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# Sequential Analysis of Reasons for Non-Completion of Activities: Case Study and Future Directions

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# Introduction

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- Assignments should be closely measured and monitored and causes from non-realization should be investigated
- Last Planner system of production control focus on plan realization and the collection of reasons for non-completion of activities

# Introduction

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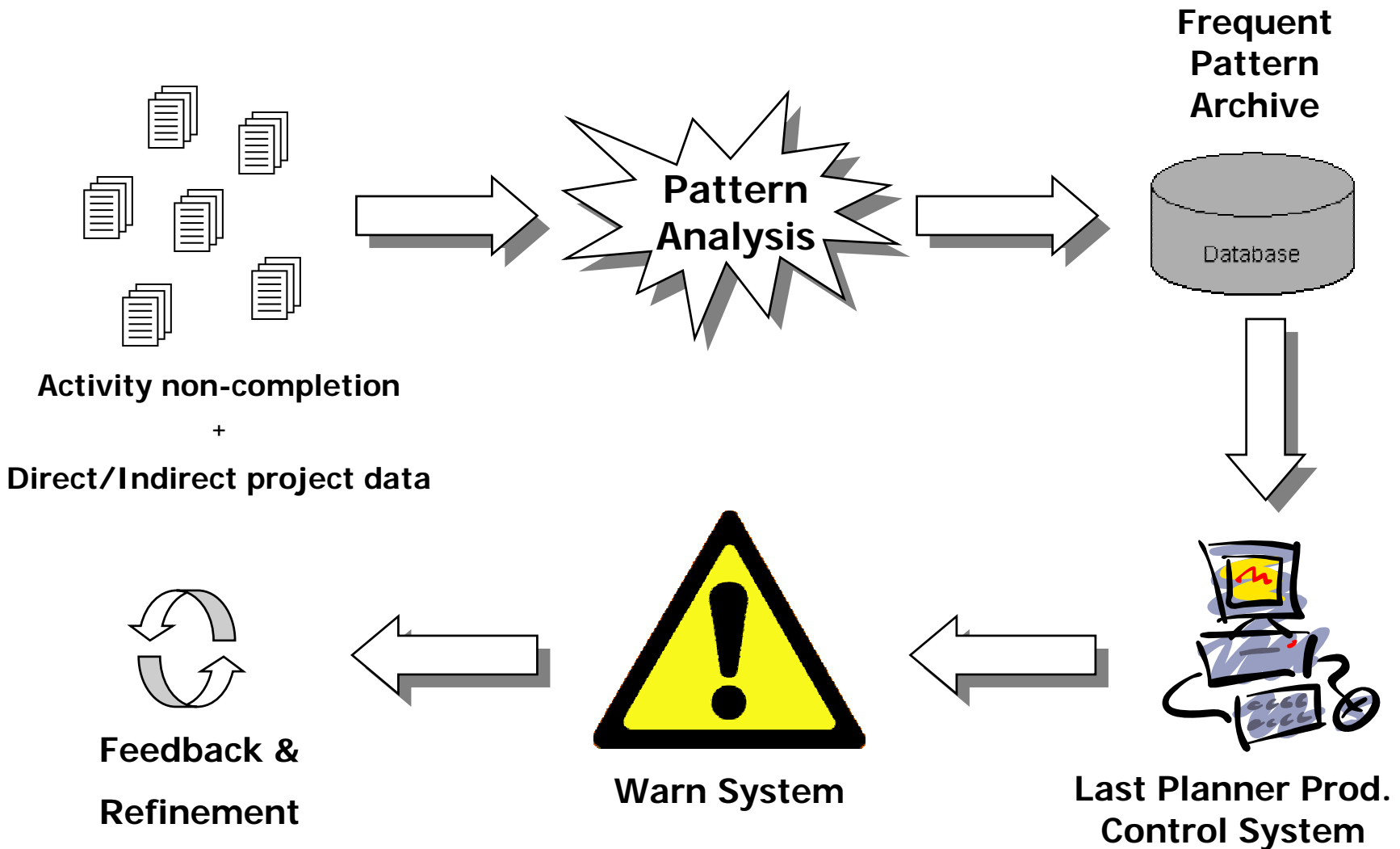
- Study sequence of reasons for non-completion of activities
  - Comprehend relationships and similar dependencies
  - Trace chain of impact in the sequence of activities

