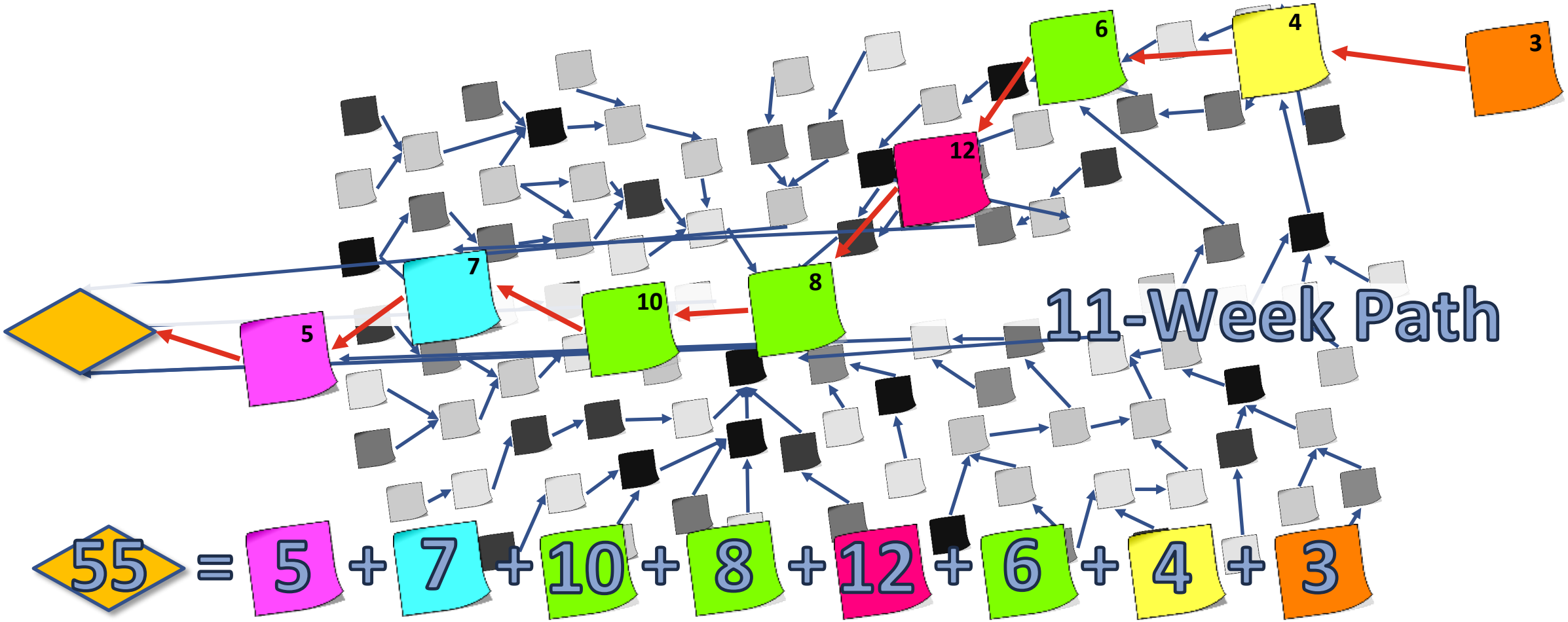

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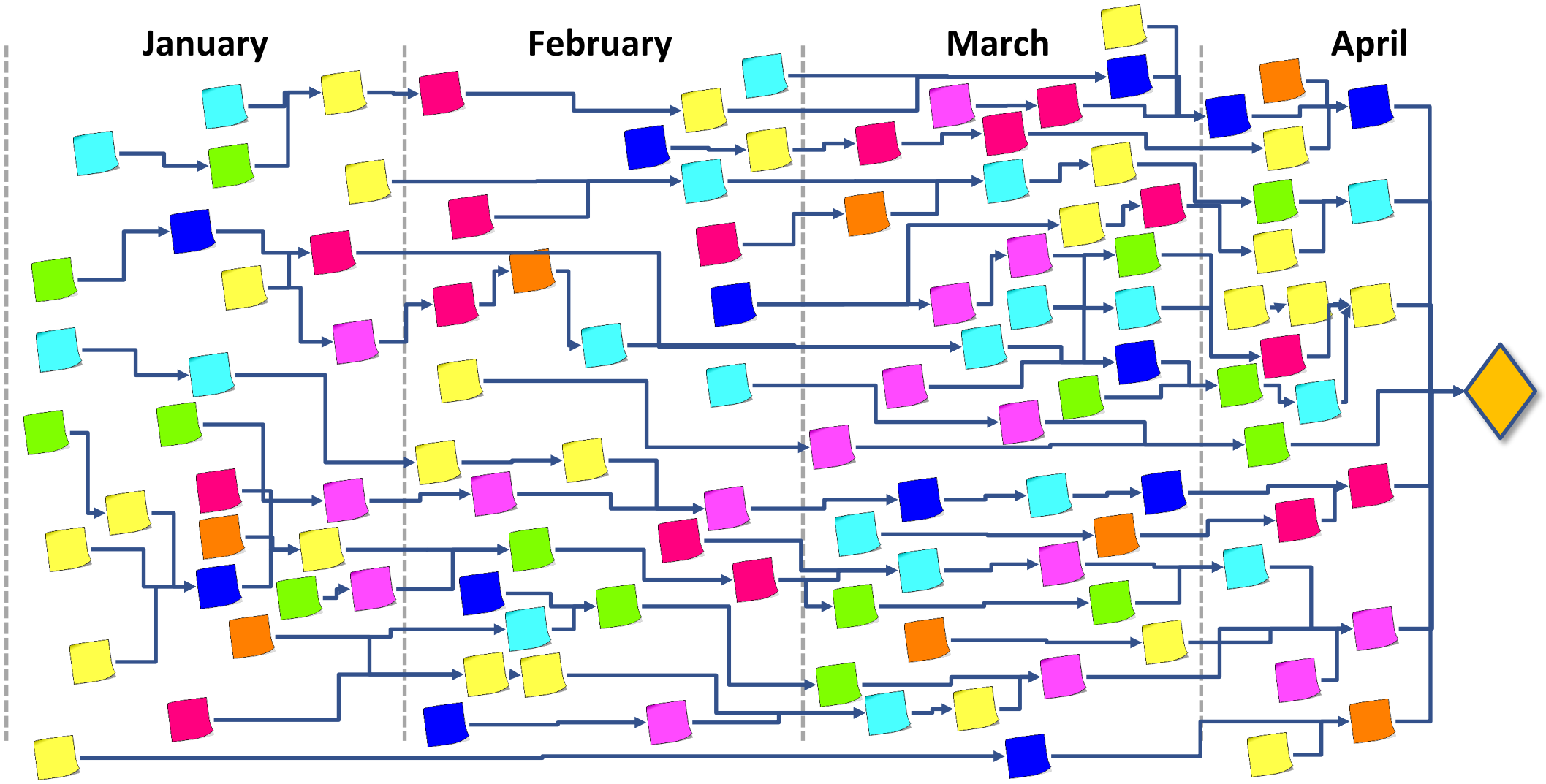

