

Project Planning & Control

Lesson 7

Emerging Trends/Tools in Project Planning

Koshy Varghese, Ph.D.

Professor

Building Technology & Construction Management

Department of Civil Engineering

I.I.T. Madras



Emerging Trends/Tools in Project Planning

- *Location Based Management Systems (LBMS)*
- *4D – Scheduling with BIM*
- *Design Structure Matrix (DSM)*
- *Discrete Event Simulation*
- *Critical Chain Project Management (CCPM)*
- *Lean Construction*

LOCATION BASED PLANNING

- Most Construction Planning approaches don't explicitly model construction path.
- Work Location is an important resource
- Tools for Location Based Management System (LBMS) are available today
- Basic Concept is similar to the well known Linear Scheduling Method (LSM) – But application today is broader.

STAGE I

STAGE II

STAGE III

Select location of planned work

Select location of planned work

[illegible]

DAY 1

SL No	Week	W1								W2					
	Date	20/02/11	21/02/11	22/02/11	23/02/11	24/02/11	25/02/11	26/02/11	27/02/11	28/02/11	01/03/11	02/03/11	03/03/11	04/03/11	
1	Wall reinforcement														
2	Wall formwork														
3	Wall concreting														
4	Wall de-shuttering														
5	Deck formwork														
6	Deck reinforcement														
7	Deck concreting														
8	Deck de-shuttering														