# Objectives

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- Supplement Last Planner production control system with additional capabilities to:
  - warn likely prospective activities failures through pattern recognition.
  - Aid in the study of the cause-effect relationships among non-completed activities.
  - Suggest possible preventive/corrective course of actions.

# Objectives



# Sequential Analysis

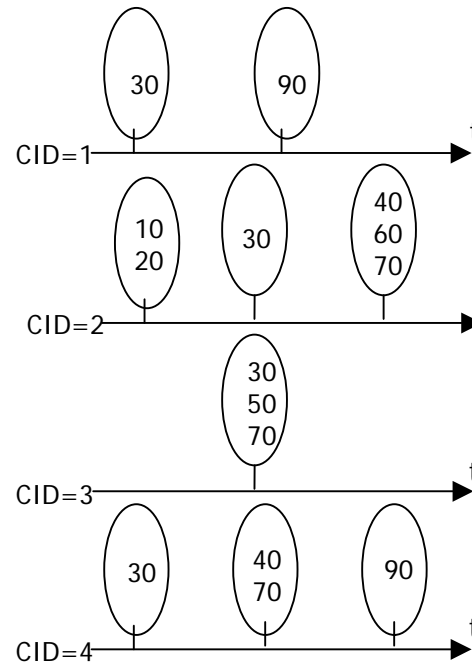
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- Sequential pattern analysis
  - Customer shopping patterns
  - Telephone calling patterns
  - Natural disasters (e.g., earthquake, hurricane)
  - Stock market fluctuation
  - DNA sequence analysis
  - Optimization of deferred maintenance

# Sequential Analysis

- Traditional sequential pattern analysis

Customer ID	Time	Items
1	1	30
1	2	90
2	1	10,20
2	2	30
2	3	40,60,70
3	1	30,50,70
4	1	30
4	2	40,70
4	3	90