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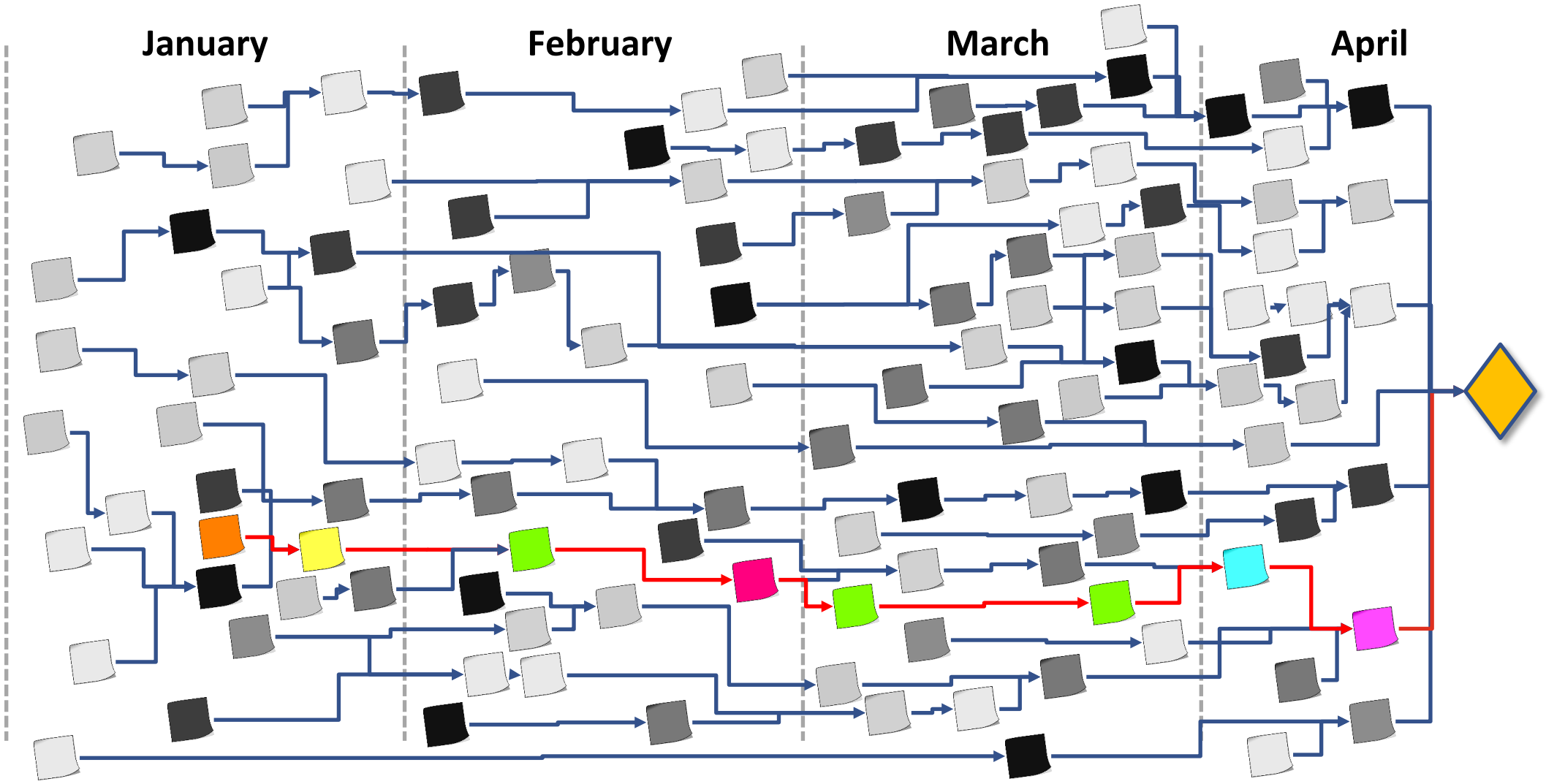

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Problem:

"Supply chain is broken and we're forced to design out of sequence."

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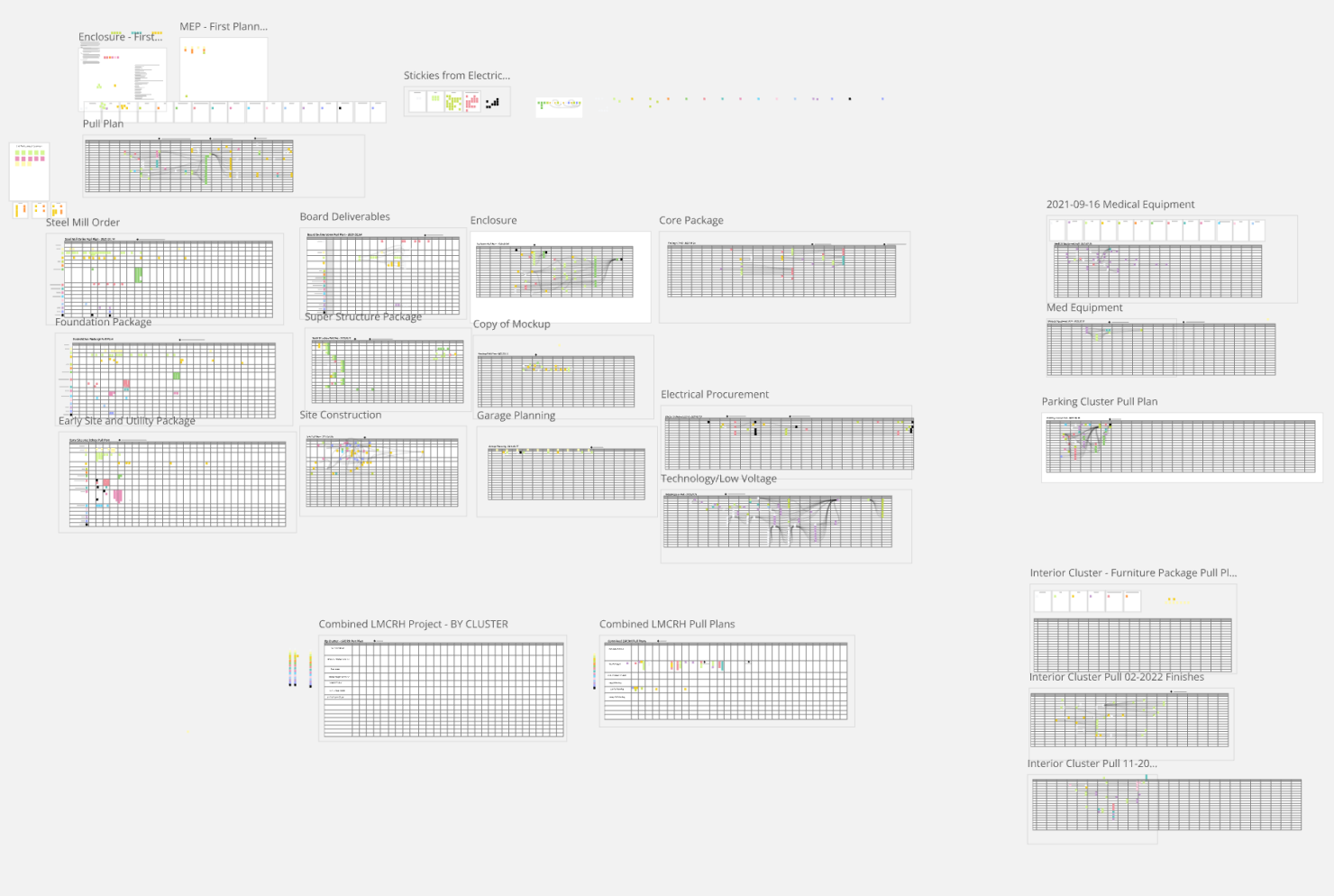
Anchor Planning in Work Streams



- One project
- Just the design phase
- 21 total pull plans
- Over 1,500 stickies
- Statused and replanned weekly
- **Replanning is working the plan**

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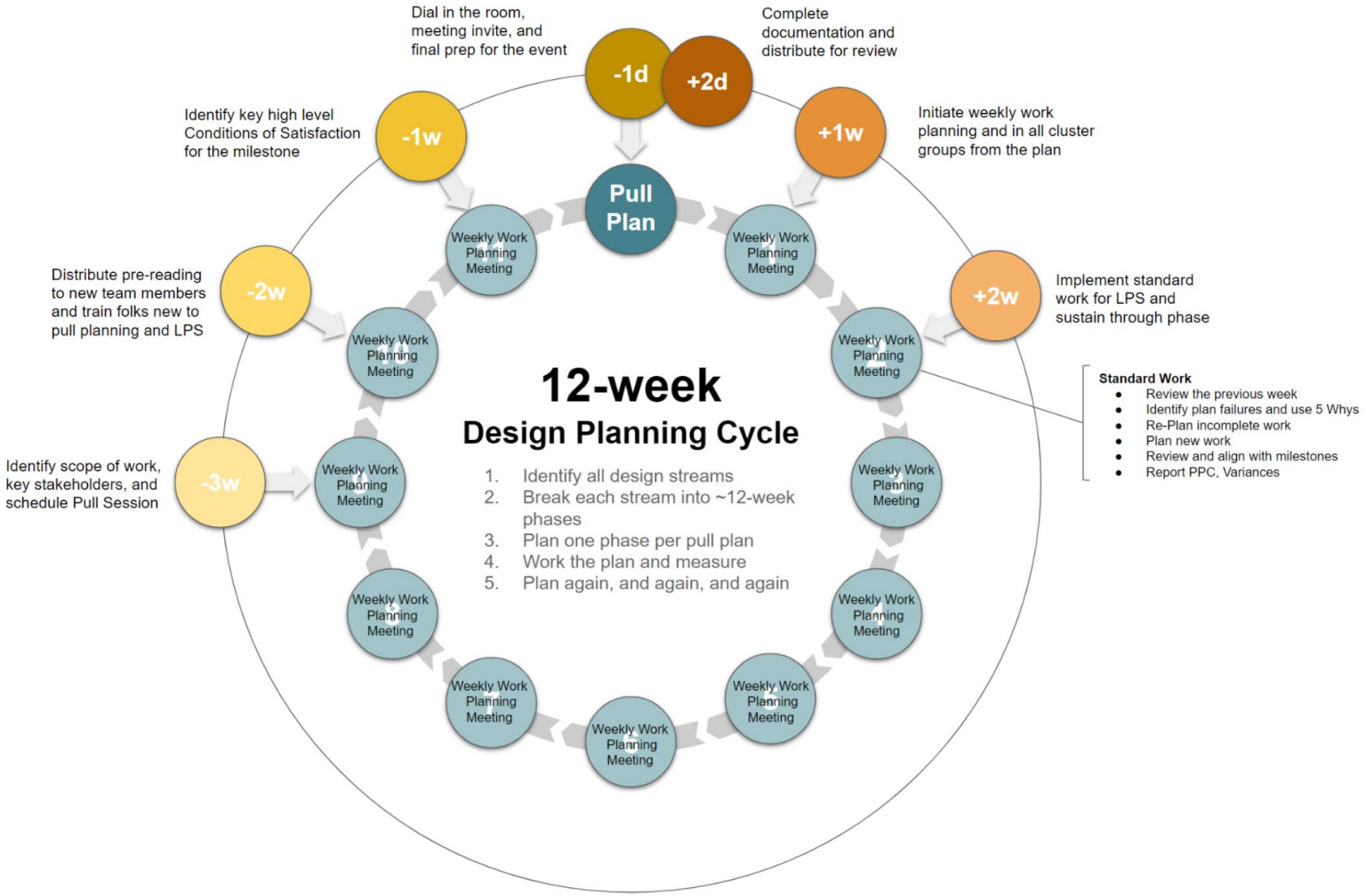
12-Week Design Planning Cycle