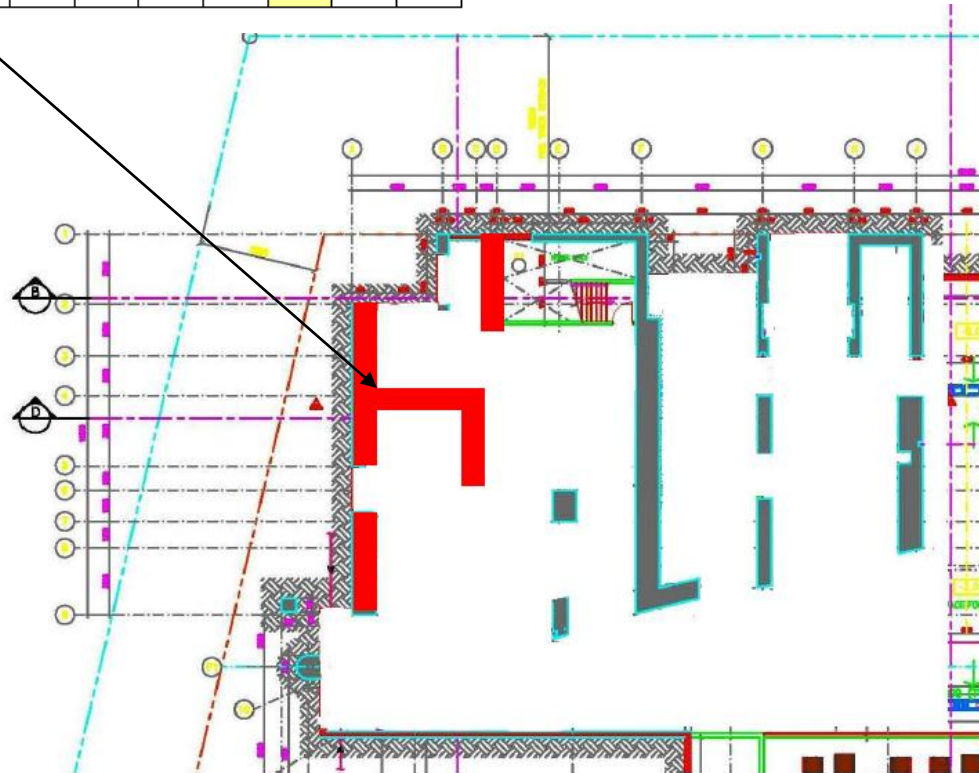
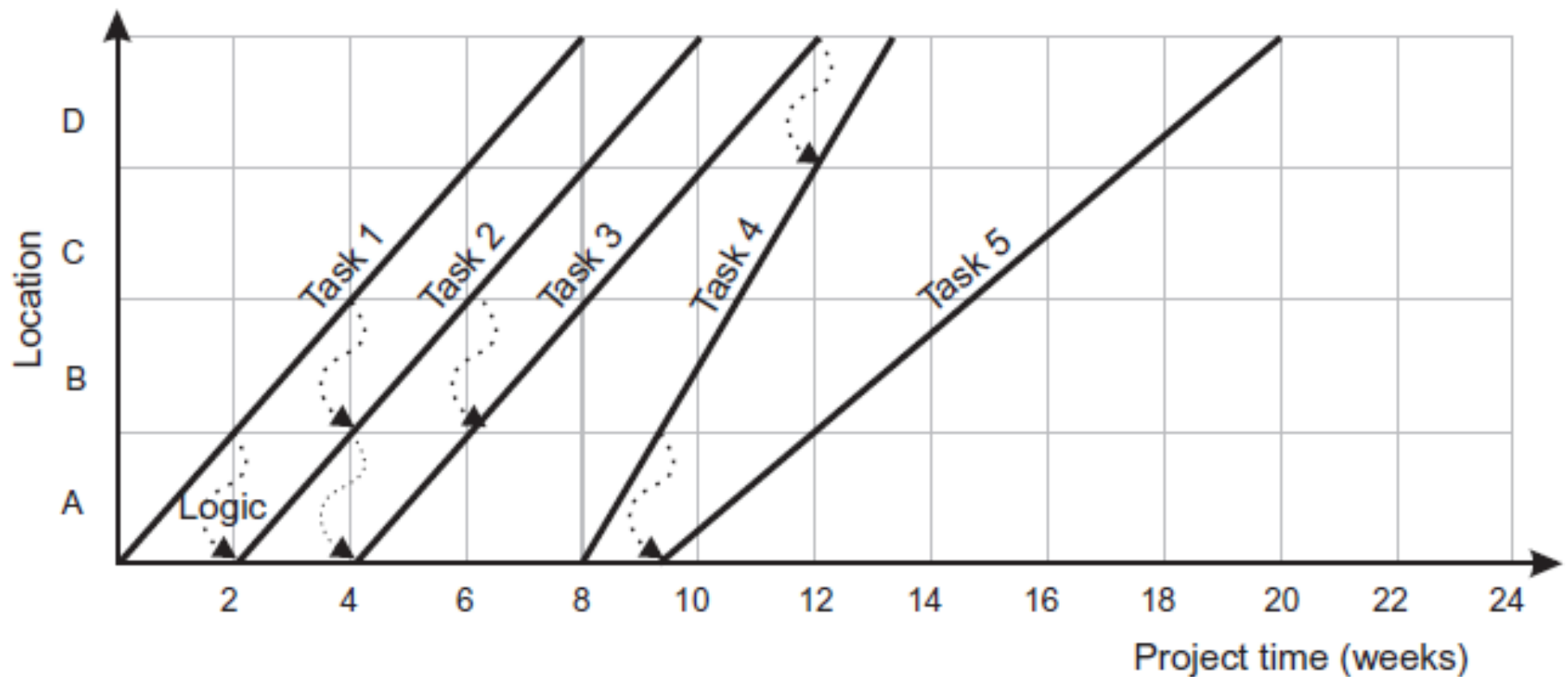