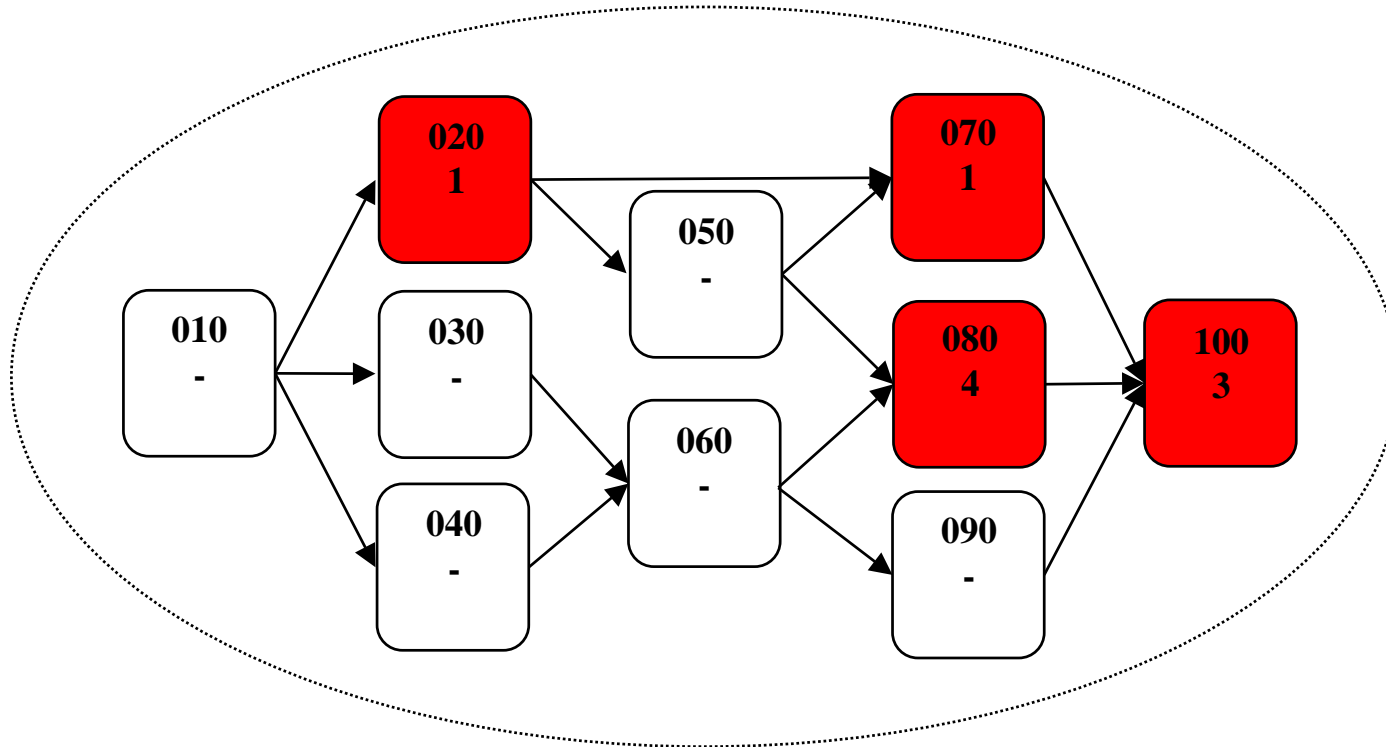
$\langle 30 \rangle \langle 90 \rangle$  (1,4)  
 $\langle 30 \rangle \langle 40,70 \rangle$  (2,4)  
 $\langle 30 \rangle \langle 60 \rangle$  ? NO.

MinSupp=50%, i.e. 2 customers:

Source: Adapted from Aggrawal and Srikant, 1995

# Sequential Analysis

Subset of hypothetical scheduling



# Sequential Analysis

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- Data Summary
  - Database containing work flow control data
    - Non-completed activities x Reasons
  - Data Summary
    - 4 Months of excavation/foundation work
    - Total Activities = ~18000
    - Non-completed activities = ~4500
    - Average PPC = ~ 75%

# Sequential Analysis

- Sample Output

Code	Category	Sequential Pattern of 1 activity		Sequential Pattern of 2 activities		Sequential Pattern of 3 activities	
1	Information						
2	Material	3	1329	3->3	135	3->3->3	39
3	Labor	1	991	6->6	85	6->6->6	21
4	Plant (Equipment)	6	593	4->4	72	4->4->4	16
5	Weather	7	492	7->7	71	7->7->7	14
6	Directive	4	438	1->1	63	1->4->7	7
7	Prerequisites	2	421	2->2	34	2->2->2	7
8	Site Access	5	161	1->3	21	1->1->1	6
		8	108	4->3	21	4->7->7	5
		Total	4533	7->3	20	7->7->3	5
				5->5	17	...	...
				4->7	16		
				7->6	16		
				1->4	12		
				8->8	12		
				6->3	11		
				7->1	11		
				1->6	10		
				...	...		

- This type of analysis could warn managers about the likelihood of prospective failures and what kind of failures these might be