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Problem:

"I can't bring on the right people at the right time because blah blah blah."

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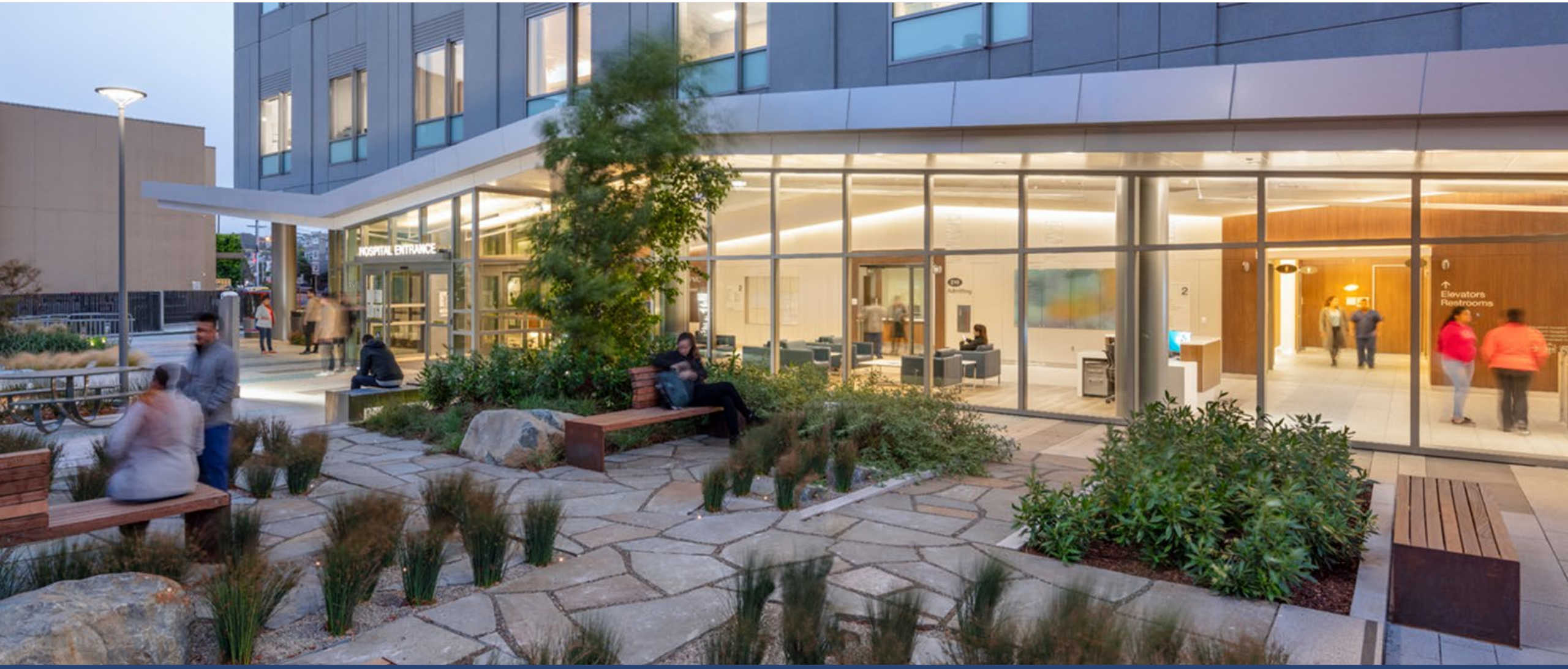
Design Planning with Visual Management



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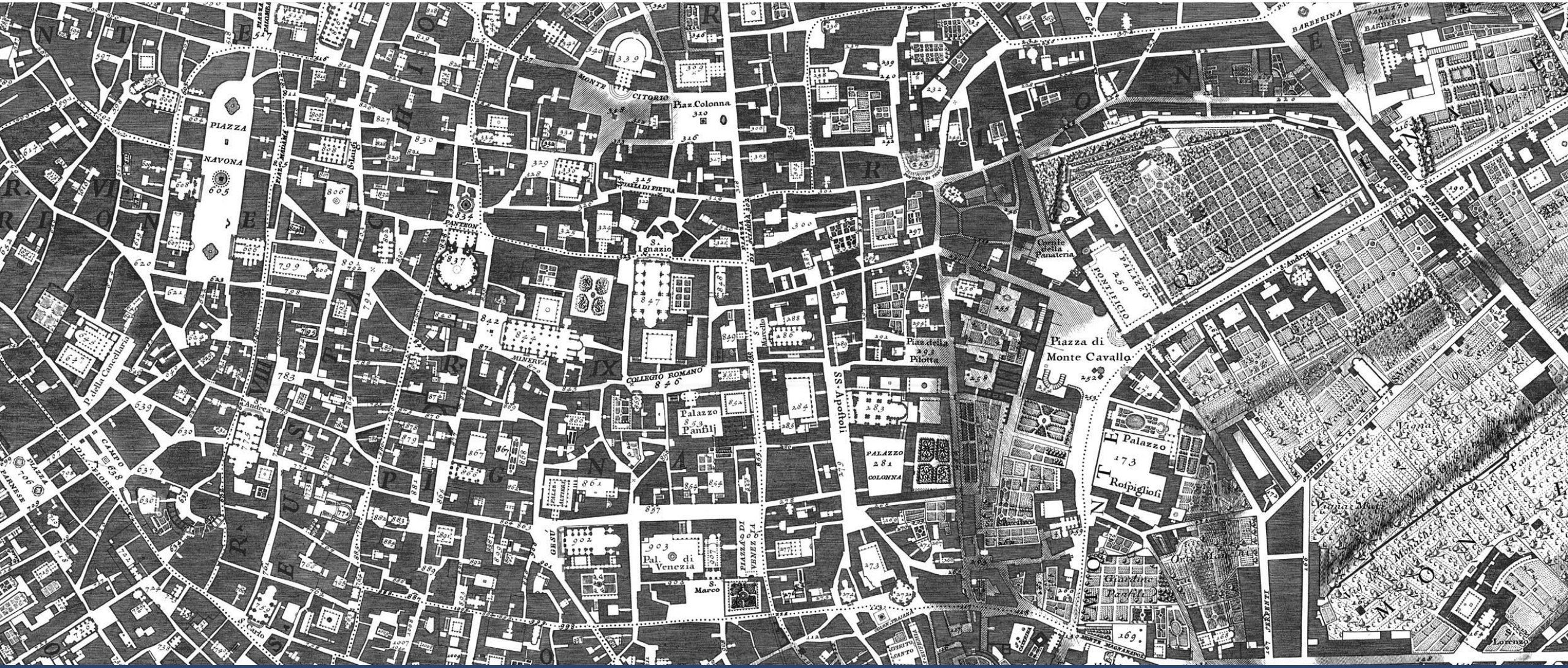
Design Planning with Visual Management