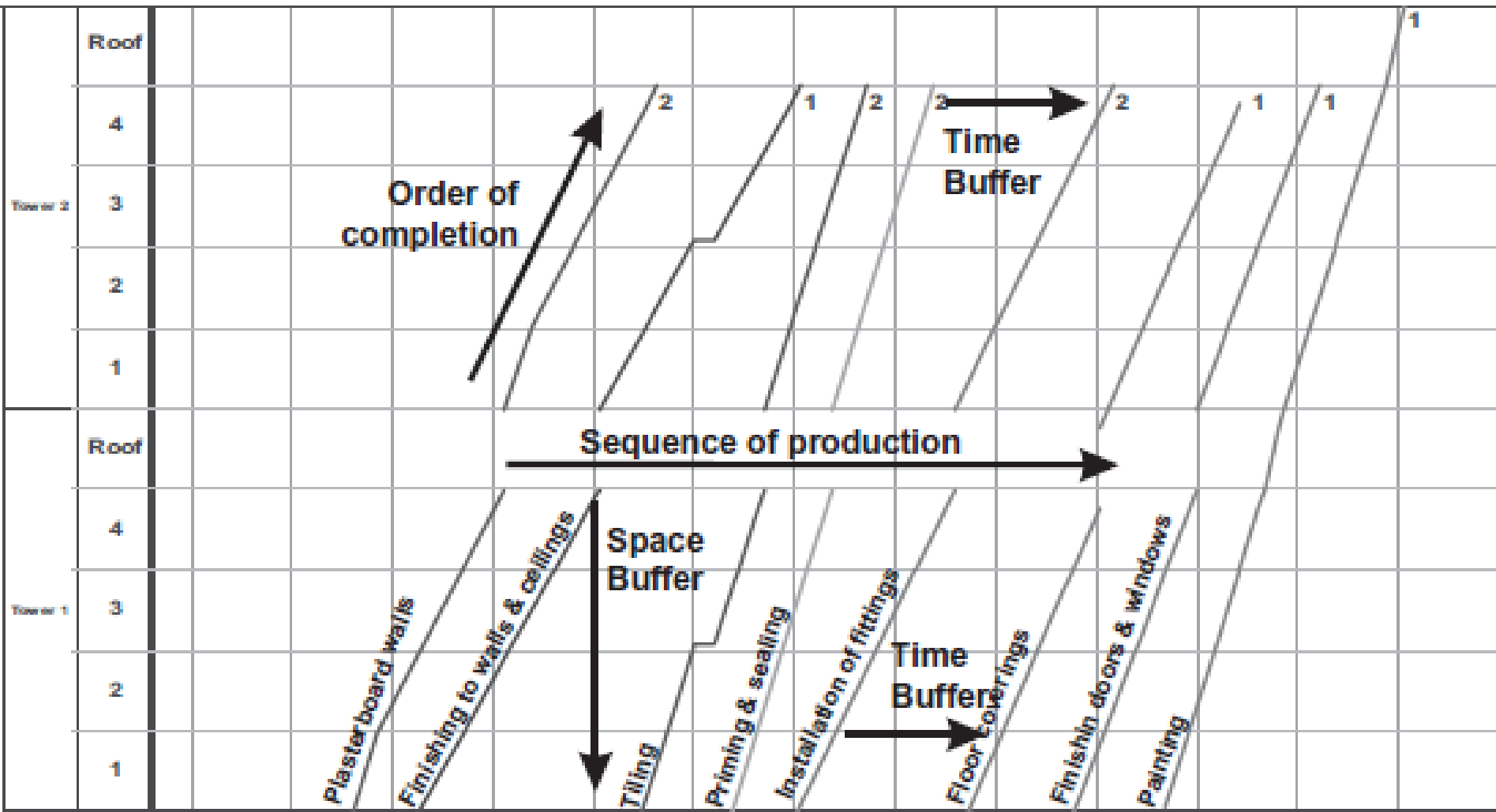