# Conclusion

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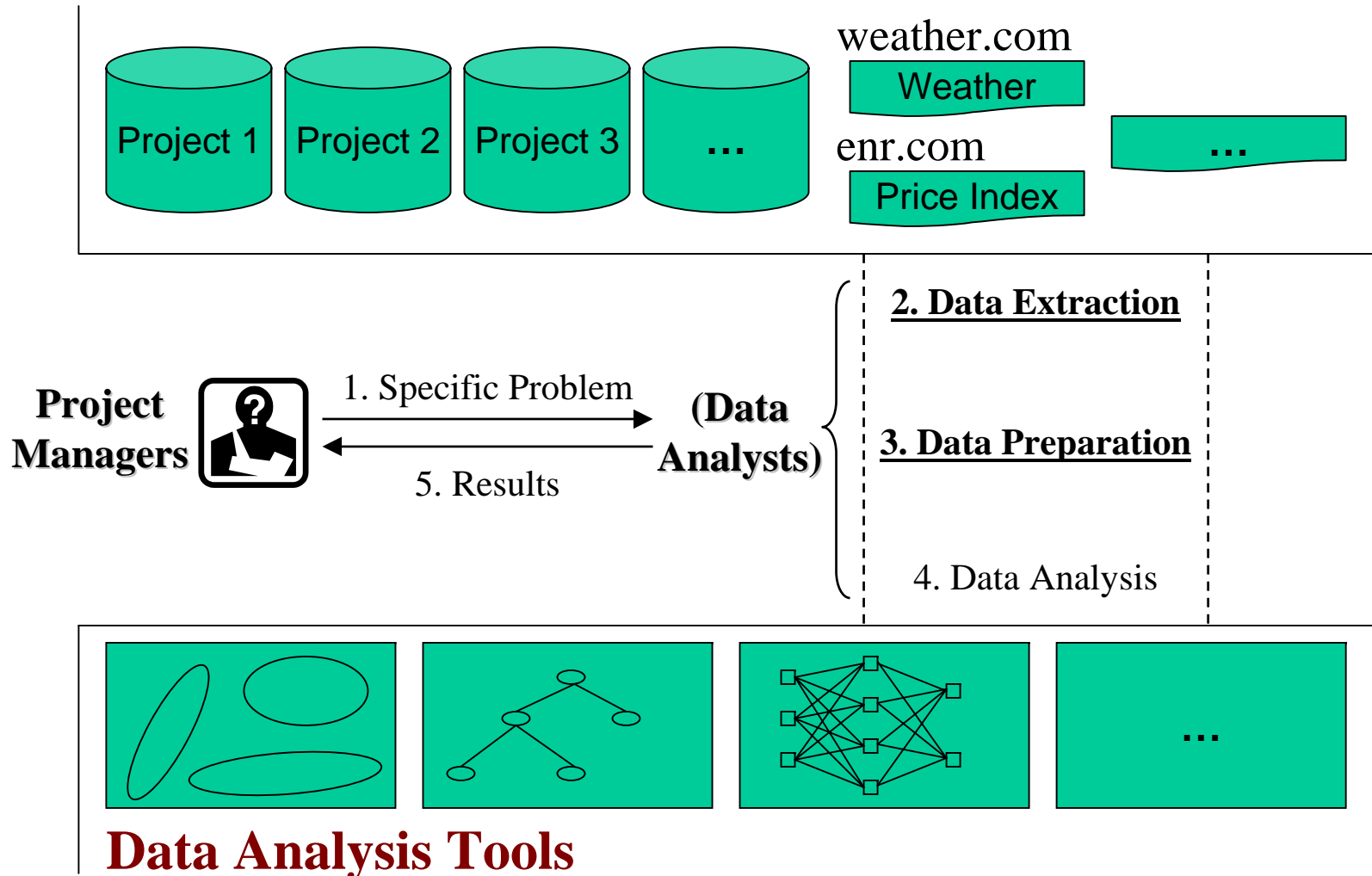
- Sequential pattern assumes independence between sequences
  - Paths of non-completed activities shares sub-paths losing our independence assumption
  - Drawing all the paths replicates nodes
- How to model relationships of activities completed and non-completed
  - graph representation + graph pattern recognition
  - definition of the correlation and impact on subsequent activities

# Conclusion

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- Integration of other project data sources
  - Reasons might be biased
  - Better description of characteristics of non-completed activities
  - Analyze which characteristics impact more the non-completion of activities
- Ensure data integrity
  - Facilitate data cross reference
  - Feasible standard model for data integrity

# Needs



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Thank you