Design Planning with Visual Management

Back of House

- Areas that can be designed based on professional best practice
- Requires neither input from users nor special attention from the interior designers

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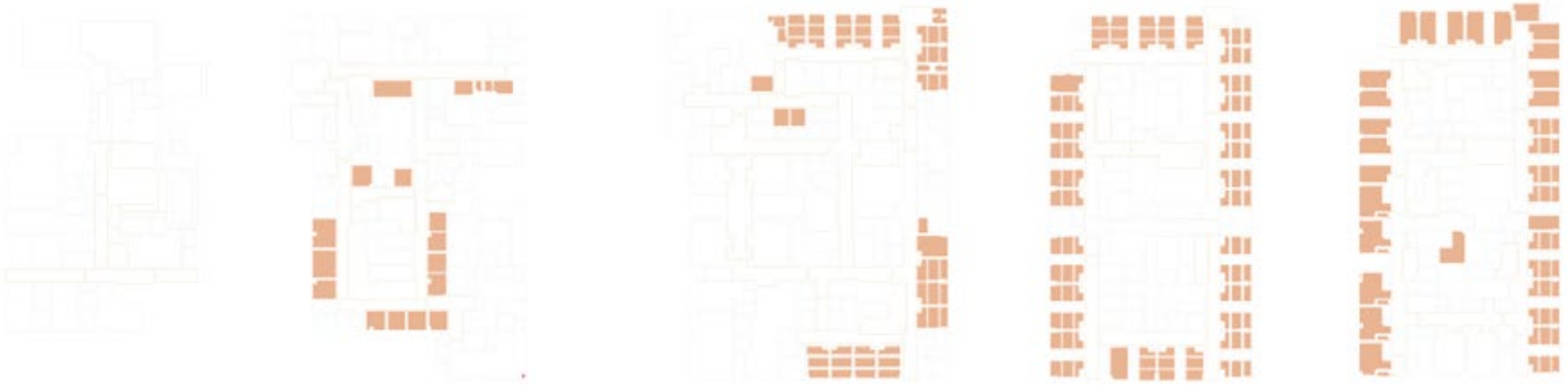
Design Planning with Visual Management

Group A



- Patient Rooms
- Waiting Areas
- Fewer than a dozen unique spaces, but which repeat throughout

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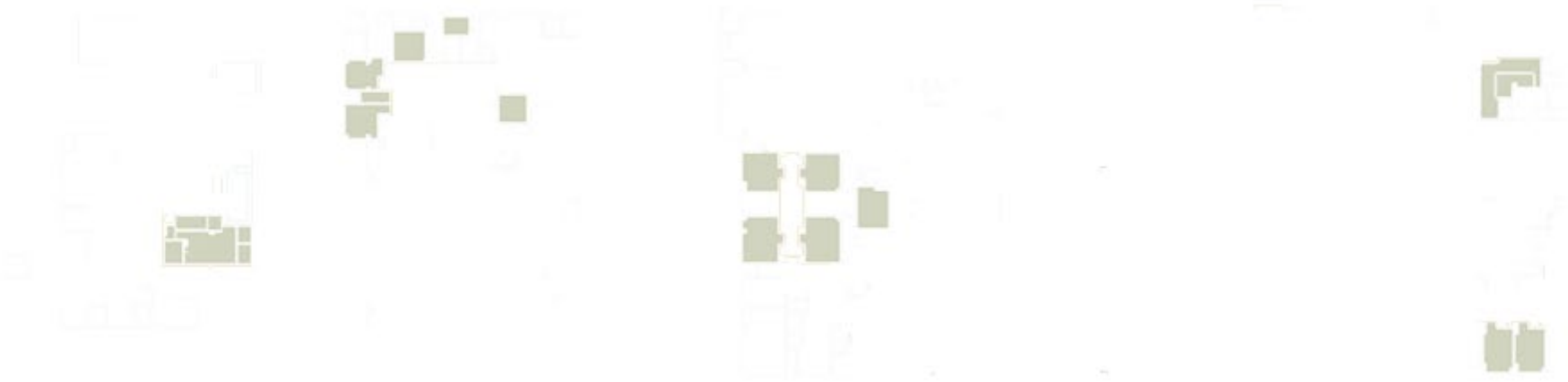
Design Planning with Visual Management

Group B



- ORs / C-Sections
- Nursery
- Diagnostic Imaging rooms

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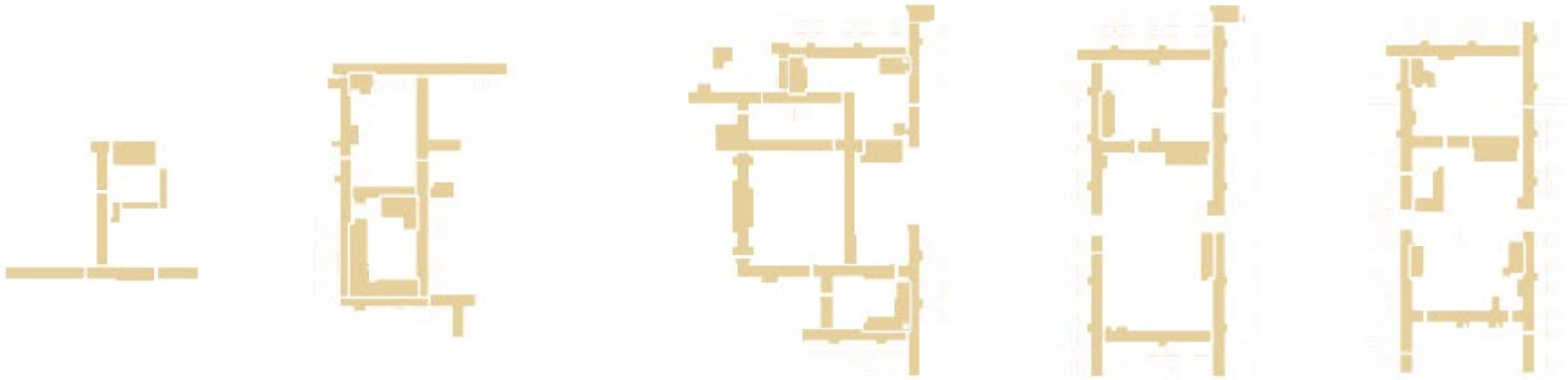
Design Planning with Visual Management

Group C



- Corridors
- Nurse Stations

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Design Planning with Visual Management

Group D

- Elevator Lobbies
- Main Lobby / Cafeteria
- Public armatures

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Design Planning with Visual Management

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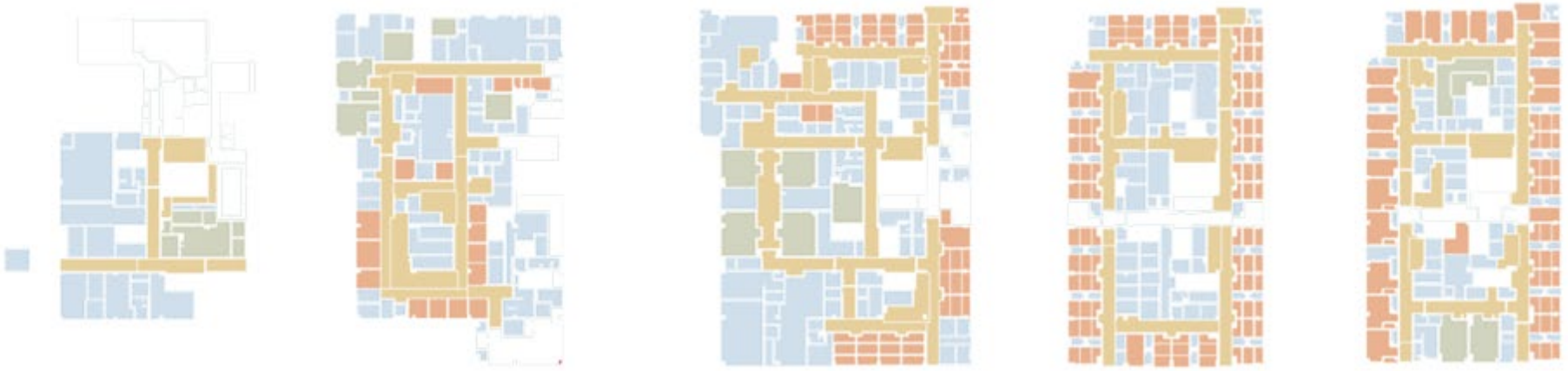
Design Planning with Visual Management