Figure 03 – Plan showing Day 01 Target

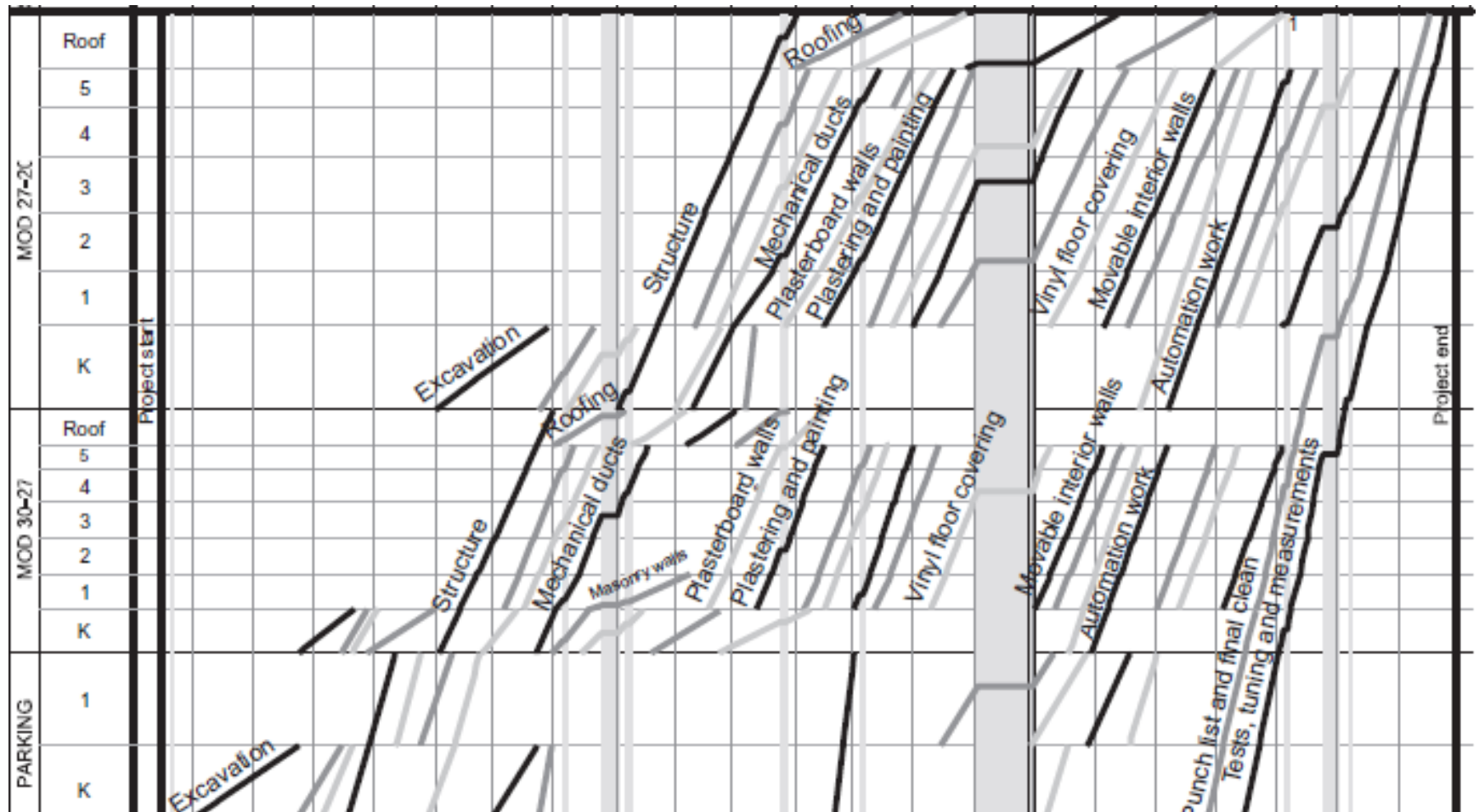
Location Based Planning



Location Based Planning



Location Based Planning



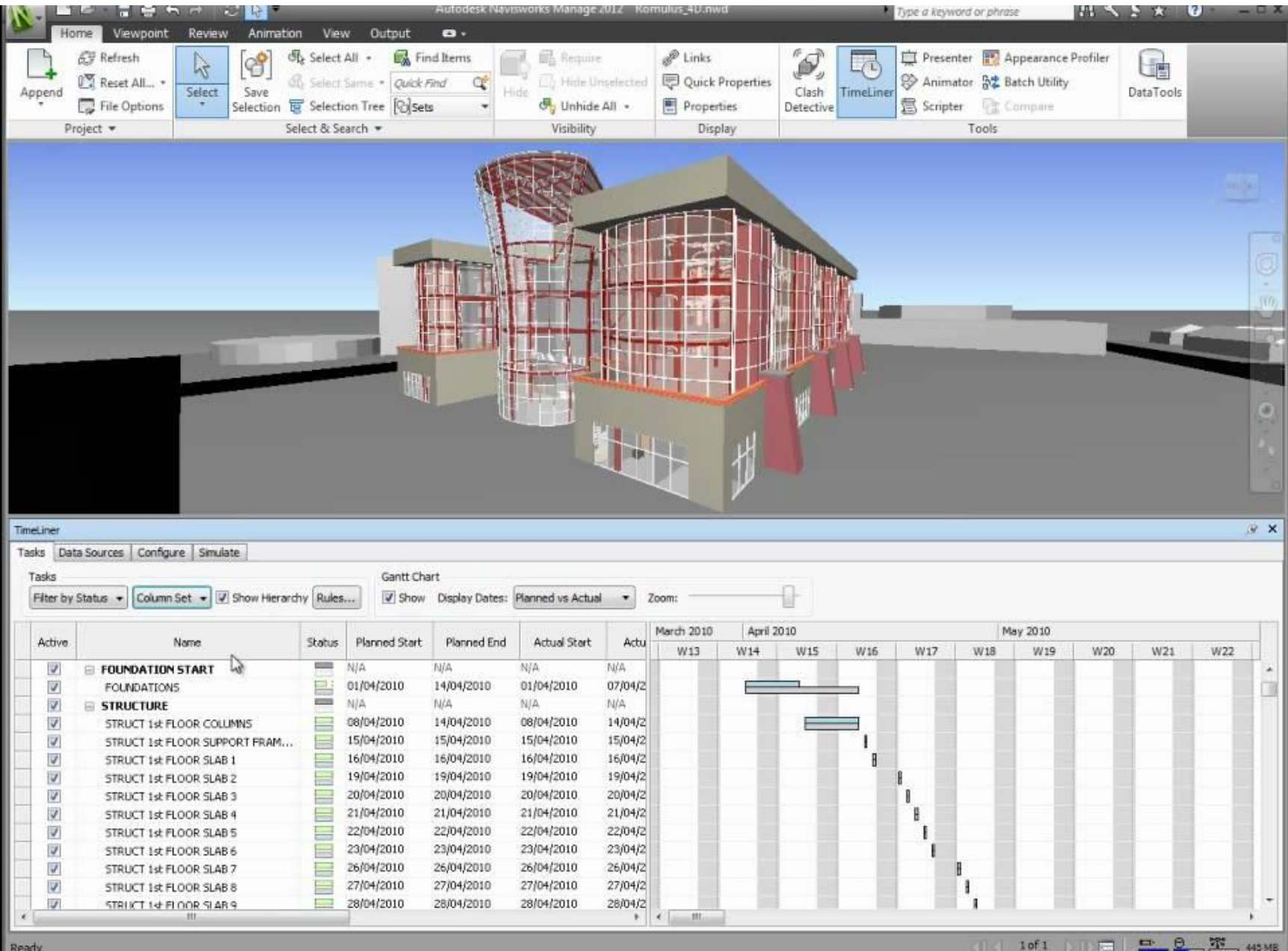
Location Based Scheduling Vs. CPM

- Location provides the container for all project data and is used as the primary work division through a LBS. In addition to the more familiar Work Breakdown Structure (WBS). ¹
- CPM scheduling emphasizes ²
 - The project duration and the critical path to achieve the set duration.
- LBS emphasizes ²
 - Physical “locations” to plan, analyze and control workflow.
 - LBS focuses on production efficiency as resources move through locations.