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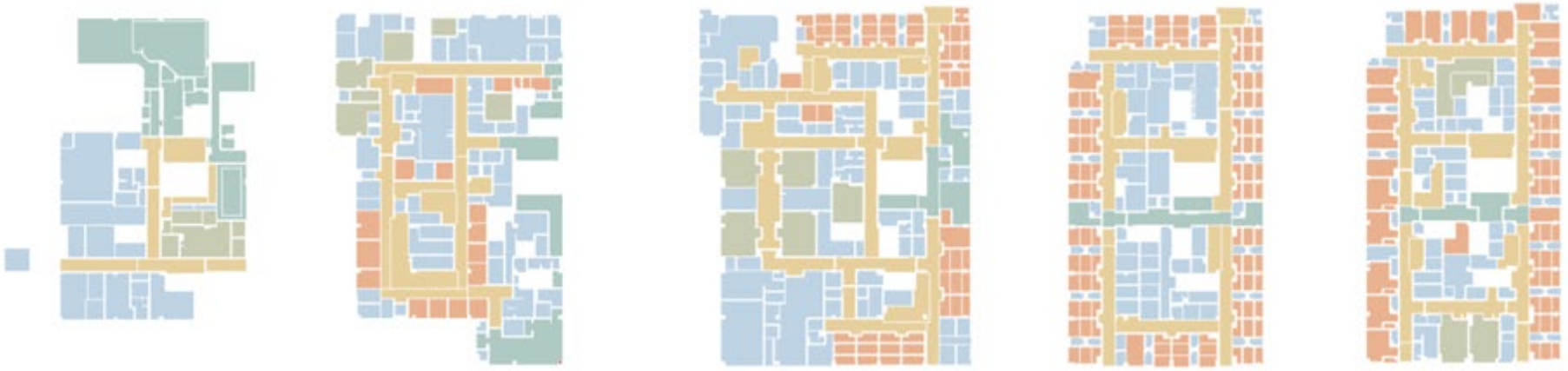
Design Planning with Visual Management



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Problem:

"Pull Planning is Exhausting. After 3-hours, we have a couple dozen stickies on the wall."

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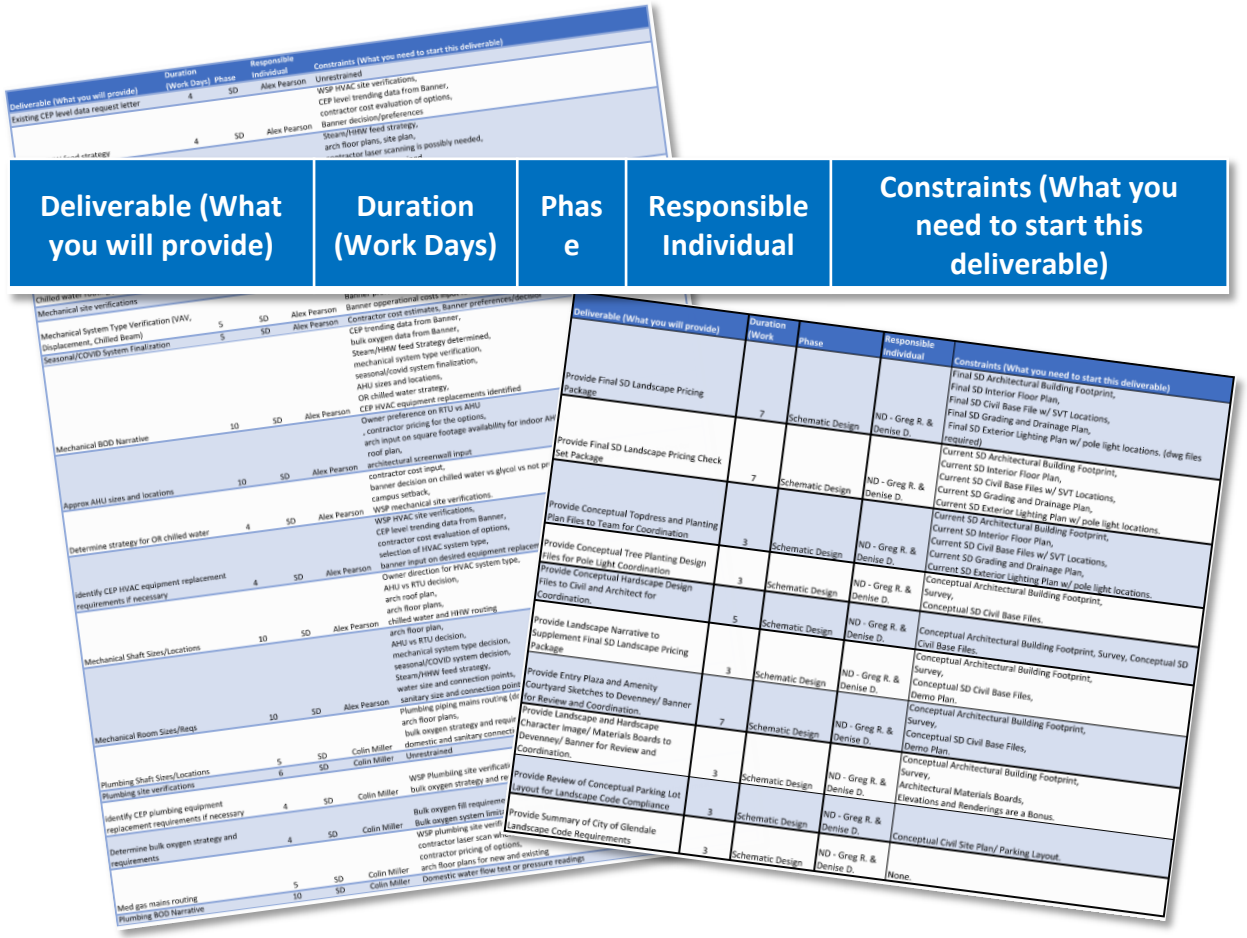
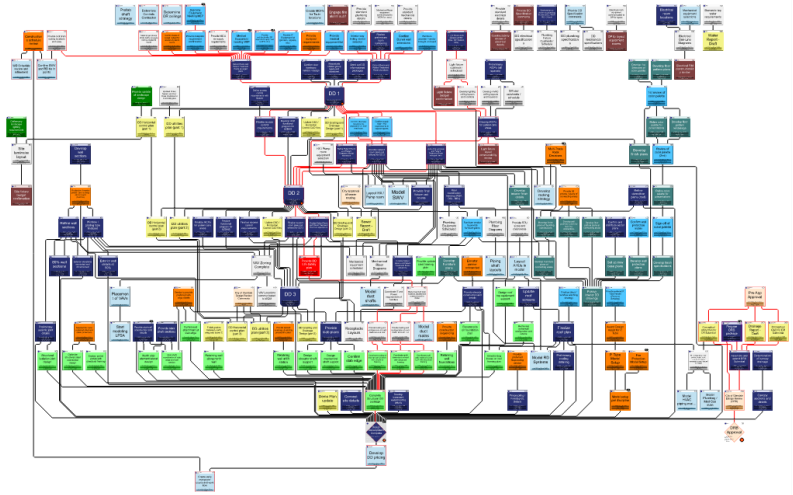
Importance of the “First Planner”



Successful Homework includes:

1. Defined Deliverables
2. Reliable Durations
3. Responsible Individual
4. Constraints Identified



Homework: 1-week prior to the pull

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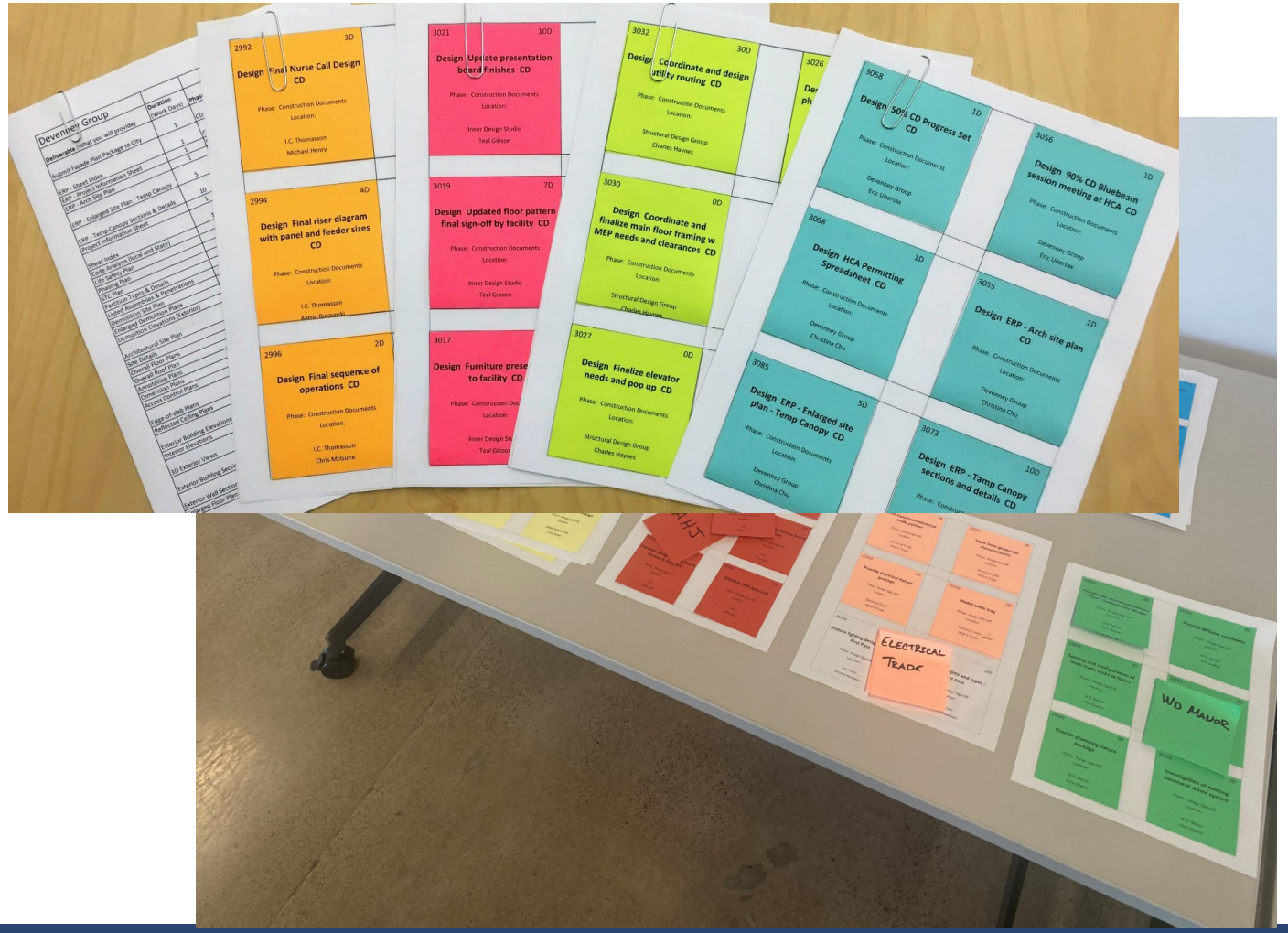
Importance of the “First Planner”



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COS and SOC

- For the pull at hand:
- Conditions of Satisfaction (COS): "How will we use the product of this pull?"
- Standards of Completion (SOC): "What will I produce to meet that pull?"
- COS and SOC for SD package for a replacement hospital:

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COS and SOC

- For the pull at hand:
- Conditions of Satisfaction (COS): "How will we use the product of this pull?"
- Standards of Completion (SOC): "What will I produce to meet that pull?"
- COS and SOC for SD package for a replacement hospital:

CONDITIONS OF SATISFACTION

- Achieve end user signoff at the departmental room level
- Provide an estimate update to the Board of Directors
- Achieve planning approval
- Bring on design-assist trade partners
- Ensure place in line for steel mill order

STANDARDS OF COMPLETION - STRUCTURAL

- Framing plan substantially complete
- Major slab openings identified and dimensioned
- Gravity load calcs 50%
- Outline spec complete
- Issue preliminary steel mill order for bringing on steel design-assist trade partner

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Problem:

"There's a lack of consistency in how people plan or talk about planning."

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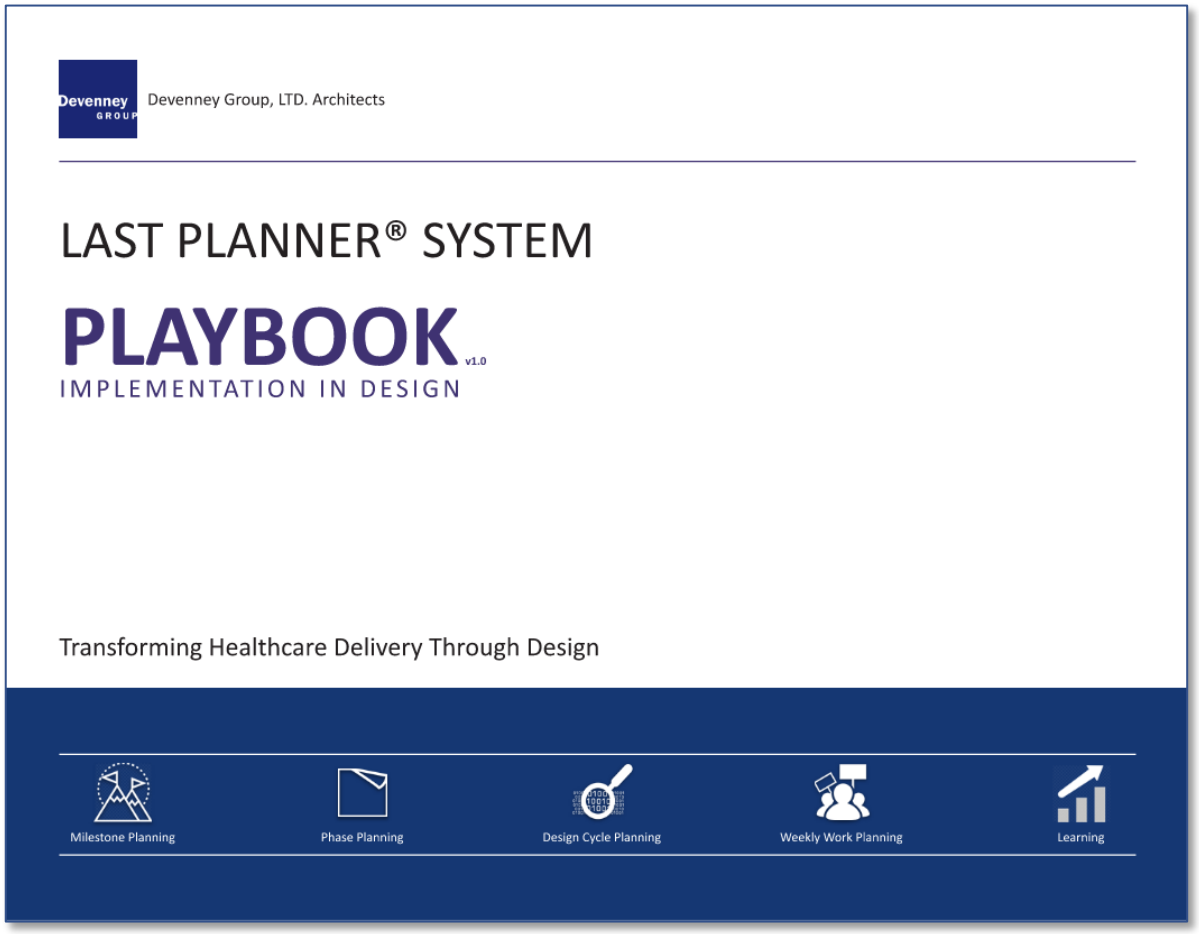
Level Setting



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5. Weekly Work Planning
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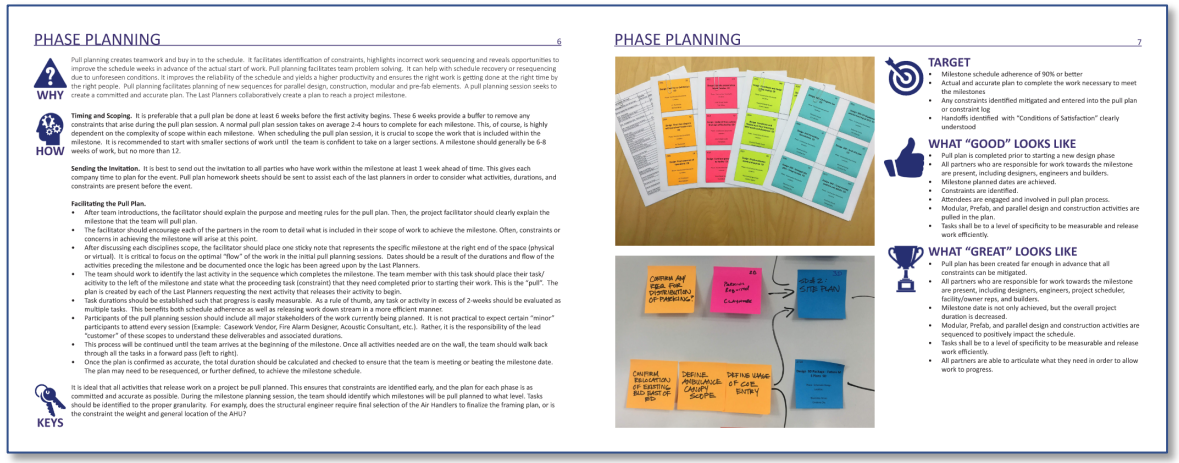
Level Setting



PHASE PLANNING 6

WHY

Pull planning creates teamwork and buy in to the schedule. It facilitates identification of constraints, highlights incorrect work sequencing and reveals opportunities to improve the schedule weeks in advance of the actual start of work. Pull planning facilitates team problem solving. It can help with schedule recovery or resequencing due to unforeseen conditions. It improves the reliability of the schedule and yields a higher productivity and ensures the right work is getting done at the right time by the right people. Pull planning facilitates planning of new sequences for parallel design, construction, modular and pre-fab elements. A pull planning session seeks to create a committed and accurate plan. The Last Planners collaboratively create a plan to reach a project milestone.