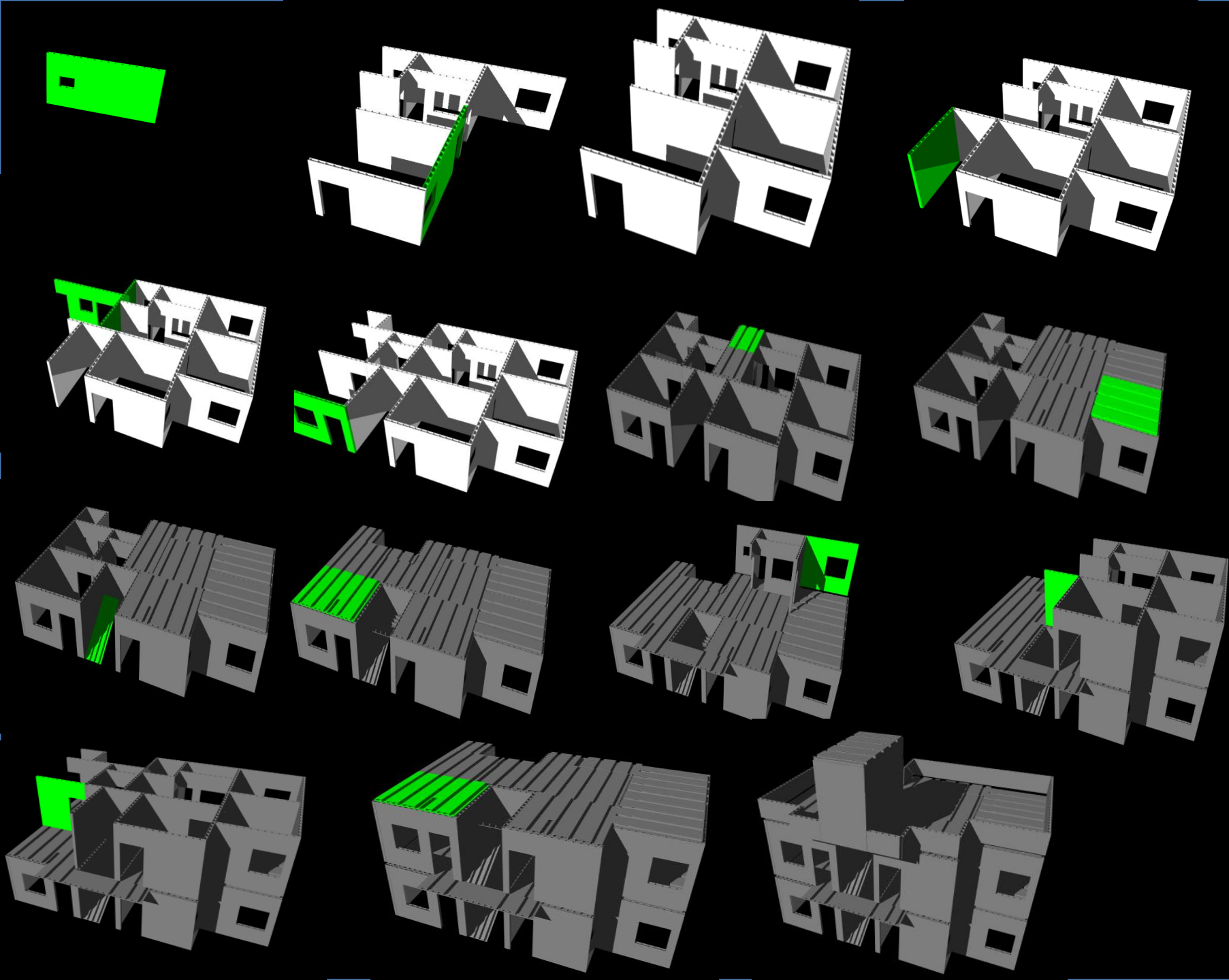
¹ *Kenley and Seppänen, 2009*

² *Lowe et al., 2007*

4D – Scheduling – Using CAD/BIM



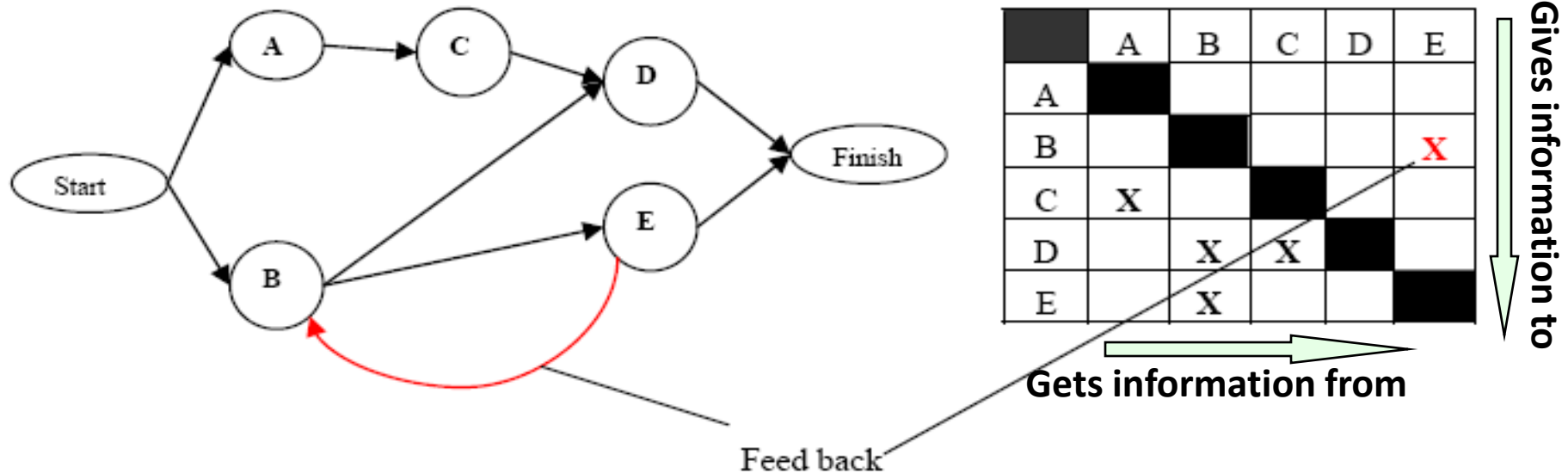
4D SCHEDULE



Design/Dependency Structure Matrix (DSM)

To Represent the information dependencies:

A two-dimensional matrix representation of the structural or functional interrelationships of objects, tasks or teams.