HOW

Timing and Scoping. It is preferable that a pull plan be done at least 6 weeks before the first activity begins. These 6 weeks provide a buffer to remove any constraints that arise during the pull plan session. A normal pull plan session takes on average 2-4 hours to complete for each milestone. This, of course, is highly dependent on the complexity of scope within each milestone. When scheduling the pull plan session, it is crucial to scope the work that is included within the milestone. It is recommended to start with smaller sections of work until the team is confident to take on a larger sections. A milestone should generally be 6-8 weeks of work, but no more than 12.

Sending the Invitation. It is best to send out the invitation to all parties who have work within the milestone at least 1 week ahead of time. This gives each company time to plan for the event. Pull plan homework sheets should be sent to assist each of the last planners in order to consider what activities, durations, and constraints are present before the event.

Facilitating the Pull Plan.

- After team introductions, the facilitator should explain the purpose and meeting rules for the pull plan. Then, the project facilitator should clearly explain the milestone that the team will pull plan.
- The facilitator should encourage each of the partners in the room to detail what is included in their scope of work to achieve the milestone. Often, constraints or concerns in achieving the milestone will arise at this point.
- After discussing each disciplines scope, the facilitator should place one sticky note that represents the specific milestone at the right end of the space (physical or virtual). It is critical to focus on the optimal "flow" of the work in the initial pull planning sessions. Dates should be a result of the durations and flow of the activities preceding the milestone and be documented once the logic has been agreed upon by the Last Planners.
- The team should work to identify the last activity in the sequence which completes the milestone. The team member with this task should place their task/activity to the left of the milestone and state what the proceeding task (constraint) that they need completed prior to starting their work. This is the "pull". The plan is created by each of the Last Planners requesting the next activity that releases their activity to begin.
- Task durations should be established such that progress is easily measurable. As a rule of thumb, any task or activity in excess of 2-weeks should be evaluated as multiple tasks. This benefits both schedule adherence as well as releasing work down stream in a more efficient manner.
- Participants of the pull planning session should include all major stakeholders of the work currently being planned. It is not practical to expect certain "minor" participants to attend every session (Example: Casework Vendor, Fire Alarm Designer, Acoustic Consultant, etc.). Rather, it is the responsibility of the lead "customer" of these scopes to understand these deliverables and associated durations.
- This process will be continued until the team arrives at the beginning of the milestone. Once all activities needed are on the wall, the team should walk back through all the tasks in a forward pass (left to right).
- Once the plan is confirmed as accurate, the total duration should be calculated and checked to ensure that the team is meeting or beating the milestone date. The plan may need to be resequenced, or further defined, to achieve the milestone schedule.

KEYS

It is ideal that all activities that release work on a project be pull planned. This ensures that constraints are identified early, and the plan for each phase is as committed and accurate as possible. During the milestone planning session, the team should identify which milestones will be pull planned to what level. Tasks should be identified to the proper granularity. For example, does the structural engineer require final selection of the Air Handlers to finalize the framing plan, or is the constraint the weight and general location of the AHU?

PHASE PLANNING 7

TARGET

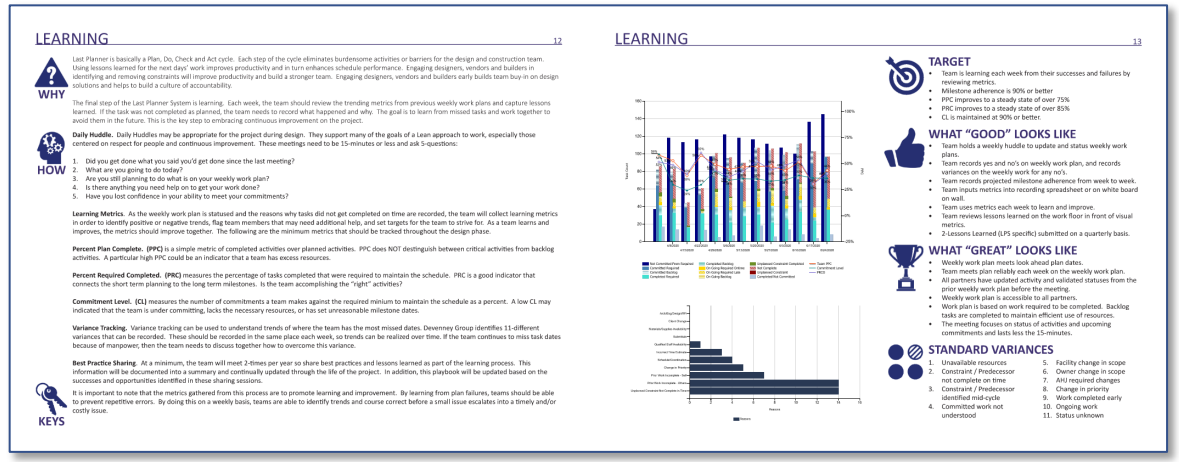
- Milestone schedule adherence of 90% or better
- Actual and accurate plan to complete the work necessary to meet the milestones
- Any constraints identified mitigated and entered into the pull plan or constraint log
- Handoffs identified with "Conditions of Satisfaction" clearly understood

WHAT "GOOD" LOOKS LIKE

- Pull plan is completed prior to starting a new design phase
- All partners who are responsible for work towards the milestone are present, including designers, engineers and builders.
- Milestone planned dates are achieved.
- Constraints are identified.
- Attendees are engaged and involved in pull plan process.
- Modular, Prefab, and parallel design and construction activities are pulled in the plan.
- Tasks shall be to a level of specificity to be measurable and release work efficiently.

WHAT "GREAT" LOOKS LIKE

- Pull plan has been created far enough in advance that all constraints can be mitigated.
- All partners who are responsible for work towards the milestone are present, including designers, engineers, project scheduler, facility/owner reps, and builders.
- Milestone date is not only achieved, but the overall project duration is decreased.
- Modular, Prefab, and parallel design and construction activities are sequenced to positively impact the schedule.
- Tasks shall be to a level of specificity to be measurable and release work efficiently.
- All partners are able to articulate what they need in order to allow work to progress.



LEARNING 12

WHY

Last Planner is basically a Plan, Do, Check and Act cycle. Each step of the cycle eliminates burdensome activities or barriers for the design and construction team. Using lessons learned for the next days' work improves productivity and in turn enhances schedule performance. Engaging designers, vendors and builders in identifying and removing constraints will improve productivity and build a stronger team. Engaging designers, vendors and builders early builds team buy-in on design solutions and helps to build a culture of accountability.

The final step of the Last Planner System is learning. Each week, the team should review the trending metrics from previous weekly work plans and capture lessons learned. If the task was not completed as planned, the team needs to record what happened and why. The goal is to learn from missed tasks and work together to avoid them in the future. This is the key step to embracing continuous improvement on the project.

HOW

Daily Huddle. Daily Huddles may be appropriate for the project during design. They support many of the goals of a Lean approach to work, especially those centered on respect for people and continuous improvement. These meetings need to be 15-minutes or less and ask 5-questions:

1. Did you get done what you said you'd get done since the last meeting?
2. What are you going to do today?
3. Are you still planning to do what is on your weekly work plan?
4. Is there anything you need help on to get your work done?
5. Have you lost confidence in your ability to meet your commitments?