Advantages

Represent and Captures information cycles

Compactness

Easy to Read

Appropriate for Planning the Design Phase & Information interfaces

Partitioning

Rearranging the rows and columns

- a) To remove the feed back marks from the matrix
- b) To move the feed back marks as close as to the diagonal

	A	B	C	D	E
A					
B					X
C	X				
D		X	X		
E		X			

Original matrix

	B	E	A	C	D
B		X			
E	X				
A					
C			X		
D	X			X	

Partitioned matrix

Clustering

Grouping the off diagonal elements by reordering the rows and columns
(Browning 2001)

- Maximize the iterations between the elements within the cluster and minimize the iteration between the clusters.
- Allow some overlapping of clusters

	Designer 1	Designer 2	Designer 3	Designer 4	Designer 5	Designer 6	Designer 7
Designer 1		X			X	X	
Designer 2				X			X
Designer 3		X		X			X
Designer 4		X	X				X
Designer 5				X		X	
Designer 6	X				X		
Designer 7		X	X	X			

Original DSM

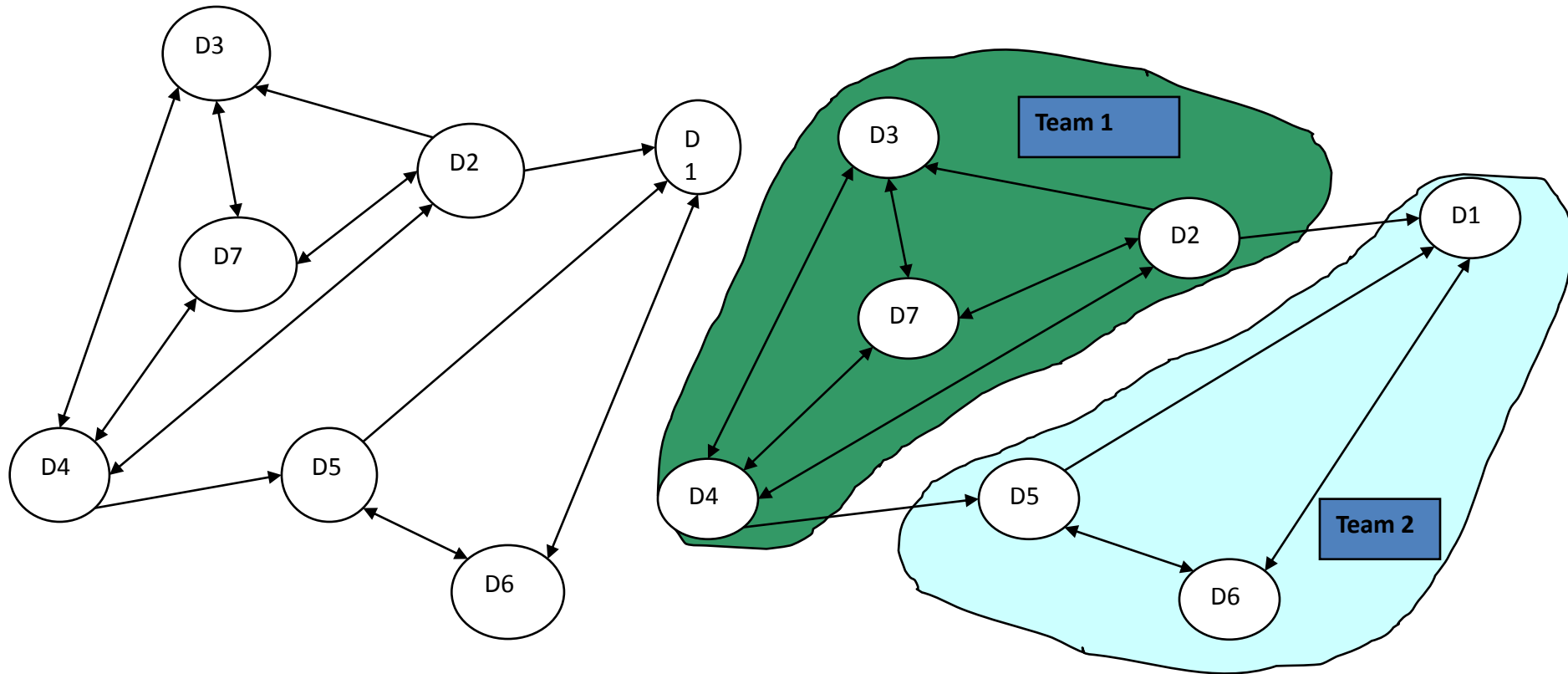
	Designer 2	Designer 3	Designer 4	Designer 7	Designer 1	Designer 5	Designer 6
Designer 2			X	X			
Designer 3	X		X	X			
Designer 4	X	X		X			
Designer 7	X	X	X				
Designer 1	X					X	X
Designer 5			X				X
Designer 6					X	X	

Re sequenced DSM

Teams formed after DSM analysis.

Team 1 consists of 2 3 4 7 ; **Team 2** consists of 1 5 6

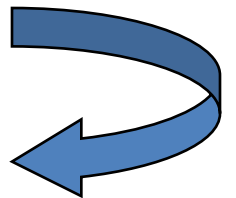
Design Team formation – Network Representation



Before DSM analysis

After DSM Analysis

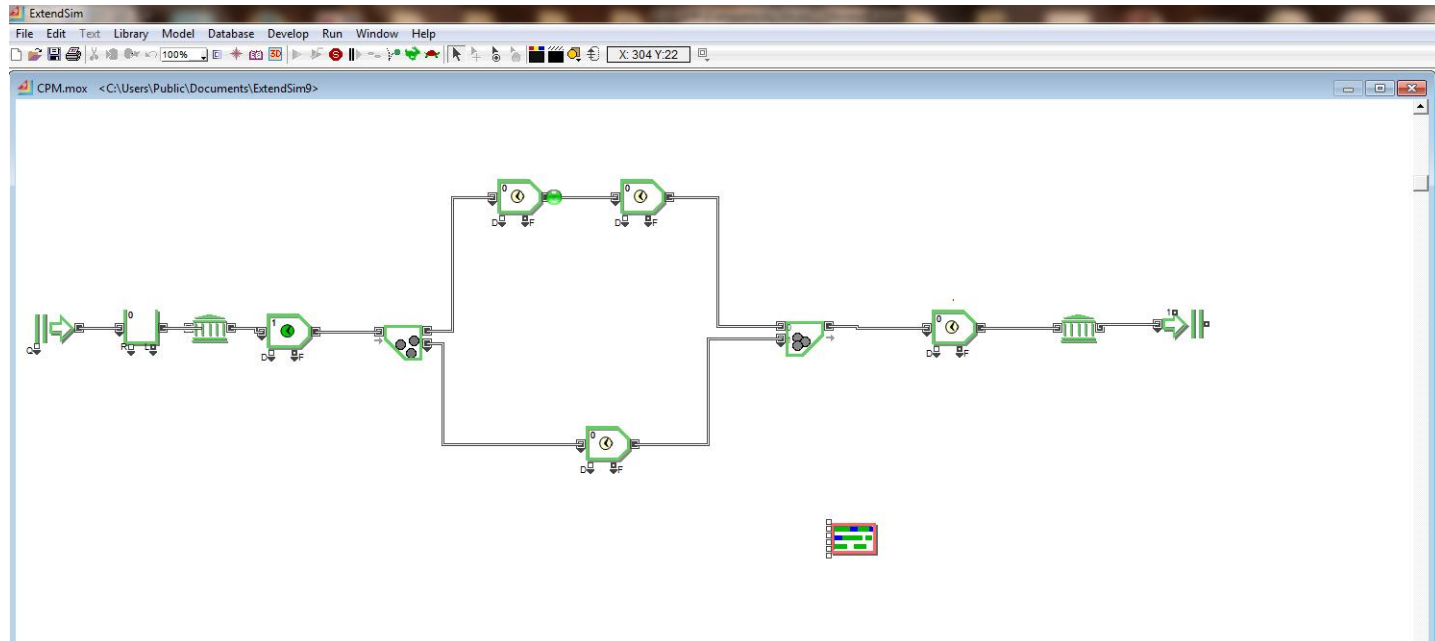
Refer to www.dsmweb.org for more information



Simulation

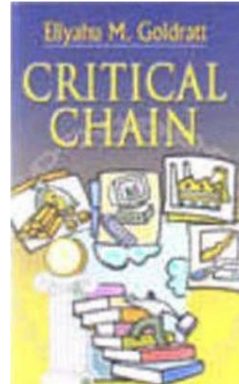
- Discrete Event Simulation in Construction
- Active research area since 1970's
- Industry applications since 2000's

Refer: AbouRizk, S., Halpin, D., Mohamed, Y., and Hermann, U. (2011). "Research in Modeling and Simulation for Improving Construction Engineering Operations." *J. Constr. Eng. Manage.* 137, SPECIAL ISSUE: Construction Engineering: Opportunity and Vision for Education, Practice, and Research, 843–852.



Critical Chain Project Management

- Eliyahu M. Goldratt's book, [Critical Chain](#). Theory of Constraints
- Addresses Several practical issues in Project situations
- Focus on resources and creating/managing buffers.
- Software tools are available today for implementing concepts



Lean Project Delivery

- Adaptation of Toyota Production System concepts to construction
- A key concept is to identify and eliminate **waste** to improve productivity -> cost & time performance → system level approach