Learning Metrics. As the weekly work plan is statused and the reasons why tasks did not get completed on time are recorded, the team will collect learning metrics in order to identify positive or negative trends, flag team members that may need additional help, and set targets for the team to strive for. As a team learns and improves, the metrics should improve together. The following are the minimum metrics that should be tracked throughout the design phase.

Percent Plan Complete. (PPC) is a simple metric of completed activities over planned activities. PPC does NOT destinguish between critical activities from backlog activities. A particular high PPC could be an indicator that a team has excess resources.

Percent Required Completed. (PRC) measures the percentage of tasks completed that were required to maintain the schedule. PRC is a good indicator that connects the short term planning to the long term milestones. Is the team accomplishing the "right" activities?

Commitment Level. (CL) measures the number of commitments a team makes against the required minium to maintain the schedule as a percent. A low CL may indicated that the team is under committing, lacks the necessary resources, or has set unreasonable milestone dates.

Variance Tracking. Variance tracking can be used to understand trends of where the team has the most missed dates. Devenney Group identifies 11-different variances that can be recorded. These should be recorded in the same place each week, so trends can be realized over time. If the team continues to miss task dates because of manpower, then the team needs to discuss together how to overcome this variance.

Best Practice Sharing. At a minimum, the team will meet 2-times per year so share best practices and lessons learned as part of the learning process. This information will be documented into a summary and continually updated through the life of the project. In addition, this playbook will be updated based on the successes and opportunities identified in these sharing sessions.

KEYS

It is important to note that the metrics gathered from this process are to promote learning and improvement. By learning from plan failures, teams should be able to prevent repetitive errors. By doing this on a weekly basis, teams are able to identify trends and course correct before a small issue escalates into a timely and/or costly issue.

LEARNING 13

TARGET

- Team is learning each week from their successes and failures by reviewing metrics.
- Milestone adherence is 90% or better
- PPC improves to a steady state of over 75%
- PRC improves to a steady state of over 85%
- CL is maintained at 90% or better.

WHAT "GOOD" LOOKS LIKE

- Team holds a weekly huddle to update and status weekly work plans.
- Team records yes and no's on weekly work plan, and records variances on the weekly work for any no's.
- Team records projected milestone adherence from week to week.
- Team inputs metrics into recording spreadsheet or on white board on wall.
- Team uses metrics each week to learn and improve.
- Team reviews lessons learned on the work floor in front of visual metrics.
- 2-Lessons Learned (LPS specific) submitted on a quarterly basis.

WHAT "GREAT" LOOKS LIKE

- Weekly work plan meets look ahead plan dates.
- Team meets plan reliably each week on the weekly work plan.
- All partners have updated activity and validated statuses from the prior weekly work plan before the meeting.
- Weekly work plan is accessible to all partners.
- Work plan is based on work required to be completed. Backlog tasks are completed to maintain efficient use of resources.
- The meeting focuses on status of activities and upcoming commitments and lasts less the 15-minutes.

STANDARD VARIANCES

1. Unavailable resources
2. Constraint / Predecessor not complete on time
3. Constraint / Predecessor identified mid-cycle
4. Committed work not understood
5. Facility change in scope
6. Owner change in scope
7. AHJ required changes
8. Change in priority
9. Work completed early
10. Ongoing work
11. Status unknown

Each Section Includes:

1. Why we do this
2. How we do this
3. Keys to Success
4. Target Metric
5. What Good Looks Like
6. What Great Looks Like
7. Some Examples

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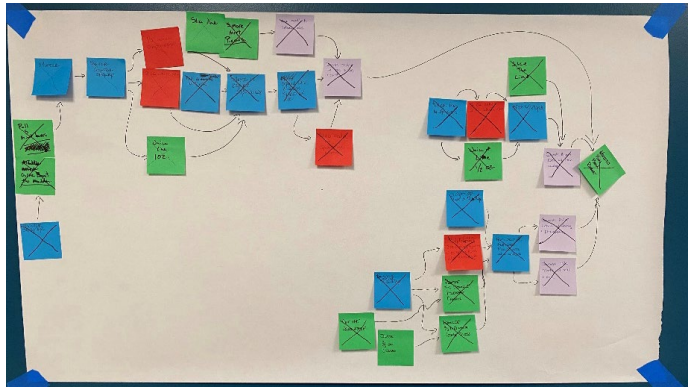
Level Setting – Make it Fun (Pull Tending)



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Problem:

"That guy thinks DD means one thing, the AIA says something else, and I don't agree with either."

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Use Smart Milestones

Schematic Design

- Space Program Sign-Off
- Departmental Adjacencies Locked
- Frozen Floor Plan

Design Development

- User Sign-Off
- Exterior Design Sign-Off
- Interior Design Sign-off
- Phasing Plan Determined
- Site Specific Vendor Drawings

Construction Docs

- Coordinated BIM
- Permit Set Submitted
- Construction Set Complete

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Problem:

"I'm hitting 100 PPC, what's the problem?"

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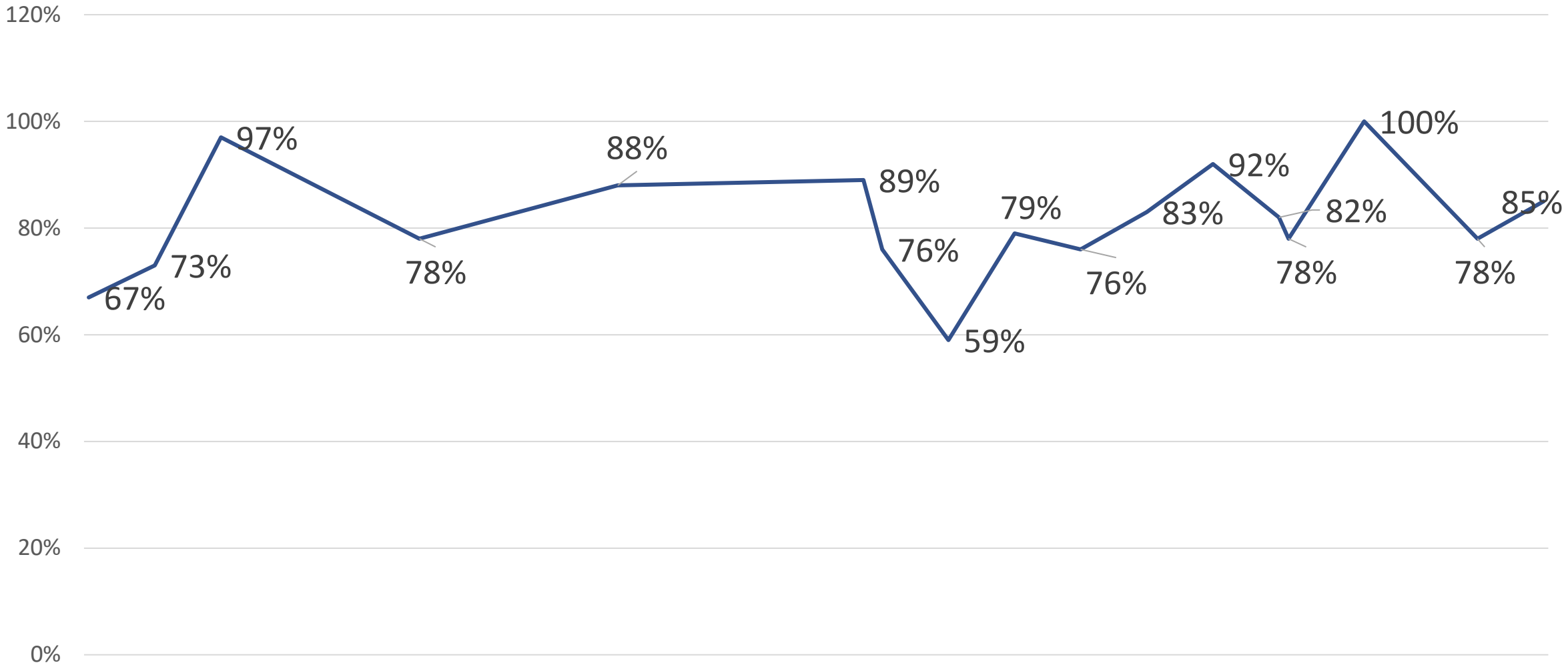
Transforming Design and Construction

Healthy Metrics



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What can you do on Monday?

- Ask the two questions:
  - What is the problem I'm trying to solve?
  - How can I be more effective
- Improve by 1% (continuously)
- Start fixing what bugs you

26TH LCI CONGRESS
OCTOBER 22-25, 2024

In the spirit of continuous improvement, we would like to remind you to complete this session's survey! We look forward to receiving your feedback.

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Thank you for attending this presentation. Enjoy the rest of the 26th Annual LCI Congress!

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